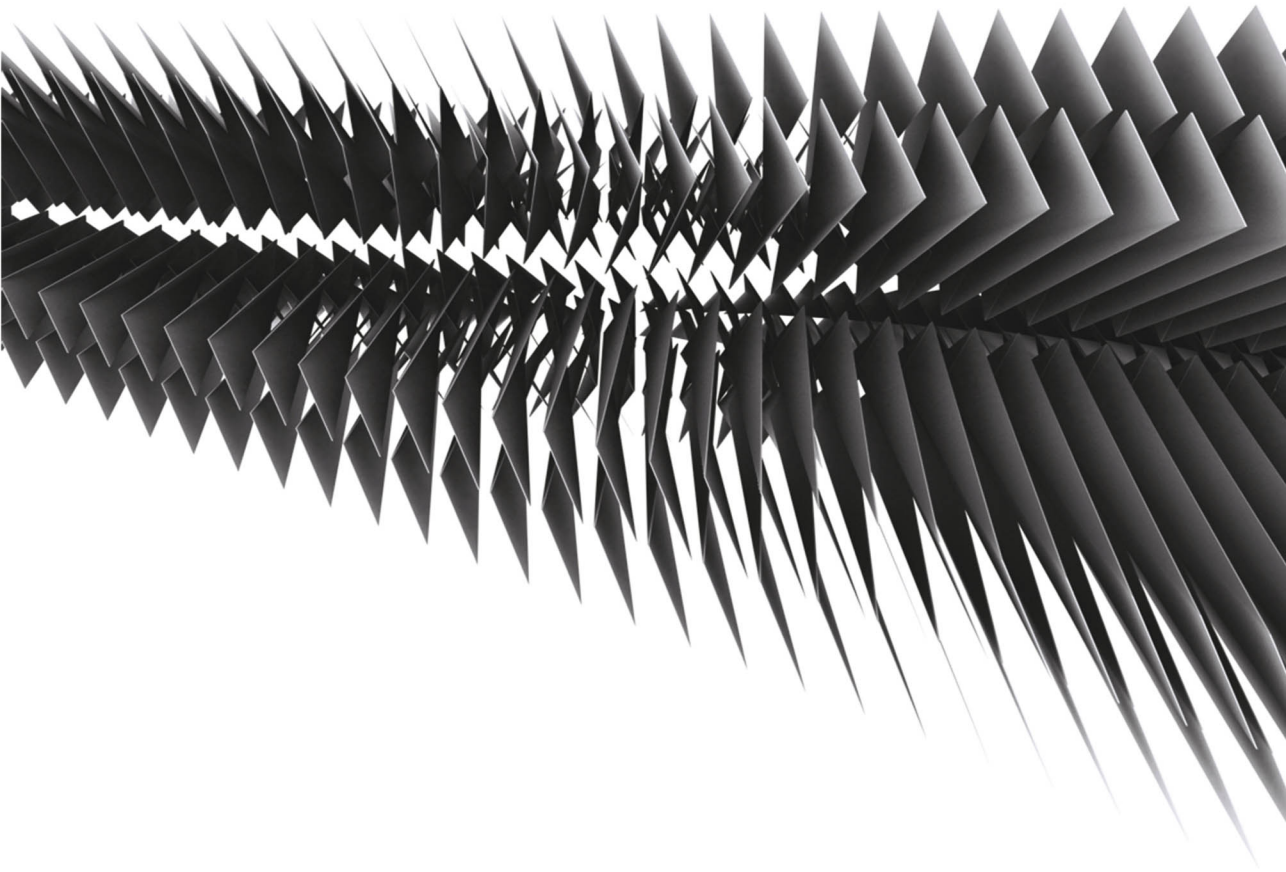

ENHSA - EAAE
Architectural Design Teachers'
Network Meeting

teaching and experimenting with architectural design

advances in technology and changes in pedagogy

EAAE Transactions on Architectural Education no 35

editors Constantin Spiridonidis and Maria Voyatzaki

european network enhsa of heads of schools of architecture
EUROPEAN ASSOCIATION FOR ARCHITECTURAL EDUCATION
éducation et culture Socrates

Teaching and Experimenting with Architectural Design: Advances in Technology and Changes in Pedagogy

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Host institution of the workshop that gave rise to this volume

School of Architecture,
University Lusiada, Lisbon, Portugal

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Editorial

We would like to express our sincere gratitude firstly to Professor Joaquim Braizinha, Head of the School of Architecture, University Lusiada for he has been a very warm supporter of this event. From the very beginning he was very positive and extremely cooperative in helping us realise it. We would also like to thank Johannes Kaeferstein and Oliver Fritz from the Liechtenstein School of Architecture and Sean Hanna from the Bartlett School of Architecture, who have been very creative partners in the organising committee as well as very helpful on the scientific committee of this event. We would also like to thank two other persons who were in the scientific committee, Dimitris Papalexopoulos from the National Technical University of Athens and Antonino Saggio from La Sapienza University in Rome: their contribution their collaboration, constructive comments and support were invaluable. Our gratitude, appreciation and respect should be expressed to our keynote speakers Paul Coates, Fabio Gramazio, Matthias Kohler, Neil Leach, George Legendre, Ilona Lénárd, Kas Osterhuis, Bob Sheil and Søren Sørensen, for the impact of their formal lectures as well as their informal interventions and lively participation in the entire event.

Last but not least we would like to thank our colleagues from the European Association for Architectural Education who trusted us once again to organise this event and whose presence at every stage of the planning and preparation was very significant. Of course, there were many other people involved in the organisation of this event as well, including our two colleagues from the Lusiada University Cristina Meirelles de Moita and Miguel Seabra as well as all the students that very warmly embraced us. Special thanks also go to our colleague Manos Zaroukas who worked very closely with us from the beginning, mainly, but not exclusively, in designing the graphics.

Constantin Spiridonidis
Maria Voyatzaki

The Rationale

Teaching and Experimenting with Architectural Design: Advances in Technology and Changes in Pedagogy

In what way have the recent technological advances and particularly those in information technology influenced the experimentation and the teaching off architectural design in European Schools of Architecture? Which are the new values and new priorities directing this teaching in our days? Which are the new methods, processes and strategies implemented for the teaching of architectural design? What is new, what is different, what is innovative which are the difficulties this new pedagogy has to deal with?

Teachers of Architectural Design are invited to a Workshop entitled "Teaching and Experimenting with Architectural Design: Advances in Technology and Changes in Pedagogy" to debate upon possible answers to the above questions. The workshop focuses on the impact digital design techniques and the subsequent new conceptions of architectural form have on the teaching and the experimentation with of architectural design. The event is organised by the Socrates Thematic Network ENHSA (European Network of Heads of Schools of Architecture), the thematic network of the EAAE (European Association for Architectural Education).

Teaching architectural design

Architectural education has always been dominated by the teaching of architectural design. It has always been guided by the views on architecture this teaching reflects, has always been conducted by the values and principles emerging through its implemented pedagogy, has always been implicitly ruled or explicitly regulated or even controlled by its educational objectives, teaching strategies, methods and priorities.

The organization and the development of an architectural design course is, for its leader, a real project. It has its own process (the teaching method), its own tools (the selected design themes, assignments, and all other educational means), its own concept (the educational aims and strategy), its own objectives (the expected learning outcomes), its own connotative meaning (the driving value system), its own conception about architecture and about the architect. It is structured upon its own internal architecture (the implemented pedagogy), which represents, reflects and sometimes declares or even glorifies its attachment to a specific framework of thinking, understanding and doing architecture, in other words to a specific architectural paradigm.

As atelier or as laboratory, as lab or as studio, 'integrated' or 'vertical' the course of architectural design is always the decisive melting pot of architectural education, the efficient catalyst of architectural knowledge, the powerful multiplier of architectural creativity, the effective developer of a framework of thinking, understanding and doing architecture. It is the dynamic 'heterotopia' where the articulation and integration of architectural ideas take place, through experimentation, critique, confrontation, exchange, argumentation, debate or even imposition. It always appears as a promising invitation to a serious commitment, determined engagement, deliberated dreaming and passionate search for the new, the other, the innovative, the experimental.

Experimenting with architectural design

Teaching architectural design is always strongly related to experimentation. Not only experimentation with forms to be created, with tools to be exploited, with means to be implemented, with materials to be used, with ideas to be formulated, with values to be expressed, or with principles to be forwarded. It is also related, to a great extent, to experimentation with forms of teaching, with the educational tools and means to be exploited, with the teaching strategies to be implemented, with the learning outcomes to be achieved, with the values to be appropriated by the students.

Sometimes this form of experimentation is aiming at the further development of an already implemented pedagogy in the framework of a particular approach to architecture and architectural design. In this case the experimentation is aiming at better teaching results that is to say at a further development of the way the contents and forms of expression of this approach are converted into teaching practices.

The character of experimentation is not the same when we, as architects and teachers, are experiencing new understandings of architecture and we are considering other than the already established values, principles and priorities in creating architectural forms. In cases of shifting paradigms, experimenting with architectural design in a school of architecture has a double dimension since it develops on two parallel levels: the one of creating innovative architectural forms and the other of implementing innovative forms of teaching students on how to create such forms.

Advances in Technology

The mental and operational landscape of our life is already dominated by the extended applications of digital technology. All the activities, in our every day experience, are profoundly influenced by this new condition which rapidly transforms our vision of things and of the world. Nowadays, the applications of digital technology are not only powerful devices constituting the main tool for designing, modeling and manufacturing architectural forms. As tools are also a powerful, efficient and meaningful medium for thinking about the field domain of their application, about the objects resulting from their use, about the subjects who choose to employ and who legitimize them as expressive signs manifesting a certain way of (re)conceiving, (re)thinking thinking, contemplating and experimenting with contemplating architecture.

In this revolutionary environment of information society architecture, as a cultural statement and manifestation of our life in space, seeks its redefinition and its reinvention as a new framework of values and principles, of knowledge, skills and competences, of tools and means, of priorities and preferences, as a new paradigm. New terms, notions and concepts emerge in the architectural vocabulary: liquid, hybrid, hyper, virtual, trans, morphogenetic, animation, seamless, skin, interactivity, parametric, nodes, machinic, morphing, self generating, build-ability, and so on. The consequence is that new values, new aesthetic principles and new orientations forms of experimentation are quickly rapidly grounded in the consciousness of the architects and have strong a impact on architectural education and on the teaching process.

Changes in Pedagogy

The impact of this new condition on architectural education and more specifically on architectural design education is tremendous. The traditional architectural design studio is progressively transformed into an experimentation lab in most of the cases dominated by the computer lab or even dispersed into distant and virtual work places from the students' homes. The tutorials are mainly developed on the basis of PP presentations and not any more on the drawing board. The knowledge of a significant number of software is in our days a necessary condition, which has already marginalized the traditional courses on drawing and representation techniques. CDs with multimedia paperless presentations tend to replace the drawn deliverables of architectural design modules.

The forms of collaboration in the design studio between students as well as between teachers and students have radically changed. The team work becomes increasingly difficult due to the dispersed location of persons, due to the continuous individualization of the subjects and due to the continuous personalization of computers as main design tools or instruments. The Iinternet is very often used as a direct communication substitute extending while destabilizing the contact hours at the school. The digital representation techniques, to a large extent, replaced the traditional models introducing highly sophisticated modeling software closely related to the manufacturing of the designed forms by the industry. New materials and new information made the experimentation in the design studio a completely new adventure for teachers and students.

As the speed of changes grows dramatically, the coexistence of many different views and aspects on architecture and more specifically about architectural design education becomes one of the main characteristics of our educational environment. Schools of architecture, in most of the cases, appear rather resistant to this (unknown,unknown and fearful) avant-garde digital and/or experimenting dynamism. Usually only a small number of teachers manage to reform their architectural design modules and to encourage their students to become familiar with and to appropriate this new paradigm. As the school environment does not always offer a fertile ground for the debate on teaching architectural design in our digital era the exchange, the networking and the debate with other teachers from other schools becomes a real wish, expectation and academic necessity.

Teaching and Experimenting with Architectural Design: Advances in Technology and Changes in Pedagogy

Animated by this necessity, the workshop has the following main objectives:

1. To bring together teachers who have incorporated in their architectural and urban design teaching practices the support of digital design techniques and/or any other form of experimentation together with the new conceptions about form those techniques and experimentations entail.
2. To establish a dialogue and exchange of ideas and experiences among them on the influences of current advances of technology on architectural design pedagogy.

3. To map the architectural design modules which are conceived, structured and developed by employing innovative experimentations and digital design techniques of generating and manufacturing architectural forms.
4. To outline the educational objectives of those modules, the teaching strategies they follow, the student competences they pursue and the learning outcomes they expect to achieve.
5. To record the teaching methods they use in order to arrive at their expected objectives.
6. To present the design themes selected for the teaching process, the different assignments introduced by the teachers, the necessary technical infrastructure used by the students.
7. To investigate the criteria for the evaluation of the students' performance and the competences achieved by the educational process.

The workshop is a debate-oriented event. Eminent architectural design teachers who experiment with their architectural design courses have been invited to present their cases. Teachers of architectural design are invited to contribute to the debates on the above mentioned issues by presenting a paper or a poster with their views, ideas, experiences and pedagogical approaches approachesto architectural design education responsive to the contemporary context of the creation and production of architectural form. Debates will enhance the two types of presentation and will argue the issues arising to architectural design education and experimentation.

Constantin Spiridonidis

Opening of the Workshop

Joaquim Braizinha, Lisbon, Portugal
Good afternoon, dear colleagues. Welcome to Portugal and to our School. I expect that for most of you this is your first visit to Lisbon, and I hope you will make the most of your time here.

I have the impression that we are anticipating the future. I would say that this is a general characteristic of us architects, when we are doing our projects, when we are teaching and preparing students to be future architects, and in activities such as these, in events like the one beginning today. Such meetings, with presentations that are the product of systematic research, can transform the way of thinking of teachers, in this case, teachers of architectural design and they are really very important. In this sense, I can say that we can change the future when we are together, whether we are looking or moving in the same direction or whether we remain looking towards each other. I am very happy to have the opportunity to hold this meeting here in Lisbon. Of course, it was Constantin and Maria who made this meeting possible, with their experience from the meetings they organise in the framework of their ENHSA Network every September in Crete concerning the evolution of the profession in the schools and so on. It was their initiative that brought us all together, working in the same direction and looking in the same direction, to the future. Therefore, I wish to thank you, Dino, and you, Maria, for the very generous work that you are doing.

Let us hear some applause for Dino and Maria.

Of course, you have a whole team of people working with you and I cannot mention all of them by name, but I would like to express my thanks to them also. I would also like to refer to the team we had working here to organise this event, so thank you, Cristina and Miguel Siavra, for your help. There was a small but well-knit group of people working on the organisation of this event, always in touch and working together with Constantin and Maria.

What else can I say? I hope that you will enjoy this meeting and this town. Some specific information: we will have lunch every day in the palace and this afternoon after the meeting we are going to have a reception, a special opportunity to get together. So please enjoy yourselves. We are here to answer any questions you may have, to help you see the town, perhaps to tell you about some places that are particularly interesting. There are eleven students who are here to help you with anything you need, as well as myself.

Thank you for coming, and I will now ask my Rector, Diamantino Durão, to come up and say a few words to you.

Diamantino Durão, Lisbon, Portugal
Thank you very much, for inviting me to be at the table. We are running a little late: I usually say that fifteen minutes is an academic delay, and fifteen plus fifteen minutes is the academic plus the European Commission delay – we, I think, are in between, which is not too bad. I will be very brief, but first I must say how honoured I am to have you here. I would like to thank all the organisers, all the participants and all the speakers. It is an honour for us to have you here and I hope that you will have good sessions. I know it is as important to have good presentations as it is to have good discussions, formal and informal. I am sure it will be a good meeting. I do not know whether there are any Portuguese students or students from other countries here, but if there are I just want

to tell them to make the most of this meeting, for it will give them the opportunity to talk to people who are very much involved in architecture and very much involved in teaching. So welcome to our University and, as Professor Braizinha said, enjoy Lisbon, enjoy Portugal, and enjoy the meeting, and let me ask for a round of applause for the organisers because if things go well it is because we have good organisation, and in this case I am sure that the Portuguese and the Greek organisers have done a very thorough job and I think that we should express our thanks with a round of applause. Thank you very much.

Joaquim Braizinha, Lisbon, Portugal
I would like to invite Professor Per Olaf Fjeld to say a few words. For those of you who do not know, he is the president of the European Association for Architectural Education.

Per Olaf Fjeld, Oslo, Norway
Thank you Professor Braizinha for hosting us and for the generosity you have extended to us in this beautiful city and this beautiful university. Thank you for that: we certainly felt the warmth of your welcome immediately, and I cannot think of a better place to have such an event. I also want to most warmly thank Constantin Spiridonidis and Maria Voyatzaki, who have been doing this for fourteen, fifteen, sixteen years with the same passion, and I think the same pleasure, and certainly with the same professionalism. It is a very generous effort that has been going on over a very long time.

Our attitude towards space has changed. There is no doubt about that. The way we use space, the way we see space, our perception of space is not the same as it was ten, fifteen or twenty years ago. How aware we are within that change and within the relationship between what was and what is going to be I am not entirely sure, but I will argue that our sense of space has changed. And to teach architectural design today is an enormous challenge. It is, however, an enormous challenge that I enjoy every day. Within each challenge there is also an eagerness to understand more about architectural space and the way in which that space can be better understood. As the invitation said, it is certain that design is experimental today, but at the same time architecture is rooted in conditions from which it is not able to escape. It is rooted to place, to materiality and also in some way to the necessity to have a capacity for use. Within this experimentation, it is not just openness but also a resistant force or forces that we have to respect. It is very interesting that there has always been a relationship between the tools that we are using, the process and the product. It is a relationship that has always been there, but today our tools are much stronger than before. They have the ability to act in a certain way. You might say that to some extent they are an extension of our body, or that there is a strong relationship or a duality between the tools we use and our own body. I do think that the better we understand this duality between the machine on the one hand and our body on the other, the stronger the possibility that we will be able in some way to move architecture forward. As I say, it is a search, an experiment with many different levels that we are working with; but at the same time, if we are going to be honest we also know that this search has within itself no particular direction: it is characterised more by openness than by any particular direction. In that sense, we can ask whether the search is directed within the idea of transformation, of the existing; are we searching for a new architecture per se, or are we searching for expressions in

many different directions, a multiplicity of choice and of multiple ways of doing things? In the absence, then, of a common goal, it is interesting what each one of us, whether as a country, a school, or an individual, looks upon as a true resistant force within our world. In other words, within the time we have and the capacity to do everything, what would we actually like to do and what do we want to do within the forces that we sense are the most crucial to work with or against. There is also, whether we like it or not, a strong relationship between the ideal content and the process. The content is not so easy to describe today, as it is constantly changing; but if there is a strong relationship between content and process, and the tools that we are working with today are almost so strong as to have the capacity to make a content within themselves, then in that there is a challenge that we have to understand in a much deeper way. If content is now more than the product of the tools and the process, I am sure you see why it is crucial to better understand that relationship.
On behalf of the EAAE and the ENHSA we all wish you welcome to Lisbon and this workshop and I do hope we have some good discussions ahead of us. Thank you.

Joaquim Braizinha, Lisbon, Portugal
I would now like to invite Professor Constantin Spiridonidis to say a few words and to welcome you to this workshop.

Constantin Spiridonidis, Thessaloniki, Greece
Dear Rector of the Lusiada University, dear colleagues, dear friends, the fact that you are here is a kind of relief from all the troubles and problems and tiredness that we had to go through in the context of preparing this event, and I would like to express my gratitude for your participation and your forthcoming contribution to the debates. Most of you know that these activities are developed in the framework of the Socrates Thematic Network on Architectural Education, and since I see some faces that I have never seen in the past I would like to say a few words about this Network. This Network on architectural education, the Network of Heads of Schools of Architecture, emerged from the activities of the European Association for Architectural Education and is based upon its activities, so in a way it is a part of the same thing but with a different name. The aim of this Socrates Project is to develop a debate on architectural education in these times when significant changes are occurring around us, and more specifically all the changes imposed and promoted by the European policies that have developed during the past six or seven years. So our aim is to promote this dialogue between schools of architecture in order to achieve a better adaptation to these new conditions, to create a critical understanding between us and to facilitate an eventual networking of schools, individuals, ideas and perspectives; and following this logic the ENHSA develops a variety of activities. One of these activities is the Meeting of Heads of European Schools of Architecture, which is addressed to the people who are responsible for the administration of academic issues of the schools of architecture in Europe; but we also develop activities that are addressed mainly to teachers of architecture. To this end we have four different but parallel networks or sub-networks running in the framework of this project: these are the Network of Teachers of Architectural and Urban Design, the Network of Teachers of Construction, the Network of Teachers of Architectural Theory and the Network of Teachers of Restoration/Conservation.

This is not the first event that we have organised in the framework of the Network of Teachers of Architectural and Urban Design. Our very first activity, at the beginning of this Project, led to the publication of two volumes containing a collection of different teaching paradigms or examples from different schools of architecture around Europe. After that, we organised in Hania, in Greece, a workshop where we discussed the texts, the proposals, that appeared in those volumes. This is the third activity we have organised in the framework of this Network; and the reason for the title of this event was that something very surprising to us emerged from our discussions in Hania, and that was that most of the texts that had been submitted to these volumes made little or no reference to new technologies. So we considered that something had happened, and we wanted to promote a discussion on this issue. The fact is that there are significant changes occurring around us in our everyday life which influence our understanding of the world and therefore of architecture, and when we have different understandings of architecture it is not possible to have the same pedagogical strategies and the same teaching approaches. So that was the main question that we wanted to raise at this event: what, in other words, should the new teaching approaches be when we have such significant changes as the ones we see around us, and specifically in the way we understand architecture, in the way we think about architecture, and of course in the way we are doing and designing architecture. This is the question we would like to explore and which we addressed to you in our invitation to this workshop, and we are delighted that 90 people responded to our invitation.

I see the academic quarter of an hour has become an academic twenty minutes, which admittedly is not very bad for Mediterranean Europe. I feel obliged to move as fast as possible to the first keynote speakers, because the time schedule is very tight. As you may have noticed, we considered that it was more useful to allow more time for debates than for presentations. So I would like to continue immediately with the first keynote speakers, Kas Oosterhuis and Ilona Lenard. I would like to thank them for their eager acceptance of our invitation. We had the opportunity to have Kas and Ilona in Hania at the Meeting of Heads three years ago, and it was very interesting for us to see their work and their way of understanding and thinking about architecture. I am sure that you know that they are in the centre of the architectural avant-garde, producing not only new architecture but also new ideas about architecture, and we considered that their presence here in Lisbon would be a very inspiring way to begin this event. I would like to thank them very much for coming and I invite them to come up and give the opening keynote lecture. Thank you very much.

Keynote Lecture

Kas Oosterhuis
Ilona Lénárd

Mission Statement ONL

Delft University of Technology School of Architecture,
Delft,
the Netherlands

Kas Oosterhuis *studied architecture at the Delft Technical University. In 1987-1988 he taught as Unit Master at the AA in London and worked / lived one year in the former studio of Theo van Doesburg in Paris together with visual artist Ilona Lénárd. Their design studio is in 2004 renamed into ONL [Oosterhuis_Lénárd]. From 2000 Oosterhuis is appointed professor digital design methods at the Delft Technical University and has been a Member of the Board of Museum Witte De With in Rotterdam. Kas Oosterhuis is Director of Hyperbody, the kowledge center for Nonstandard and Interactive Architecture at the TU Delft. Kas Oosterhuis is Director of the Protospace Laboratory in the iWEB pavilion, located in front of the Faculty of Architecture. Kas Oosterhuis has initiated two GSM conferences on the subjects multiplayer game design, file to factory design and build methods and open source communication in the evolutionary development of the 3d reference model. Award winning building designs include the Saltwaterpavilion at Neeltje Jans (Gold Award 1997 for innovative recreational projects, Zeeuwse Architectuurprijs 1998, nomination Mies van der Rohe Award 1999), the Garbagetransferstation Elhorst/Vloedbelt in Zenderen (Business Week / Architectural Record Award 1998, OCE-BNA Award for Industrial Architecture 1996, Aluminium Design Award 1997) and the Hessing Cockpit in Acoustic Barrier in Utrecht (National Steel Award 2006, Glass Award 2006, Dutch Design Award for Public Space 2006, nomination Mies van der Rohe Award 2007).*

Ilona Lénárd *is trained as a professional actress in the Academy for Theatrical Arts in Budapest. After that finished her second studies at the Willem de Kooning Academy for Visual Arts in Rotterdam as a sculptor. Ilona Lénárd has worked since closely together with architect Kas Oosterhuis. She has worked / lived in 1988-1989 in the former studio of Theo van Doesburg in Paris together with Kas Oosterhuis. Their design studio is in 2004 renamed into ONL [Oosterhuis_Lénárd]. After her studies Ilona Lénárd has received many grants to support her professional activities as a sculptor. Ilona Lénárd has founded together with Kas Oosterhuis the Attila Foundation and organized the Sculpture City event in 1994 and the ParaSite project in 1996. Ilona Lénárd has been lecturing in The Netherlands and abroad on Artificial Intuition and Powerlines. She has been a visiting lecturer at Hyperbody at the TU Delft. Ilona Lénárd has realized a number of art projects in public space, she has exhibited and published internationally. Award winning projects of ONL [Oosterhuis_Lénárd] include the Saltwaterpavilion at Neeltje Jans (Gold Award 1997 for innovative recreational projects, Zeeuwse Architectuurprijs 1998, nomination Mies van der Rohe Award 1999), the Garbagetransferstation Elhorst/Vloedbelt in Zenderen (Business Week / Architectural Record Award 1998, OCE-BNA Award for Industrial Architecture 1996, Aluminium Design Award 1997) and the Hessing Cockpit in Acoustic Barrier in Utrecht (National Steel Award 2006, Glass Award 2006, Dutch Design Award for Public Space 2006, nomination Mies van der Rohe Award 2007).*

International Arena

ONL's architecture begins with a strong concept. The design concept intuitively fuses local and global conditions. The visionary concept has the features of a hypothesis which is tested against the reality of the architectural praxis. It is our experience that a bold statement is instrumental to pave the way for practical solutions. The provocative design concept propagates ONL's architecture into the competitive international architectural arena. In the past 15 years we have worked our way towards the international design elite and we are currently developing challenging national and international projects in Europe, Asia and the Middle East.

Kinetic Design

According to ONL design is subject to styling. We look at the styling of industrial objects like household appliances, cars, ships and the highway system for our inspiration. Why are things shaped the way they are? In our view design and styling is so much more then putting boxes on top of each other. We think of the building as a whole body, shaped by its boundary conditions and by gently imposed curves, ONL's Powerlines. We make folds in the body as to emphasize its forward drive. We use kinetic design to give the people passing by an experience of speed and friction. ONL developes the interior to give the users the feeling to move naturally forward inside the building body. Exterior and interior are two faces of the same body.

Monocoque Structure

According to ONL architecture must be fully synchronized with structure. The support structure is seen as a selfsupportive monocoque body, where structure and surface design comes together. ONL is specialised in the design of building bodies with complex surfaces. We have built up unique knowledge as how to master the complexity of complex surfaces in the design process. We have refined the art of automotive styling for architectural monocoques. Designing with complex surfaces and smooth kinetic styling induces the necessity for a new attotide towards production. Mass production is old school, mass customisation is the new paradigm, where ONL's unique architectural approach is based upon. Series of the same are no longer beautiful, the new aesthetics of non standard architecture naturally favor series of one-offs. ONL has developed and the file to factory process of mass customization and put into practice succesfully, in close cooperation with those manufacturers who produce using CNC machines.

Inclusive Ornamentation

Ornament has been considered a crime in modernist architecture. Architects were aiming at pure forms following pure function. Since 1990 ONL developed the concept of sculpturebuildings where form does no longer follows functions, but allows the function. Since

we have seen architecture as sculpting data. Now ornament is a natural ingredient of the fusion of design and structure. Ornament is no longer an addition to the structure, but forms integral part of it. Complex surfaces, kinetic styling and the cost-effective file to factory production processes are scale-free. Parametric design principles and mass customization work on the level of urban design, the size of the whole building body and at the level of the finest detail. Ornamentation is inclusive in the design of structural surfaces.

Sustainable Abundance

Modern society at large is no longer an economy of scarceness, that is not for Europe, China, the Middle East and the Americas. Now architecture is positioned in the Long Tail of the global economy. Modern architecture is no longer based on the principles of mass production and the economy of scarceness. Now it finds its roots in customization and abundance. Customization means producing just in time and right in place, avoiding unneccesary waste and pollution. Customization leads towards a wild diversity, acknowledging the fact that each individual component has an unique shape, dimension and identity. Customization is a conditio sine qua non for local and global sustainability. The logic of customization shapes the genome for a visual language of richness, wealth and abundance.

More can also be found on our website *www.oosterhuis.nl*

Session 1

New Values, New Priorities

Chair:
Sean Hanna
University College of London
The Bartlett School of Architecture
Graduate School
London
United Kingdom

Martin Frühwirth
Urs Hirschberg
Stefan Zedlacher

Formotions*

Institute for Architecture and Media (IAM)
TU-Graz
Austria

This paper reports on three recent projects carried out in the no_LAb, the laboratory for augmented architecture at the institute of architecture and media of TU Graz, where in 2006 an optical 3D motion tracking system was installed in order to support various types of motion-based investigations.

Optical 3D motion capture systems have become standard in the special effects industry and are increasingly common in medical applications, as well as in Virtual Reality (VR) and Augmented Reality (AR) set-ups.

While applications in the mentioned industries (medicine, special effects, virtual and augmented reality) have driven the development of optical 3D tracking systems, their application is not limited to these. We see a number of areas, where such systems can enable new types of investigations that are relevant for architectural design. There was a shift in research on computer interaction towards a growing interest in physicality that recognized human beings as having a body, rather than just being "brains" and there are many investigations about what such gestural interfaces could potentially do (Camurri, 2004). Moreover, it has been shown in the work of artists and researchers, that by means of tracking, space itself can become the interface: an invisible architecture (Novak, 2001). This was the main reason for our decision to install an optical system at the no_Lab, the laboratory for augmented architecture of the institute of architecture and media (IAM) of TU Graz.

Tracking in space is an important bridge between physical and virtual realms. With optical 3D motion capture systems, the user can be completely untethered from the computer, moving and behaving naturally. The possibility to track complex movements in space in real time and at high precision can open up new modes of interacting with spaces, and of generating or analyzing movement as form as part of an architectural design process. The three workshops described in this paper explore the potential of these upcoming fields of research. They were carried out in a "hands-on" fashion with groups of students, typically lasting one intense week.

Workshop 1: "sculpting motion"

The focus of the first workshop was the generation of form through movement. The workshop was held under the title 'Sculpting motion', referring to earlier work of two of the authors (Hirschberg, 2003) and a class with this title, taught at IAM and the Harvard GSD. Rather than exploring synthetic motion, as in those earlier projects, the goal of the workshop was to create suspended wooden motion sculptures. As is usually helpful in workshop situations with limited amounts of time, the goals and the technical means to reach them were clearly stated up front. The larger context of the task also involved reflecting about motion in art and architecture, where it has long been a central topic. Particularly in the modern movement, inspired by contemporary discoveries in mathematics and physics, theories about its importance and its expression were developed.

The futurist movement in Italy, with artists such as Boccioni or Balla, was among the first trying to find an artistic expression of this new condition. But their work was not only a reaction to scientific theories. Just as Marcel Duchamps' famous nude descending a stair, their work clearly was inspired by the photographic motion studies of Eadwaerd Muybridge and others.

Technology influencing artistic expression: Marcel Duchamps' famous nude descending a stair was inspired by Eadweard Muybridge's photographs of bodies in motion

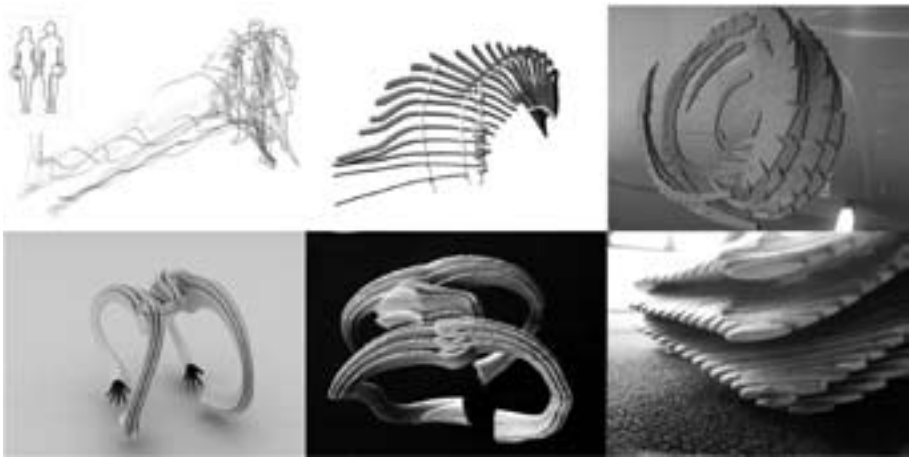
Thus a technological development – high speed photography – triggered these influential artistic experiments. The photographic experiments of Muybridge, which were later perfected by Harold Edgerton at MIT, opened up a new way to perceive and analyse motion (Solnit, 2003). In many ways, this can equally be said about today's 3D motion capture systems. We again find ourselves at a time when technology opens up an avenue of creative investigations unavailable up until now.

Among the first artistic fields to capitalize on this new technology was dance. There are practical reasons for this. Before motion capture systems came along, dance had neither a notational convention nor a recording technology general enough to record dances fully – a consequence of the complex movements in space dances consist of. The interest of dancers in the virtualization and thus preservation of their art is therefore not surprising. Artistic applications of motion tracking systems in dance, like in the work Paul Kaiser did with Merce Cunningham and others have already quite a tradition (Kaiser, 2002).

While artistic projects that have used motion capture technology typically deal with unusual types of motion, such as dance, one of the guidelines we gave the students at the outset was that they should develop scenarios with everyday types of motion – not only because we didn't have any dancers, but mainly because we felt that seeing motion as form was spectacular enough as such. Another rule for everyone was that the tracking setup wasn't an individual movement, but some social interaction between two or more persons. The step from having the tracking data to actually developing a sculptural form wasn't automatic, but one where students had to make design decisions about the type of object they would derive from their dataset. Once the movement had been tracked by our VICON Tracking System, the tracking data was worked on in the program MAYA. Most students applied their knowledge of MEL, the MAYA embedded scripting language to turn the data into a form according to some formal logic that would work well with the tracking paths. In most cases the data had to be simplified or trimmed. Many also went back to recording their action again with different marker positions.

For the massaging of the digital model, different strategies were explored: some turned the tracking points into individual objects, varying their size and/or rotation based on the speed of the movement (eg. the distance to the next object) thus creating a jagged, expressive look. Others lofted a surface along the tracking paths. They

started developing a design-identity. Every change of media developed its own formal potential. The step to turn the projects into physical sculptures was a great challenge. The students had to invent a construction logic that could be implemented for building their models using the laser cutter. A lot of hands on work was necessary despite the help of the machine.



Massaging the motion capture data: students followed different procedures in turning the motion capture paths into digital models. Most made use of generative scripts to interpret the tracking data in an interesting way. The coming together of the 'Clap your hands' wooden sculpture: "It's impossible to think up forms like that" (pictures in the second row)

The results of the workshop presented to illustrate this approach show that bringing our own bodies' movements into a form-making process can lead to rich and inspiring results. One thing that many expressed is that *"it's impossible to think up forms like that"*. Turning movement into form can give unexpected insights into the intricate relationship between time and space – the very essence of what architects need to deal with.

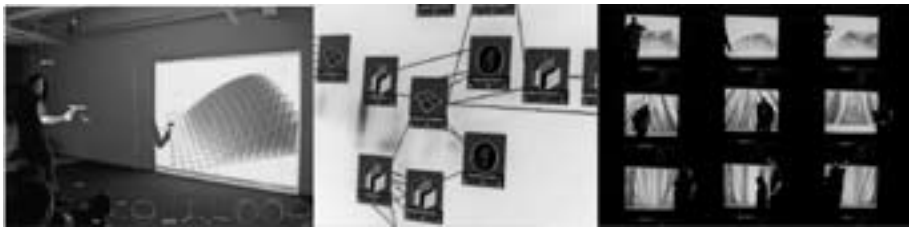
Workshop 2: "puppeteering architecture"

Shortly after the first workshop we initiated the second of this kind, focusing not directly on the creation of objects but on the human-computer interaction possibilities the tracking system opens up.

The larger issue the second and third workshops address is how we can create tools that allow us to bring our intuition into the design process and in how far tapping into the expressive powers of our body movements might provide new possibilities in this respect. It has often been pointed out that current CAAD systems are particularly weak in supporting the early stages of design. Among the most important (and perhaps most obvious) conclusions most researchers in this field came to is the need to make the interface as intuitive as possible, ideally to make it "disappear" altogether. The goal put forward in many such projects was to come to a mode of interaction similar in ease as

the traditional sketching. We may infer that an underlying premise of choosing sketching with its fluid type of movements as an inspiration for an ideal interface is that such movements allow us to interact with the computer in a more direct or more intuitive way. This notion can be taken further by exploring gestural interaction.

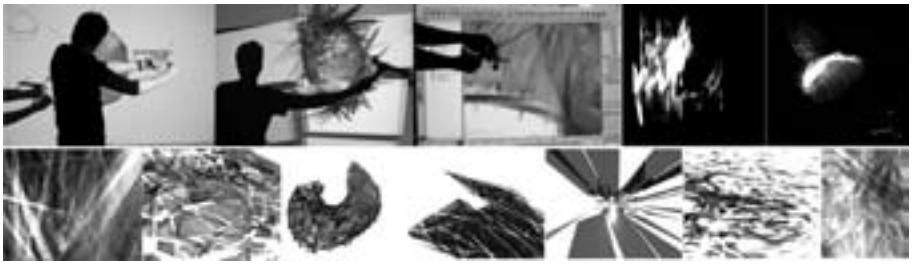
In order to stay away from the common notions of computer tools, the analogy to puppetry was chosen as a playful approach that put more emphasis on narrative than on the creation of form. This proved to be successful as many of the applications the students produced contain rather novel interactive features. The students developed gestural interfaces by means of a real-time interface of a high end optical 3D motion tracking system with the modeling and animation software Maya, making use of the MEL scripting language. The analogy was also appropriate as most students used just one object with markers to control their model, tying the X, Y, Z coordinates and the three angles by which the object's position is defined in space to various functions or properties in the modeling system.



Project Student A: Interacting with a field of green cubes in different modes. Main control with object in right hand, switching of modes and adjusting parameters with head gestures (nodding, shaking); midle: Linking of parameters and objects in the Maya hypergraph interface. The right picture shows a sequence of interactions in different modes, switching of modes is controlled by nodding or shaking head

While puppetry per se has very little in common with the way architects tend to design (or for that matter sketch) spaces, what interested us was its narrative dimension. To control their puppets a puppeteer makes highly artificial and awkward movements, yet they are held together by the narrative of the play the puppets enact. The students' final presentation was labeled as a performance rather than a presentation of their project. In fact it was only then that we brought the question into the discussion whether they thought that their puppeteering interface could also be used as a way to construct form. Many of the inventions they had made out of necessity for their performances (switching modes through certain extreme movements, using a second marker object to control the environment rather than the model, animating the environment for continuous modeswitching) represent rather unusual, but interesting ideas when applied to a modeling paradigm. The results and the experiences gained in the second workshop laid the foundations for the third workshop, in which the idea of modeling by movement was explored further.

Student B: controlling a particle field (displayed as sprites) with two hands. Student C: watering virtual flowers with one hand;



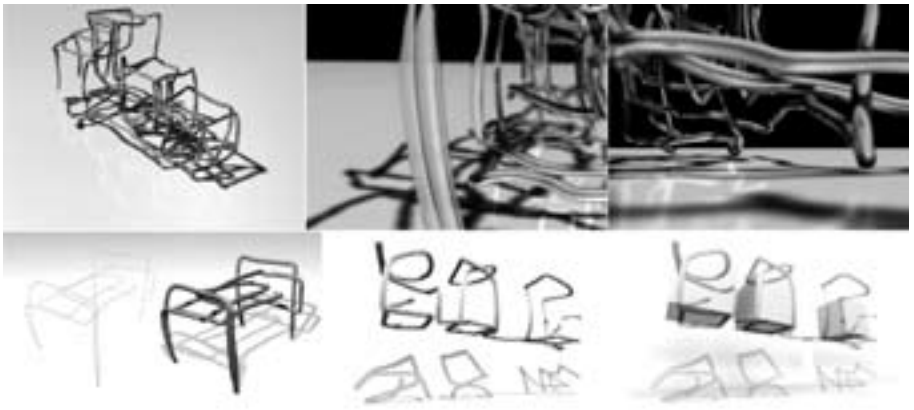
Student D: controlling a deformation node connected to an object with two hands and his head marker

Workshop 3: "formotions"

The title of the third workshop (which is also the title of this paper) describes rather well what it was about: formotion can be read as the short version of form through motion, or formation by motion. The main difference to the second workshop was that students could use a head mounted display during their interaction with the virtual model. Our initial enquiry was stated as: *"Is it possible to let a first sketch become an object, to design directly onto space?"*

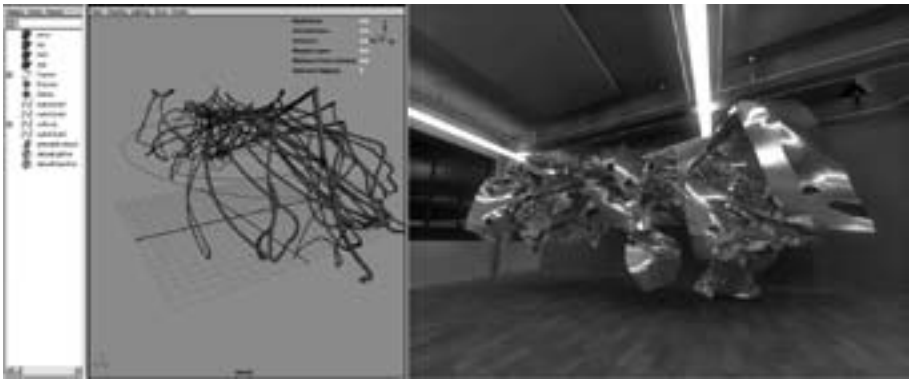
In using the Animation software Maya in a somewhat unusual manner, the students had to create, modify and visualize formations of different objects and the relationships between them as design proposals in real-time. In connection with the 3D-Motion-Capture System from VICON we invented a new method to digitize natural body movements and project them immediately onto virtual realms. Therefore we are able to extend the linear design process – from our intellect through our hand to a novel medium of abstraction – with the simultaneity of those mentioned steps.

Thereby, the tracking space itself became our interface. As a warm-up assignment – called "blind reviving"-, the students were asked to redraw a piece of furniture into space (without wearing the head mounted displays, thus not seeing what they were drawing).



"Blind Reviving": pieces of furniture redrawn in real-time into space like a freehand sketching in 3D

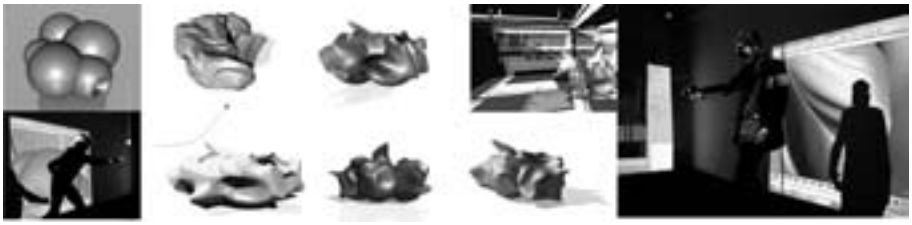
While the resulting spatial sketches seemed somewhat clumsy, they turned out to be good starting points for further investigations. Some sort of sketching in space is probably the most obvious initial idea one might have about a 3d interface for a design tool. But despite their quirky aesthetic qualities, the furniture sketches suggest that, when operating in space, sketching might actually not be the most successful metaphor.



The space drawings (3D Taping) of the redrawd objects were then developed further in Maya and placed into the virtual model of the no_Lab; The right picture shows an exploration of the "borders" of the tracked space, border hulls, border-"lines"

The ideas the students came up with in the phases after this first test were often inspired by less refined movements: pushing and pulling, blowing... It turned out that the dynamics engine of Maya provides some very effective modes of interaction, that the students experimented with in their Formotion projects.

One idea put forward by the teachers was to conceive of the role of the computer in these projects as enabling 'Augmented Daydreaming'. The immersive feeling of being able to physically walk around a virtual model and the possibility to interact with it in the soft and indirect ways the dynamics engine allows really brought out this feeling in the students.



Using the virtual model of our lab as the setting, students had to come up with a scenario of how they could interact constructively with a virtual model. Student E shaping a soft, ephemeral object with a virtual blowdrver;

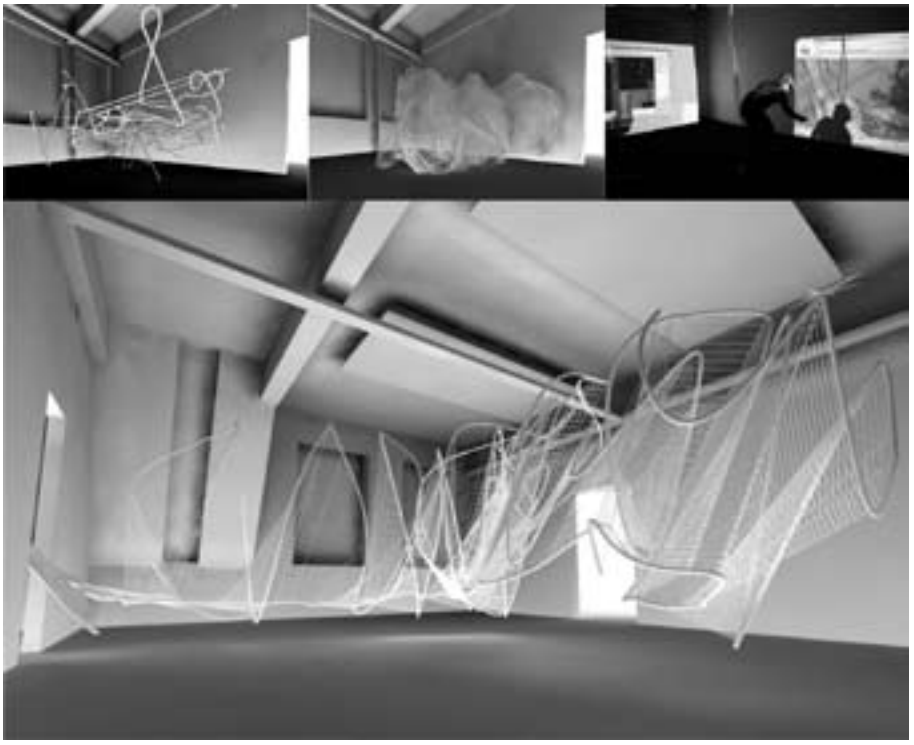
Student F differentiated between pushing and pulling by turning his hands around, which proved to be a very successful gestural metaphor that people picked up easily

Beside the dreaminess, some projects also featured real inventions. One student differentiated between pushing and pulling by turning his hands around, thereby triggering the force field attached to his hand's position to change direction. This turned out to be very effective and was also immediately understandable for other users who picked up on it almost instantly.

One student worked on spheres with a wind field, effectively shaping a soft, ephemeral object with a virtual blow-dryer. There is something idiosyncratic about operating a virtual blow-dryer, but as a way to define large, curvy shapes it seemed to be very practical. It reminded one of the experiments in wind channels that are done in car design; with much less overhead, of course. To subsume, all the investigations during this workshop do concern an individual research, which can somehow be located between 3D-Drafting, 3D-Taping and 3D-Painting in connection with personal feeling.

"...feeling and thinking while acting" (Protzon, 1993).

Midweek Impressions: testing the interface in different manner using and acting with a HMD; The immersive feeling of being able to physically walk around a virtual model with the HMD and the possibility to interact with it in the soft and indirect ways the dynamics engine allows, really brought out this augmented feeling in the students



Student G: investigations and transformations on the imaginary spatiality between the stones inside the Zen garden (Ryoanji Tempel Kyoto)

Conclusion

In this paper we described three different workshops that explored motion tracking and gestural interaction with virtual models as ways of designing, making use of an advanced optical tracking system. Given the 'indirect' approach and the limited time of the workshops, the projects presented in this paper are obviously not meant to be

understood as fully fledged gestural design tools. Nevertheless as experiments they are indicative of the potential of gestural interaction in design and provide ample reasons why this area should be explored further.

The results of the workshops suggest the following future tendencies:

- **"Craft is back".** The computer is more and more turning into a tool for both the mind and the hand.
- **"Build the tools you build with"** (Kapoor). Our having the students use their (limited) MEL scripting skills as part of their design projects was successful. We are particularly happy about this, as we believe that the richer the technological possibilities are getting, the more urgent is the need for designers to also control the design of their tools. In order to get the full potential of the technology we have to start designing the way we design.

Furthermore, the workshops are examples of how we can explore digital (realtime-) environments as places where the creation and reinterpretation of abstract architectural design processes using a variety of digital and physical media can unfold. The use of rapid prototyping systems (such as 3D Printer, Laser cutter, CNC Milling Machine) was not focused on much in this paper, but they were available and must be seen as part of the general context within which this work was done. We conceive of the design process as augmented by things – a hybrid meta-model of things and machines which help us think. The investigations made during these workshops used the no_LAb as a facility for **"augmented daydreaming"**, involving not only student's creative thinking, but their whole bodies in their individual design processes in correlation with their own personal feeling and thinking.

In this environment, the non-orthodox goals and content of the workshops in combination with the intense collaboration with the students proved to be a successful strategy for design research. Using deliberately induced errors, the forced changing of media and wilful "misinterpretation" of design artefacts, digital media and its immersive applications did not create limitations, but rather evoked new insights and encouraged creative contemplation about design. Thus, based on our experience, it seems possible that the entire architectural design process can be redefined from the inside out. Going back to the need to build our own tools, mentioned above: Maybe the tools we need to build are environments!

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Christian Fröhlich
Martin Kern

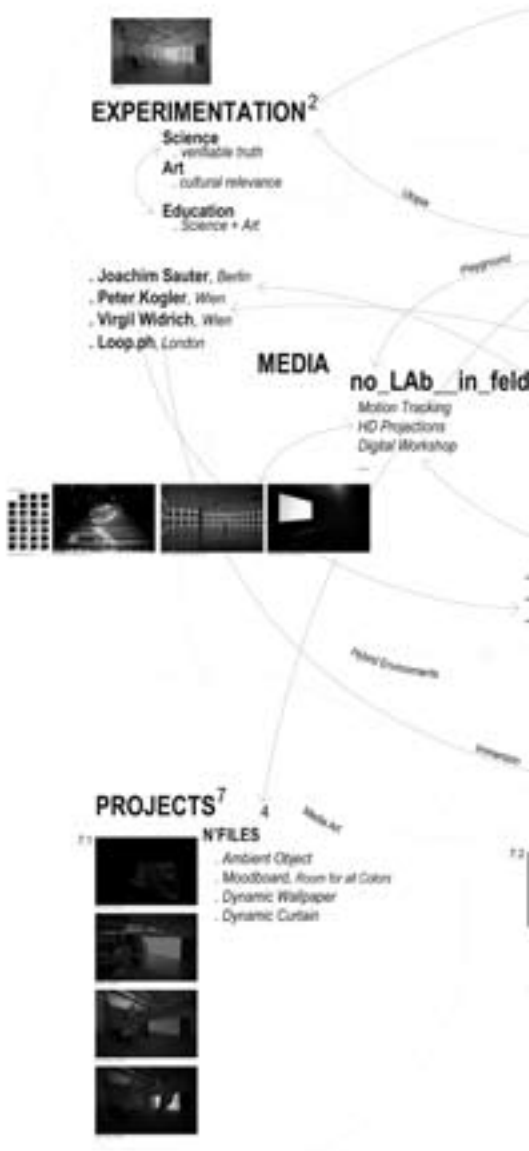
N'Files
A Space to React Communication between Architecture and its Users

Technical University Graz
Austria Institute for Architecture and Media
Austria

This paper describes how advanced media technologies are used to explore architectural spaces through movement and visualizes the concept and the current state of development of "reactive spaces" in the media laboratory no_LAb. How can one communicate with architectural spaces, through one's movement or even one's appearance? One goal of the project N ` Files - A Space To React is it to develop a system which supports the interaction between spatial areas and its users. A space, which is changing with and through the user....which reacts to the user's input. The basis for such experiments was laid in research fields such as Ambient Intelligence (AmI), Ubiquitous Computing or Hybrid Environments. If take these new communication and interaction possibilities some steps further, then it becomes clear that our traditional sense of space will be transformed radically by them.

One must be accurate, if one daydreams.
If one does not daydream, liberties are allowed.
That is the deadly about academic thinking,
because it thinks always protected and falls therefore into the dust.
If one daydreams, one cannot take that liberty.

(V.Flusser, 2003)



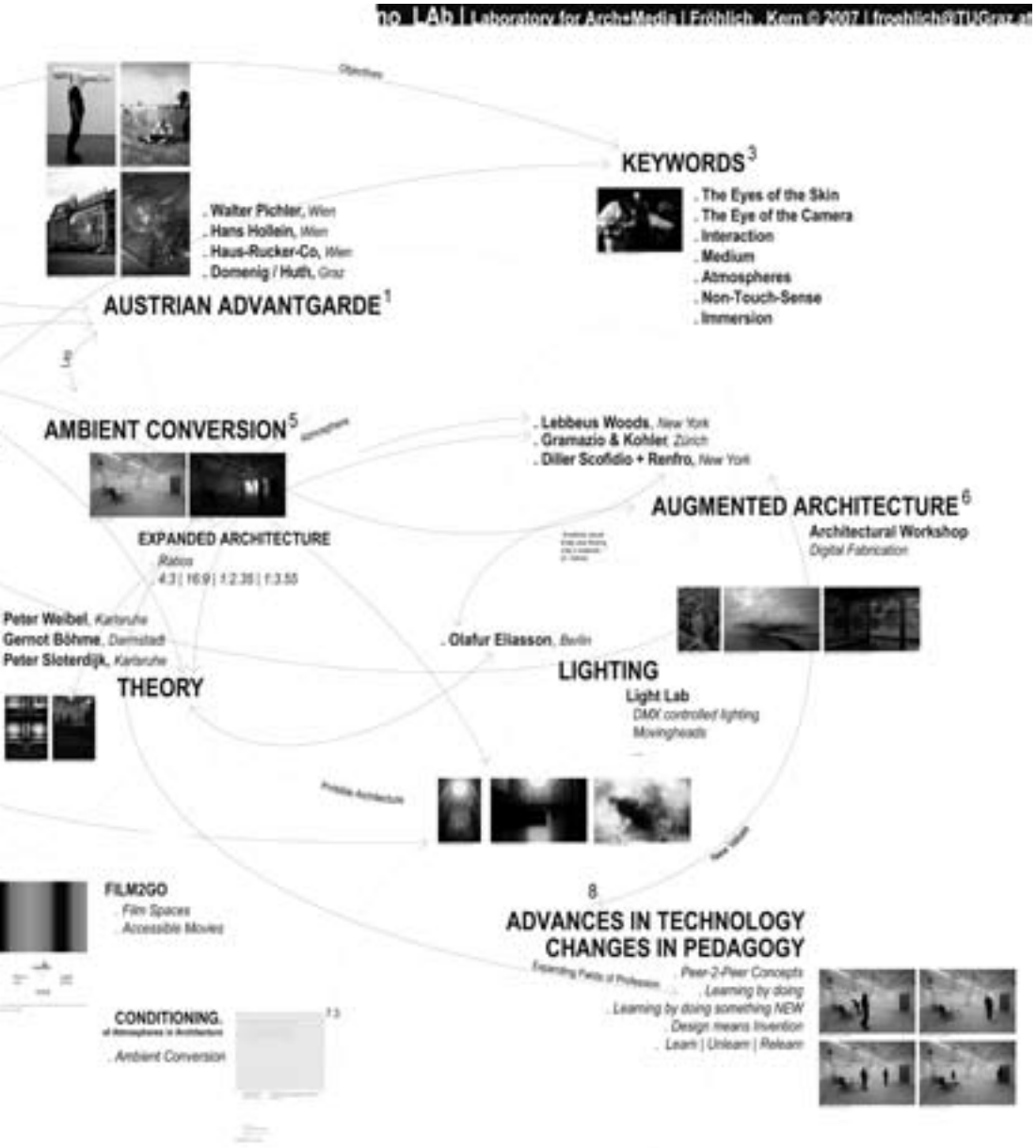


Fig. 00
Mind Map – no_Lab Laboratory for Arch+Media

01. Austrian Avantgarde

We follow a tradition which goes back to the utopias of the 1960'ies and 70'ies... There where people who blew up spaces - like Hans Hollein or groups like Haus-Rucker-Co.... guys who designed helmets as living rooms - like Walter Pichler... or like Eilfried Huth (Huth/ Domenig) who said: "The house I dream of, is a daydream..."

What they all have in common is that the use the exhibition space of an art-gallery as field of experimentation before they put to test their designs on the construction site. That is to say, that an art-laboratory is used as a playground for architectural experimentation of utopian ideas.

Our favorite defintion of the term "utopia" is from Raymond Ruyer: “Utopias are thought experiments about different possibilities”...What we made out of this, are: Architectural experiments about different possibilities...We consider Experimentation as the basis for design teaching.

02. Experimentation

In the introduction text for our workshop there is mentioned that experimentation is directed by objectives that legitimise innovation: in science by truth, in art by cultural relevance. And the question for us has to be: What is the objective for architectural education..? Well, we would like to show you that architecural experimentation is directed by exactly the same objectives as you mentioned, because art and science / technology are the main ingredients for design approaches...

In the following we would like to explain that through our work or better to say at first through our keywords concerning our project “N’Files – A Space To React”.You will see that our objectives are partly related to art (cultural relevance) as well as to science and technology.

03. Keywords

03.1 The Eyes of the Skin

Regardless of our prioritisiation of the eye, Visual Observation is often confirmed by our touch. (Juhani Pallasmaa)

03.2 The Eye of the Camera

Vision has been strenghtened by numerous technological inventions. We are now able to see both deep into the secrets of matter and immensities of outer space. The eye of the camera, from the film "The Man with a Movie Camera" by Dziga Vertov (1929)

03.3 Interaction

The taste of the apple...lies in the contact of the fruit with the palate, not in the fruit itself; in a similar way...poetry lies in the meeting of poem and reader, not in the lines of symbols printed on the pages of a book. What is essential is the aesthetic act, the thrill, the almost physical emotion that comes with each reading. (Jorge Luis Borges)

03.4 Medium

„Medium "is a relations term. "Medium" is described in Latin as >a center<, thus something that exists itself in the middle „in medio", i.e. between two objects referring one on the other. It is obviously dependent on these two items (...), thus has at first no own value. Only as arranged contents carriers between producer and recipient, between designer and user a medium generates identity. (from: Introduction to media lore / Einführung in die Medienkunde, D. Kerlen, Reclam 2003)

03.5 Atmospheres

The...new aesthetique has to do it with the relationship between environment qualities and human condition. This "and", this inbetween both, that, whereby environment qualities and condition are referred one on the other , that are the atmospheres. (...) One does not know quite well, should one attributes the atmospheres to the objects or environments, from which they come from or to the subjects, which receive them. One does not know as well, where they are. They seem to fulfill the space misty with an emotional sound. (Gernot Böhme)

03.6 Non-Touch-Sense

A lot of attention is paid to the senses (hearing, seeing and feeling). The touch-less connection between human being - maschine - space is located via genuine sensual perception. The immaterial interface and the paradigm of being without contact is creating a further sensual perception - the non-touch sense. To find an approach

to this unusual sensitive experience, associations with the technique of ChiGong, the movement of matter by pure mental energy, are used as comparisons. (Monika Fleischmann)

03.7 Immersion

The idea of immersion is described the best through such magic moments, when a viewer in the cinema is totally absorbed by the aura of the canvas and when he accepts the narrative world as his own. He dives into an artifical world. (archplus 175)

What if we cannot percept pictures any longer separately from our body, but instead getting roped into the pictures? (...) What if these pictures bypass the representative level and interact on the pre-linguistic body? (Marie-Louise Angerer)

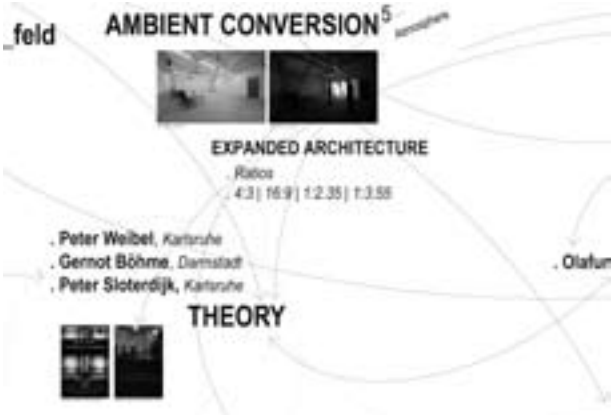
Immersion means, you get involved to immerse (...) into artificial environments (...). Through these techniques humans were finally taken serious as creatures, to whom diving belongs - not only in the wet element, but in elements or environments absolutely. The procedure is well known for a long time(...); but already the panoramas of the 19th century anticipate the problem of hallucination management and the immersion change. Immersion is a de-framing procedure for pictures and sights, which get rid of the borders environment. (Peter Sloterdijk)

04. N'Files

(see below: 07.)

05. Ambient Conversion

So what we do, is Ambient Conversion. We convert spatial environments and augment them with the help of advanded media technologies. These Tools are transforming whole spaces into interfaces, which react to movement and appearance of their users.



06. Augmented Architecture

At the media laboratory no_LAb[1] of the institute of architecture and media recently a high end optical 3D motion tracking system has been installed.[2] Such systems are normally used in the film industry of Hollywood or in medical laboratories for motion analy-

sis. At the institute of architecture and media we use the equipment for experiments, in order to extend architecture beyond its traditional, physical borders (Augmented Architecture). With the assistance of these advanced technical means it is possible to create a fusion of the space of material action and the space of digital data.

"The architects should finally stop thinking only in materials" - Hans Hollein demanded 1968 in his manifesto "everything is architecture". A demand which nobody tried to put into practice – including Hollein. "Thus if one wants to immaterialize static architecture - i.e. transform it into a dynamic system - architecture became a medium, which always changes, temporal and spatial, a context-steered event world. (...) From the variability of the architectural elements" - door, window, wall, facade, etc. - "from the virtuality of the stored information" - warmth, light, sound, gestures, movements - "a building would arise, which shows life-similar behavior: viability. (...) Architecture, as an intelligent ambiente, which reacts to the inputs of the users and accomplishes intelligently condition changes. Interactivity between users and architecture, both as correlating parts of a dynamic system, which shows life-similar behavior - viable architecture."[3]

The project N'Files follows the intention to use learned cultural behavior when handling media. Thereby a lot of attention is paid to the senses (seeing, hearing, feeling). At the centre the touch-less connection of human being – machine - space is located via genuine sensual perception. By the immaterial interface (the space is the interface!) and the paradigm of the touch-less a further sense is generated - the non-touch sense. This unusual sensitive experience is starting point for the research of space communication via gestures and movement – one option, how we will use our spaces in the future. Test section for the project N'Files is the media laboratory no_LAb of the institute of architecture and media at Graz University of Technology, in which the technical facility is given by the optical trackingsystem. For this project the laboratory is transformed into an interactive space volume, which reacts to its visitors and adapts its appearance on these. That means, the space is not steered by computers or classical input devices, but the space is(!) the machine. A machine, which is able "to feel sensory" and to reflect these moods to the users. Architecture as a medium and as intelligent environment, which can react on the inputs of its users - conscious and unconscious - intuitive and "on demand "...

07. Projects

07.1 N'Files

Ambient Object

The surface of a table as a tangible interface to navigate through presentations. Once again, the main idea was to take an ordinary object - a table - which's function is clearand extend it with a new (intelligent) value. So the challenge is to observe, how would people act with this new object - an ambient object. Will they take the new functions for granted..? A short example introducing the interface: if you want to play a video in your presentation, you have to do the following: On the table there lies a videocassette. If you touch the cassette, the video starts to play. So our goal is an intuitive interaction. That is to say if one moves or points on something, the room system should be able to react.

Moodboard - Room for All Colors

Translation of room geometry into RGB color spectrum. Every room coordinate has its own color. If a visitor moves through the space the room reacts with color; from bright red to dark blue...

Dynamic Wallpaper

Inner Facade and Virtual Window, which describes the actual state of the room in realtime according to frequency and fluctuation.
The pattern of the wallpaper is transformed through one's movement.

Dynamic Curtain

Interactive virtual curtain as OpenGL plane which allows one to move the curtain without touching it. The immaterial interface and the paradigm of being without contact is creating a further sensual perception - the non-touch sense....drop the curtain with your movement.

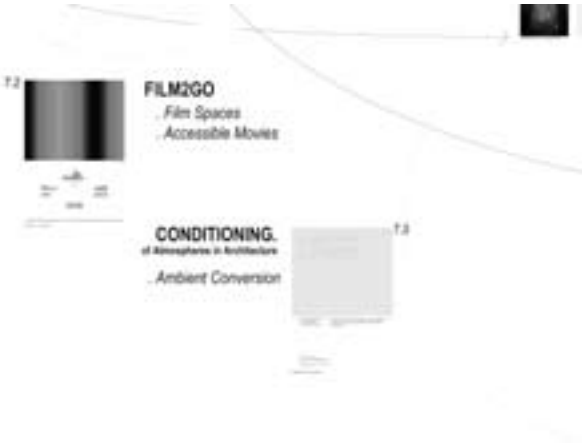
07.2 Film-2-Go (2006)

Video Spaces
Accessible Movies

What happens if someone replaces the camera and uses instead his own body movement..?

Participants of FILM2GO will develop a new genuine form of interaction between immersive projection environment of the media laboratory no_LAb and the own body

movement. A constant of the space perception is extracted from them: the ground floor. To find an approach to this unusual sensitive experience, associations with the technique of ChiGong, the movement of matter by pure mental energy, are used as comparisons. Equal to a trapezist the probands will navigate through video matrices only by shifting their center of gravitiy and will experience and define what "forward" means in a nonlinear movie...



07.3 Conditioning of Atmospheres in Architecture (2007)

Hybrid Environments merging physical spaces of actions with spaces of virtuality

Advanced Media Technologies are transforming whole spaces into interfaces, which react to movement and appearance of their users. Architecture can thereby affect us directly and not through the detour of sense interpretation. Thus a whole bundle of architectural means are already implied: materiality - immaterial, performance, body perception, tactility, mood, sense, sensibility and last not least atmosphere.

In module 1 HYBRID ENVIRONMENTS of our MAS-Program "Architectural Computing and Media Technology" weare dealing with those potentials of the atmospheric to produce presence. The participants will use the media-lab no_LAb and the associated light-lab as playground for realtime-designs and will put to test a new genuine form of architecture as simulation, before the projects will be casted in an urban context and become item of a closing discussion with wellknown experts.

08. Advances in Technology - Changes in Pedagogy

Where Students Dream

Students know best. If you want to know what is going on in the world of architecture, find your way to the nearest design school and wander around the tables and the model shops, the canteen and the lecture halls. There you can find the latest experiments.

Students can still dream, and they don't yet know what is impossible.
(Aaron Betsky, Archiprix catalogue)

no_LAb__in_feld
Laboratory for Architecture and Media.
the prototype of a next generation design studio.

The Media Laboratory is about people, computation, and quality of life in a digital age and focus on the study, invention, and creative use of "enabling technologies for learning and expression by people and machines." (MIT)

New Values for Experimenting with Architectural Design

We use media as architectural instruments ("invisible architecture"). The challenge is to provide complex technological environments with a certain simplicity and intuition, which one the user requires and expects for a good reason. "We live in an increasingly complex technological world where nothing works like it is supposed to, and at the end of the day makes all of us hunger for simplicity to some degree."[4] The research project follows therefore the question whether an architecture / a space of media can support the user in everyday actions or whether there are actions, which change or simplify by handling media or even actions which will be possible only because of the use of media.

New Methods for Experimenting with Architectural Design

Integrated into different courses - like "inter.media" and "v|ideo s|ense" - there is an ongoing workflow between instructors, tutors and students. We highly believe that that these peer-2-peer concepts, which we practise in workshops, discussions and extended seminars are the best way to generate contemporary strategies for architectural education.

Innovation is the Difference

Through the use of techniques and environments which are normally used in other disciplines (e.g. Motion-Tracking Systems) we demonstrate a spirit of avantgarde. Thereby we reach two goals:

- Architects are confrontated with new technologies, which helps them to augment their fields of profession – "learning by doing"
- Architects have to realize that design means always invention – "learning by doing something new"

The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn. Alvin Toffler (American writer and futurist)

Digital media technology creates the potential for the development of new spaces and new forms of work and exchange. Architecture can become a resource for the development of technology and culture by supplying what is most urgently needed: ideas and insights, which are based on an understanding of technology as an integral component

of contemporary culture. What is needed to develop these insights is an architecture laboratory, in which new technologies are developed and tested according to their extended social and societal functions and which could find its definition as an exceptional space of experiments.[5]

Notes

1 The no_LAb_in_feld is the media-lab of the institute for arch+media. A new laboratory for digital experimentation in architectural education and research. The novel forms of collaboration and learning for which it is intended and the quick pace of innovation in digital technology on which it depends both require an appropriately flexible spatial and technological framework. And it requires a particular mindset. The no_LAb_in_feld is not just another laboratory. it is a place, a community, a high-tech construction site, a permanent work in progress. It is the prototype of a next generation design studio.

2 The MotionTrackingSystem was financed in the context of the austrian university infrastructure initiative of the advice for research and technology (RFT).

3 *Viable and virtual architecture*, P. Weibel, 1994.

4 *Simplicity – the art of complexity*, John Maeda, 2006.

5 cp. *Digitale Transformationen*, Fleischmann – Reinhard, 2004 – Praxis Reaktorbau, Edler & Edler (S. 216)

Darren Deane
Eleanor Suess

On Slowness

Kingston University
School of Architecture
United Kingdom

In view of the conference theme – pedagogical shifts – we would like to join other speakers who began by forging some preliminary conceptual links. One can first of all connect the idea of pedagogy with the act of being at play (*paidia*), a process that links directly with the arcane notion of cultural play (*paideia*).[1] Cultural play accounts for the creative struggle across a dense field of choice (the *agon*), through which a path is cleared, and in which ambiguously-poised values are negotiated. Play also describes the back and forth movement between cultural extremes that typically characterises education. For the Greeks this latter process became known as the *periagoge*, or 'turning', an act of oscillation or between-ness that casts light upon the ancient notion of play.[2] To this encrusted semantic pile can be added the non-etymological, but still intimately linked term *agoge*, which further characterises learning as a process stirred by eagerness, conjuring up speculation, and perhaps most importantly, drawing us towards the unknown.

If we compress these values into a coherent description then the pedagogical process at work within architectural education suddenly resembles something like a stirring intellectual movement caught between extreme spatial, material and temporal parameters. This paper offers a theoretical account of two such parameters that inform the *pedagogical middle ground* of Kingston University School of Architecture: on the one hand, slowness and dense matter, and on the other, lightness and rapid temporal flows.

A Contemporary Dilemma: Flow or Hindrance?

Teachers of design place their agendas and attitudes within an historical context of precedents and references because it helps them to make sense of, and ultimately legitimise, their pedagogical practice. Such precedents are usually clustered around a thematic epicentre. For us, that epicentre would be the idea that the architectural 'project-space' is both *anachronistic* and *diachronistic*, i.e. consisting of differentiated layers of matter embodying different time signatures ranging from the inert and slow-moving, to the socially compliant and rapidly changing. This suggests that architects can structure their thoughts and projects as an intensified spectrum of material states; states which coexist not as linear dialectical processes (dematerialisation in the modernist sense), but as interactive conditions. Despite using the term *ana*chronism, we want to avoid any notion of nostalgia or escapism. Instead we wish to propose resituating the architectural project within a differentiated temporality stabilised at one end by something like slow mass, and at the other by recent developments in the field of dematerialised (gravity-free), highly temporalised, digital media. To put it briefly, we are interested in teaching how architectural matter can embody multiple temporalities or timelines.

'Unlocking potential', 'releasing an idea', 'seeding' and 'sparks' are pedagogical expressions familiar to many design educators. What they hold in common is the underlying discursive strand of *movement*, or the apperception that creativity is primarily a fluid act. So when considered against this widely-held assumption that the creative process *flows* in one direction or another, the idea of slowness conjures up an opposing image: that of a retrograde, non-progressive action. But are there any intellectual precedents to suggest otherwise, that slowness, or being out of sync might in fact be central to the creative act?

Slowness baffles and confuses us at the same time. We find ourselves irritated by traffic congestion whilst welcoming the contemplative stillness of the bathtub! This helps explain why some writers have combined both sensations (friction and stillness), such as Alfred Jarry's fictional scientist of 1897 Dr Faustroll, who experienced time by standing still against the tide of chronology and sequence. Moments of stillness also encourage critical distance, hence the relevance of Faustroll's character, who severs his connection with the life process, thereby deconstructing his situation into present and non-present (past)time. By following a different temporality, Faustroll's actions represent the inverted cultural process of distanciation: moving against (contra), rather than with the flow of time and matter.

So could it be that slow thinking, or apparently backward actions, can actually stimulate a type of architectural perception, in particular that branch known as the material imagination, and if so, how might this work? Consider the following statement made by Hannah Arendt in 1958 suggesting the act of making itself constitutes an interruption in temporal flow.

> *Fabrication, the work of homo faber, consists in reification. Solidity, inherent in all, even the most fragile things, comes from the material worked upon, but this material itself is not simply given and there, like the fruits of fields and trees which we may gather or leave alone without changing the household of nature. Material is already a product of human hands which have removed it from its natural location, either killing a life process, as in the case of the tree which must be destroyed in order to provide wood, or interrupting one of nature's slower processes, as in the case of iron, stone or marble torn out of the womb of the earth. This element of violation and violence is present in all fabrication.* (Arendt, 1958, 139)

Arendt's point is that slowness, solidification and interruption aids the construction of durable works of architectural intelligence, a method which perhaps eludes those always caught up in the thick of things.

Shifting our attention to architectural practice, one can detect a growing chorus of voices that, perhaps out of disenchantment with the mainstream rhetoric of fluidity and flowmania, have similarly turned their attention to slow culture, and the resistant grain of creativity.[3] Our own thoughts on slowness and mass are attuned to an historical and contemporary horizon that includes the work of practising artists, architects and writers, such as Adolf Loos' languorous domestic retreats – rooms where matter can retreat and safely "enjoy a certain period of molecular rest" as he put it (Loos, 1988, 138). 'Languid atmospheres' was also a subject of Man Ray's photography, which captured dust-covered artefacts kept in a dormant state for long periods. A slightly earlier statement articulated by John Ruskin, takes our understanding a little further by setting out a spectrum of material gradation, one side of which is determined by slow, heavy matter and viscous time: "The loosest weed that drifts and waves under the heaving of the sea, or hangs heavily on the brown and slippery shore, has a marked strength, structure, elasticity, *gradation of substance*." (Ruskin, 1880, 112).

The theme of material gradation, in particular that side of the spectrum inclined towards friction and sedimentation, is the cornerstone of the emerging London architectural practice Sergison Bates. Their 1996 essay "Friction" speaks of architecture as "contributing to an increased atmospheric density of a place and in this there lies an ultimate resistance to the artificial and the virtual." (Bates and Sergison, 1996). Their contemporaries, Adam Caruso and Peter St John, attempt something similar in claiming that anyone expressing an interest in either reality or the material intensity of architecture is in effect adopting a "resistant" position. (Caruso and St John, 2005). And both practices of course owe a great deal to Peter Smithson, whose 1987 Manifesto on "Conglomerate Ordering" refers to buildings as "lumps" with "thick building mass". (Smithson, 1993). On a more theoretical note, Manuel DeLanda's recent Deleuzian-inspired initiatives seek to rearticulate culture and society in terms of non-linear, friction based processes. Whilst these documents might not sit together harmoniously, their cultural proximity at the very least suggests that processes characterised by slowness, density and mass are important indicators of an emerging pedagogical atmosphere.

This atmosphere becomes more clearly identifiable in the context of other spatial practices which have joined architecture in its search for slow praxis. The photographic processes of Idris Kahn for instance use a technique of densely overlaid stills as a way of recapturing the materiality of a body arrested in a single snapshot, whilst the entropic, slumping mounds ('heaps' of cultural matter) conceived by the land artist Robert Smithson remind us of the indomitable gravitational pull exerted on man-made artefacts. We should also not overlook René Magritte's perilously hovering boulders - solid fragments of earth that appear to amplify gravity in the act of defying it. And in acknowledgement of our hosts here in Portugal, some space must be given to an entry found in Fernando Pessoa's *Livro do desassossego* ('The Book of Disquiet'), which reads as follows: "Reality, especially if it is brutish and rough, forms a natural complement to the soul." (Pessoa, 1991, 13.11). We could go on, but this overtly-dense retrospective shall end with a philosophical remark, this time by Walter Benjamin, who in *The Arcades Project* drew an explicit connection between the act of interpretation, and stoppage or slowness:

> *"Thinking involves not only the flow of thoughts, but their arrest as well…where time stands still and has come to a stop."* (Benjamin, 1999, 475)

These are strange words from a revolutionary thinker known to have been obsessed with time!

This truncated genealogy of literary, philosophical and artistic fragments forms a background scene to our work that architectural historians and critical theorists have yet to explore, let alone understand.[4] Together they articulate an undercurrent that revalorises slowness, friction and heavy matter as a progressive state, and not merely a retrograde action or state. Slowness is not about opposing time, rather, it prompts us to think of how to delay movement through the introduction of different temporalities and material states into the project-space; material states which perform at different rates (from the permanence of mass to the transience of film), enabling architecture to be imprinted by action, as well as carry ideational load. In addition to legitimising our agenda, these reference points help identify the genesis of our search for strategies,

techniques and sites that situate slow mass against transient everydayness and other virtual, rapid processes.

Growth through Density: The Project Space as Intensified Field

Innovation in design education falls into two broad categories. The first involves adjusting the aims, objectives or formal endpoint of creativity, often through a search for media and techniques that have visual consequences. This first type is to be contrasted with a second: innovation applied to the project as a performative space, i.e. how cultural materials and their content interact. Our efforts concentrate on the second strategy: intensifying the immanent structure, internal order, or *amplifying what animates a project from within,* as though it were somehow a second nature. We have set ourselves the task of intensifying the project as a dense field of matter that in the hands of students can be taken in various directions and at different paces.

The fictional writer Italo Calvino once declared "my working method has more often than not involved the subtraction of weight. I have tried to remove weight, sometimes from people, sometimes from heavenly bodies, sometimes from cities." (Calvino, 1996, 3) We would argue that for architecture students sometimes the opposite is true. Forced to start from nowhere, the first act can often be to assemble a thick field of data, similar perhaps to Robert Smithson's 'Heap of Language'. We therefore avoid positing simple starting points and single driving concepts, promoting instead the slow accretion of elements into *constellations* of architectural matter, which in turn become potential spaces for making design decisions.

It was the Belgian philosopher Eugene Dupréel who examined slowness, density and consolidation in his *Théorie de la consolidation* of 1931, and which he opposed to the notion of simple generative concepts:

> *Life has not moved from an original nucleus towards an indeterminate development: it seems to have resulted from an advance from the external to the internal, from a state of dispersal to a final state of continuity. It has never been like a beginning from which a consequence results, but it was from the first like a frame that is filled, or like an order that has gained in consistency through, if we may be permitted to use the expression, a kind of gradual stuffing… Life is certainly growth, but all growth that is in extension, like fabric that stretches or individuals that proliferate, is only a particular case; life is essentially growth through density, an intensive progress..*[5] (As quoted in Bachelard, 2000, 95-6)

Encouraged by such thoughts, we began re-structuring the project-space as a material constellation *out of which ideas emerge*. The process of design is often spoken of as a search for a friction-free, efficient system for expediting the so-called needs and functions that drive architectural procurement. Perhaps in reaction to this, and the increasing pressure to make every project socially compliant, we have begun to develop a non-linear, friction-based model for a slow architectural project. In our view, if the trajectory of design is towards mass, heaviness and weight, as opposed to being propelled by an

immaterial grand concept posited at the start and to be obeyed at all costs, then paradoxically, the origin (idea) of a project emerges or is drawn out through distillation.

Restructuring the 'project space' as a steadily growing field has helped turn our attention towards the interconnecting logic that gathers together this m(or)ass of material and media. When speaking to students about course-related matters we avoid using a language of abstract boxes containing words connected by arrows. We prefer to speak of ropes built from strands that map multiple pathways of architectural elements and/or media. Tied into knots, loops and points of coalescence, these strands of matter can be characterised as either slow and lumbered, or quick and responsive. They can digress, as if they have a life of their own, or join up under the influence of more powerful synthetic agents. Diagram 1 (below) expresses the aforementioned relationships.

Such descriptions have helped us rearticulate the project according to a matrix of conjunctions governed by interference, bundles, knots, slowness, swerves and multiplicity. To understand this internal order with any precision we shall need to go into more detail. Below is a second, more evolved diagram (2) illustrating how materiality interferes with and particularises the standardised pathway of a project. The resulting swerve – a Lucretian concept recently taken up by the historian of science Michel Serres – injects vitality into a process that would otherwise be limited by standardised criteria.[6]

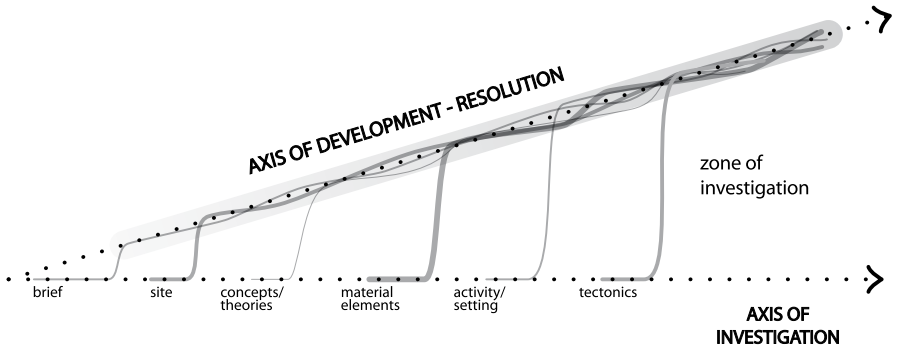


Diagram 1: Accumulating Density (by the authors)

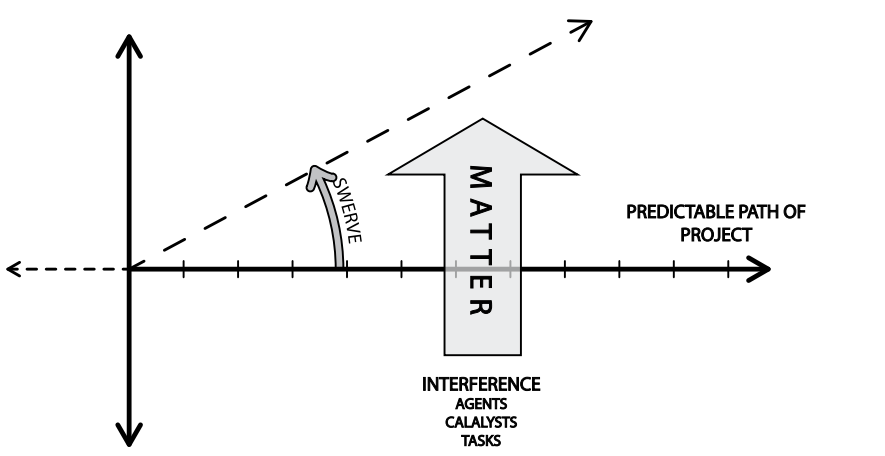


Diagram 2: Material Interference (by the authors)

Similarly in a project-space, strands of elements can swerve between processual orbits and media, helping to loosen the grip of an all-encompassing process or medium. Another way of putting this might be that heterogeneous materials and slower processes can interfere with and enrich design practice. This zone of interference is a crucial ingredient in our project space. Here is an account of this strategy of interference at work in our Second Year programme, which culminated in a digital workshop called 'moving drawings'. It describes the intersection (interference) of three investigative processes, each of which represents three different material states of a project.

Moving Drawings: Touchrail

The moving drawing "Touchrail" by Paolo Scianna (fig. 1), a Second Year student, explores the temporal qualities of a dense architectural element - a timber handrail designed to lead the user through a building and also function as a device to display traditional timber detailing. The film, which simultaneously explores these two operations of a single architectural element is the culmination of three investigative tasks that were deliberately grouped according to their contrasting materiality, (density of media): a digital time-based drawing, a making exercise (metaphorical in nature), and a brief loaded with typology and cultural decorum. Each element participates in a 3-way dynamic, opening up an interactive space between co-present material states.

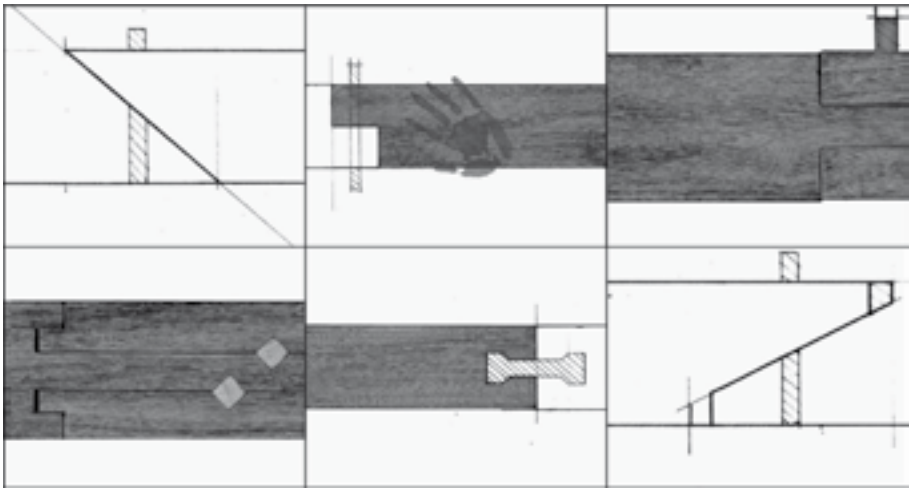


Fig. 1: Stills from Moving Drawing Touchrail, Paolo Scianna, Kingston University

Using the time-based software Adobe Premiere, "touchrail" is a film that navigates across the surface of orthographic projection employing the filmic technique of the pan (from *ortho* to *tempo*). Traditionally the 'pan' plays over a 'view', but in this instance it traverses another medium of representation, the architectural drawing. Echoing the movement of the viewer's eye as they look at the 'static' drawing, the motion of the pan shifts the view from the left to the right of the drawing in a non-linear configuration. The view changes

scale, zooming in and out. The quality of the line, the traces of the guidelines and the grainy smudges on the paper are vestiges of the originating slowness of the material study, and are now clearly visible in the time-based moving drawing. When resituated into the heightened temporal medium of Premier, the static dormant element of the rail becomes animated by its relationship with the user. As an *independent*, de-personalised object, the handrail remains stationary, unmoving. Only at the point of contact with the user's hand is it activated, gaining an overt durational existence.

"Touchrail" demonstrates how our reconception of the project-space incorporates pockets of slower material studies that, when combined with the moving drawing, jump or swerve from the orbit of static techniques into time-based media and film. Conceptually speaking, the initial material study carried not only qualitative material, but additional representational meaning and use (it was to be used as a visual display); this is then allowed to interfere with a brief (a trade school) loaded with standardised functionalist criteria. Each task embodies the same idea (an intimate architectural component that is both useful and rhetorical), evolved through different orders of matter, time and animation. The filmed object carries an uncanny material presence, whilst reciprocally the object has slipped from the stasis of an authentic lump, into the animate life of use, and from there into the active life of the building as a whole. When read together as three coexisting material states, each fragment is temporally compressed (slowed down to the point of near stasis), or expanded (animated) by the next stage of re-presentation.

A Retrospective Matrix

The idea of introducing a slower, resistant grain into the project-space led us to formulate a plural matrix of qualitative values that attempts to incorporate particularising factors and material states (Diagram 3).

Every architectural project will contain standardised data and decisions. Brief, context and tectonics and so on - the x-axis - are for us unavoidable, integral parts of the sequential, continuous design process. We hold to these criteria, accepting them as positive constraints. The y-axis – the 'particularising force of matter' – enriches the overall process, whilst the vertical z-axis represents the range of skills students are able to acquire over the course of a single project. As shown in diagram 4, standardised scenarios naturally break down under the influence of catalytic tasks, thereby forcing the project-space to expand (distend) and contract (intensify). As the particularising factor of materiality revalorises the design process according to slowness and creative non-linearity, the result is an compacted project-space consisting of interactive states that introduce multiple levels of temporality and meaning.

To conclude, the thick, slow mass of a project-space is a direct result of the forced compression – simultaneity - of many elemental strands into a singular composite space. The simultaneous introduction of multiple investigative elements allows design to unfold along three fronts, which are then integrated at a critical threshold, at which point they begin to test, extend and modify each other. By drawing in such additional valence, projects can easily become laboratories for bundling and testing the relation-

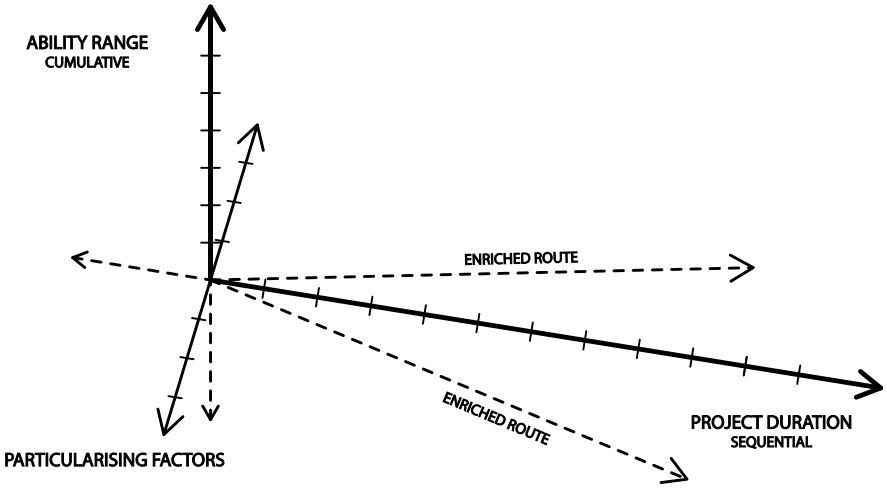


Diagram 3: Pedagogical Matrix

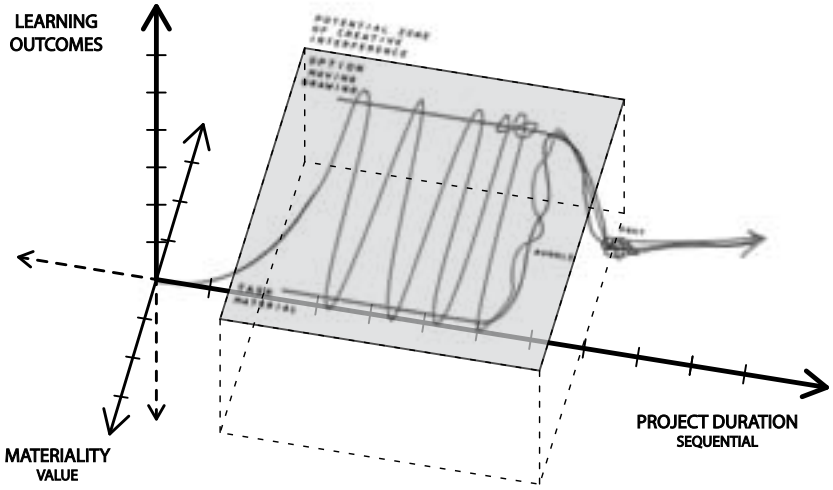


Diagram 4: Intensified Project Space

ships between apparently disconnected working methods. In the words of Adorno, every project-work is a potential space or *force field*, at which point architectural design begins to resemble a chemical, material process.

Our contribution to the debate about time-based media and the burgeoning rhetoric of fluidity, flowmania, and process-driven architecture is that it need not displace the slower presence and friction of built matter. This is why we seek to develop a conflicting logic of interference (the *agon*) that enables the configuration of projects as plural material states embodying degrees of temporality. For us, intelligent architecture cuts

across processes and states in search of a middle ground. As one of very few disciplines capable of integrating competing values, it doesn't need to be set out as a systematic ground, or determined by one overarching quality. Our introduction of the category of slowness is an attempt to contribute another side to architecture's middle ground, thereby intensifying the territory through which students and academics struggle to find their way.

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1 On the Classical, etymological connection between play and culture see Eric Voegelin's *Order and History Volume III: Plato and Aristotle*, Dante Germino (Columbia: University of Missouri Press, 2000), 313-4. "After festivals with their songs and dances can have the effect of restoring a *paideia* that is suffering from the hardships of life because these rituals are grafted on *paidia*, that is, on the play of children. Hence *paideia* has to start from *paidia*."

2 "Paideia, Periagoge, and Agathon, thus are intimately connected". *Ibid*., 169. See also Eric Voegelin, *Order and History Volume V: In Search of Order* (Columbia: University of Missouri Press, 2000), 71.

3 In this context comparisons can be drawn with the way fast-food industries are countered by the Italian 'Slowfood' movement.

4 This topic is a subtext of the unpublished doctoral work of one the paper's authors, Darren Deane (*From Part to Element: Modernism, Materiality and Cultural Change* University of Bath, 2006).

5 Eugene Dupréel, *Théorie de la consolidation. Esquisse d'une théorie de la vie d'inspiration sociologique* (Brussels 1931), 38-9. As quoted in Gaston Bachelard, *The Dialectics of Duration,* trans. Mary McAllester Jones (Manchester: Clinamen Press, 2000), 95-6. Gilles Deleuze and Félix Guattari also identified the significance of Dupréel's description of process as a sequence

of densification: "The philosopher Eugene Dupréel proposed a theory of consolidation: he demonstrated that that life went not from a center to an exteriority but from an exterior to an interior, or rather from a discrete or fuzzy aggregate to its *consolidation*...there is no beginning from which a linear sequence would derive." Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (London: Continuum, 2004), 362. This idea of consolidated entities is very similar to an earlier 20th Century conception of the artificial work defined by Theordor Adorno which he refers to as the "monad".

6 Michel Serres, *The Birth of Physics*, (trans. Jack Hawkes), Clinamen Press, Manchester, 2000, 3-4. Drawing on Lucretius, Serres describes how the elements determined by linear flow can be "torn from destiny," like a "rupture in determinism." Like a knot, the "swerve" itself is a "turbulent" pathway.

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Haptic Diagrams

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How can a digital design oriented teaching process engage with actuality, society and context? How can this new rhetoric of surfaces be employed as a platform for critical and ideological positions such as Identity, gender and locality? These questions are folded into the notion of *Haptic Diagrams*.

Digital technology is wrongly perceived as merely about techniques, optimization and form performance. Nevertheless, new technologies have always generated a set of cultural and social power relations, and at the same time provided new terminology and critical tools for reading into broader social and cultural practices. In recent debates, critical architecture found itself under attack calling for a move towards projective thinking[1] induced from inside the architectural discipline. This call was advocating for architecture of sensation, presentation and performativity.

Working critically from "the inside", we would like to introduce *Haptic Diagrams* as a model which we integrated into our design methodology. This model relates social and cultural context to materiality, corporeality, surfaces, program, event and temporality of Identity embodied in space.

The Haptic

It is architecture that is always *"Consummated by a collectivity in a state of distraction"*, we raise the notion of the haptic from Walter Benjamin's state of distraction[2]. Benjamin identifies the cognitive, hence the political, potential of modernity's new technologies and spaces; panoramas, dioramas, photography and finally cinema, generated an expansion of vision and other bodily perceptions. This new mode of perceiving, empowered by technology, is not subservient to traditional conventions or representations, thus enable an absent-minded perception that activate a deeper, more haptic involvement of body in space. It is the positive role of distraction as a kind of "not seeing" that releases architectural space from the pure visual experience and opens it up to new intuitive haptic knowledge.

The new spectatorship was related by Benjamin to the ways in which architecture is experienced. Buildings are appropriated in a twofold nature; " by use and perception-or rather by touch and sight"[3]. It is the tactile perception that engages with habit and usage, although "as regards architecture, habit determines to a large extent even optical perception". In this sense, the tactile and the optic, touch and sight, are folded into each other, reciprocally generating a haptic sensibility.

The haptic, which is both a visual experience and praxis, conjures up space through transformation, duration and temporality. It allows architecture to be perceived as a sequence of events and multiplicity rather than a singular articulation. In this sense it is the affective experience of a surface rather than a singular point of view situated in a distance, on the outline or the gestalt. The haptic grants an intimate immersion with surface, a new "closeness" to matter and texture.

This reduced distance from the surface, allowed by haptic closeness, opens a new field for an action to be taken, an opportunity for a shift from contemplation to praxis by being performative[4]. This allows us to perceive identity in a far more fluid and dynamic way than traditional approaches, it is precisely our actions and behavior that constitute our identity.

The diagram

The diagram is the architects' way of dreaming, the 'no-place' encompassing the utopian act, offering a world different from what exists, asking how we can change the world. In this sense, anything can be a diagram –an image, an equation, a building, an object, music, cinema, or comics – as long as it performs an operation, it is being in a state of becoming. Thus, the diagram is projected onto the world in order to set the relations between reality, its interpretation and its potentials of transformation.

We use the diagram as a critical tool through which we investigate the ways in which the digital design process shifts back and fourth between actuality and virtuality.

A clear cut example of the diagram that works within its historical and social context is apparent in Foucault's discussion of "panopticism". Foucault observed Jeremy Bentham's plan of the panopticon prison as the diagram of modern disciplinary societies. In this way the Panopticon, detached from its specific use, operates as a "spatial machine"- an expression that manifolds cultural and political conditions and generates the social order as a whole.

Following Foucault, Deleuze defined the diagram as an "abstract machine", by emphasizing its configuration. The diagram is *"in a state of becoming. It never functions to represent a preexisting world; it produces a new type of reality, a new model of truth"*. The diagram *"does not function to represent even something real, but rather constructed a real that is yet to come"*.[5]

The diagram is abstract in that it makes no distinction between form and substance or between expression and content. The diagram is not a plan or a blueprint, hence its meaning is not fixed[6]. By understanding the diagram by its operations, transformations and configuration over time, the diagram can serve as a tool against architectural typology.[7]

Typology is the superimposition of form and content; uses, functions, ideas and concepts that are linearly and literally translated into forms. Consequently, typology constrained architecture, and the diagram, being ever changing and unpredictable, liberated it. Liberating as it is, the diagram can easily be reduced into form, where as, at this point lays the danger to the design process.

Haptic Diagrams as generators of design methodology

Alas, our sacred design process was in danger of being reduced to a formalistic diagram. This new syntax , Haptic diagrams, is a new critical model formed to release the design process from making the diagram the object of architecture. Haptic diagrams launch the performative active aspects of the design process- rendering it perceptible and actual.

It is the haptic that charges the diagram with external concepts that can be derived from other disciplines such as art, cinema, science and theory. This is while the diagram is the mechanism that generates their relationships and potentials of transformation.

Digital new media allows the designer to become more and more accessible to new haptic knowledge consisting of data, forces, effects and transformations over time that assemble the design project.[8] This has derived a new form of subjectivity, with a tech-

nological subject (the designer, in our case) that is going through a significant change. The technological subject, using haptic diagrams, pulls aspects of program, ideology and context and embeds them within the design process. We distinguish this new form of subjectivity as the "state of distraction" throughout the design process.

Applying haptic knowledge on to the diagram allows a field of multiplicity to open up: programs can be created in different scales and resolutions, inside outside volumes and surfaces, through notions of matter, body, temporality and event.

Our design methodology uses Haptic Diagrams in order to generate a set of three possible procedures: *from cinematography to diagram, matter –surface- figure, haptic diagram as program generator.*

Methodology 1: from Cinematography to Diagram

"With the close-up, space expands; with slow motion, movement is extended. The enlargement of a snapshot does not simply render more precise what in any case was visible, though unclear: it reveals entirely new structural formations of the subject. "[9]

Cinema, through the virtual gaze reveals haptic dynamics and narratives of body in space. In this method, cinematic language is used as the external concept (haptic knowledge) that generates the diagram.

Diagram: Analyzing Cinematic language (camera movement, points of view, composition, sound, narrative, etc) as parametric data.

Haptic knowledge: The inscription of architectural meaning on to the diagram that was generated from cinematic parametric analysis.

Syntax- Haptic Diagrams: The syntax allows the intimate immersion with surface, matter and texture, a "surface closeness". The complexity generated through the visual experience emerges as a new temporality in space.

Methodology 2: Matter–surface- figure

Experimenting with actual materials construct haptic sensibilities that can be embedded into the digital realm.

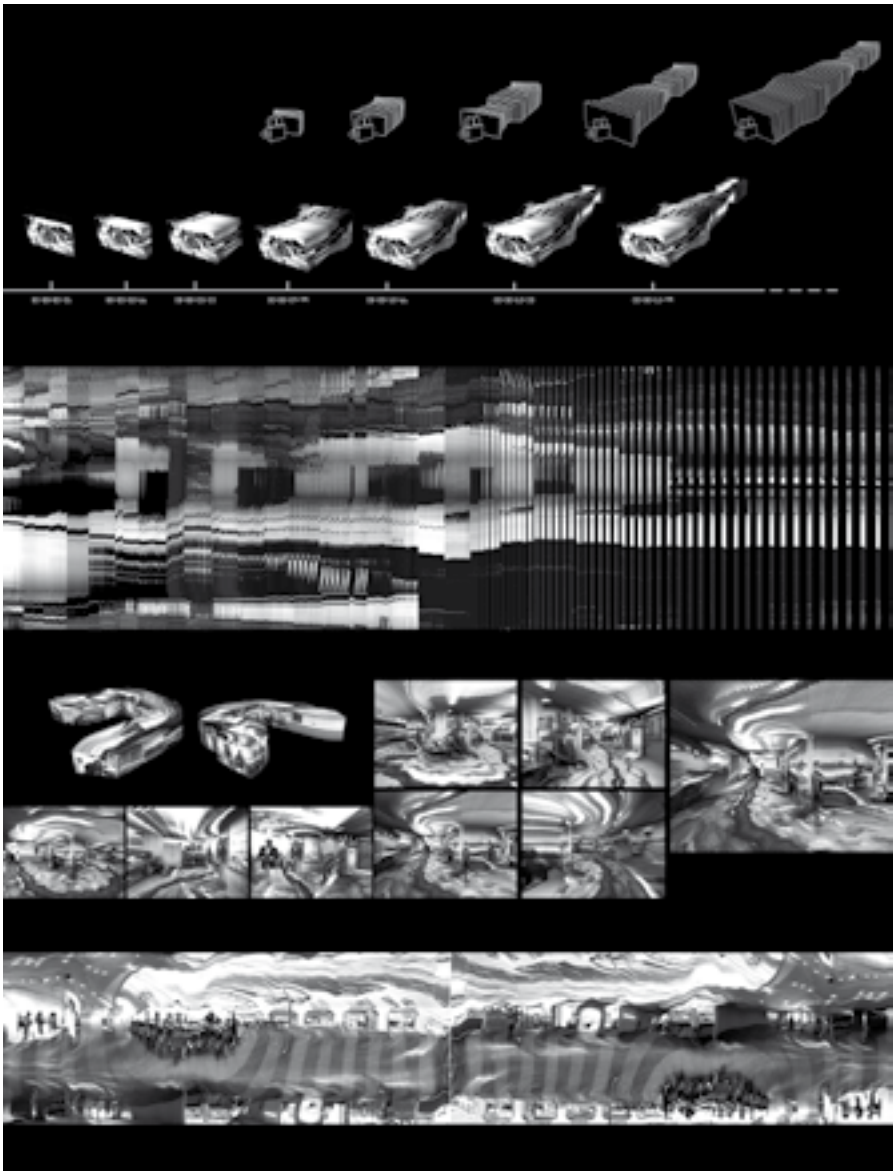
Diagram: Creating spatial surface from an actual material by using a set of rules as a sequence of operations, in order to examine how matter, surface and figure are affected by information along a timeline.

In this way the behavioral potential of real materials was explored by applying an algorithmic way of thinking outside the computer.

Haptic Knowledge: Actual body actions immersed into the surface.

Syntax- Haptic diagram 1: Searching for the formation of the figure ,but not the figurative as a fix form, by material and spatial qualities: repetitions, expansions, densities, transparencies textures and tactility. [fig. 2]

Syntax- Haptic diagram 2: At a later stage, this 3D surface was digitally modeled, using animation to examine transformations over time. The new technological subjectivity allowed an actual surface to become a new material . This actual-virtual surface was used as an abstract machine, a surface that contains the potential of its owns transformations.



1.1

1.2

1.3

Figure 1. "Film object", Efrat Yedid Ben Ezrea
This "abstract machine" was generated by digitally sampling a one shot cinematic sequence into different frames (Quentin Tarantino's "Pulp Fiction", "the Shining" by Stanley Kubrick, and on a one shot footage taken in "Dizengoff Center"- a shopping arcade in Tel Aviv). Every individual frame was lined up along the path of the camera, by defining its frame size according to the focal length used; The rows of pixels at the frames' edges (which were defined in 3D StudioMax as 4 pixels) were folded, setting the outer membrane of the film object [fig.1.1]. The "film object" can be experienced from the inside outside folded and unfolded surface. This optic-haptic effect expanded the peripheral visual field, registering traces of time into haptic experience of space.[fig 1.2, 1.3].

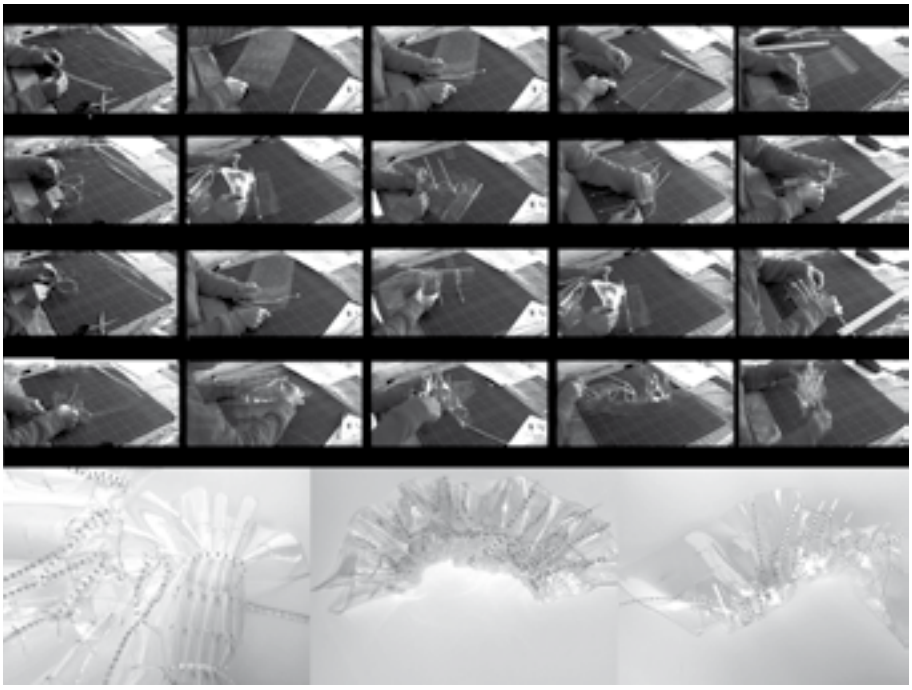


Figure 2. "actual/virtual surface", Efrat Goren
Transparent p.v,c , shackles. Using shackles as parametric vectors outside the computer.

Methodology 3: Haptic diagrams as program generators

The program is the core of the design process. Haptic diagrams as a program enable every step of the design process to go and retrieve knowledge about form, materiality, uses, as well as conceptual aspects.

Thus, the program should be challenged by theoretical framework which comes from the "outside" in order to load the design process, and enable performativity.

It is no longer a program that is left to the "building", a quantitative or "bubble diagram" –it is a matrix of multiplicities scenarios, representing a non linear way of thinking.

Haptic knowledge makes it possible to work in an inside-out manner. It examines contemporary praxis using a criticality that comes from within. At the same time, Haptic, conceptual interpretations can be applied on to operations and performances of the digital design process. Using this inside –out manner, context and conditions are activated and the distance to actuality is reduced .We believe that Haptic Diagrams venture beyond the diagram towards more sensuous, haptic, architectural spaces.

Notes

1 Robert Somol, Sarah Whiting "Notes around the Doppler effect and other moods of modernism", in *Perspecta 33 Mining Autonomy*, 2002, pp.72-77

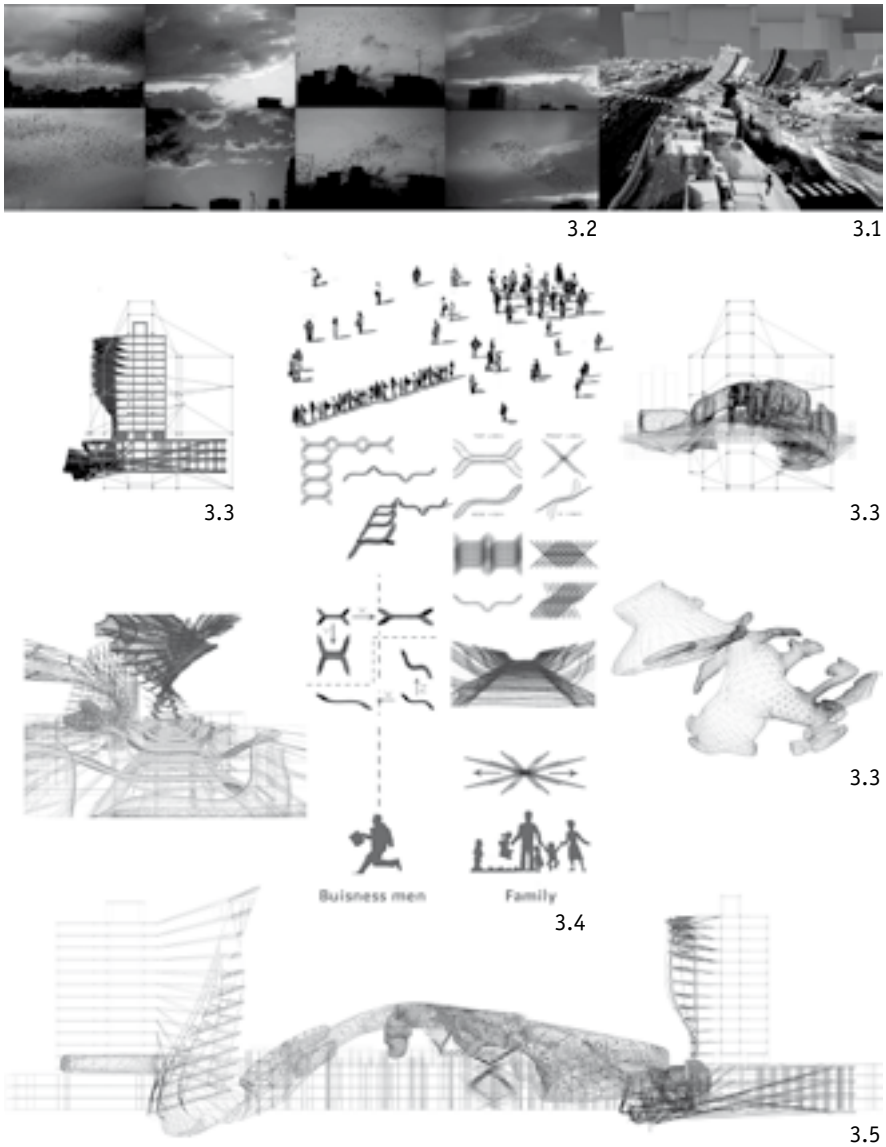


Figure 3. "Roof-S-Cape", Yaron Knor
Tel Aviv is a dense city with less and less available public spaces [fig. 3.1]. Is there an alternative public space? Where will our children play? Where will the homeless sleep and the musicians play their music? Where will we demonstrate? This project offers a different program. Tel Aviv is a flat roof top city. The upper plane of the city from the 3rd to the 7th floor is a free air rights space [fig. 3.2]. The dynamic systems of forces and flows of the cultural urban attractors are generated into a "deformatator" (the diagram), which is juxtapositioned with street flows of people and cars[fig.3.3] . These flows generate divergent flocking groups; tourists, families, businesswomen[fig. 3.4].Each group emerges by a different set of human behavioral rules, and together scripted an haptic diagram of potential urban public space over the rooftops of Tel Aviv[fig 3.5].

2 Walter Benjamin, "the Work of Art in the Age of Mechanical Reproduction" in: *illuminations*, ed. Hanna Arendt, trans. Harry Zohn (New York: Schocken Books, 1969)
3 The use of the pair touch and sight connected to the distinction made by art historian Alois Rigel (1858–1905) between two kinds of visual experience: the optical which is connected to the outline of distinguishable objects in deep space; and the haptic which conceived as an attachment to a surface.
4 Neil Leach concept of belonging refers to Judith Butler's approach of 'performativity', that relates to the way the subject acquires his/her identity. It is precisely our actions and behavior that constitute our identity and sense of belonging. [Neil Leach, *Camouflage*, (MIT Press, Cambridge, MA: 2006)]. We also relating to another sense of the term in J. L Austin concept of *performative* utterances. Performatives operate in such a way that saying of it makes it so; it is the action that is executed in the statement itself. [J. L. Austin, *How to Do Things with Words,* ed. J. O. Urmson and Marina Sbisá. (Cambridge, Mass.: Harvard University Press, 1962)]
5 Gilles Deleuze, *A thousand Plateaus,* trans. Brian Massumi, (University of Minnesota Press, Minneapolis 1987), p. 141
6 In this sense the diagram differs from 3 types of signs identified by Charles S. Peirce semiotics: the icon, the symbol and the index. While the icon and the symbol are representations of their objects; The Index is physically driven sign, sets up cause and effect relationship with its object. The index, which is not dependent on similitude, is a sign of the real. Through the indexical the diagram connected to the actual.
7 Ben Van Berkel and Caroline Bos, "Diagrams – interactive instruments in operation" , in *ANY 23: Diagram Work: Data Mechanics for a Topological Age,* December 1998
8 According to Lev Manovich, new media shifts from visual representation to a new paradigm-that of the database. Following art historian Ervin Panofsky's who saw in linear perspective the "symbolic form" of the modern age, Manovich indentify the database as the new symbolic form of the computer age. The database is a new way of experiencing the endless and unstructured collection of images, texts, and other data records of digital age. (Manovich, "Database as Symbolic Form", in *The Language of New Media,* (Cambridge: MIT Press, 2001).
9 W. Benjamin, "the work of art", p. 236

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Absorbing the "Virtual and Topological": as a Perspective or as a Technique?

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The title ought to be as modest as it can, since it attempts to record what possibly happens when the "virtual and topological" parameter is introduced within an experimental educational process of architectural design to some step of its development and not to its starting point. The question asked in the proposed paper is how, where and when the absorption of the "virtual and topological" by this educational process of architectural design is taking place. More clearly, this question provokes a discussion for exploring, whether this absorption is identified as a perspective or as a technique.

The proposed discussion is based on the conceptual material of an experimental educational process of architectural design through the Platonian notion of "play" (Tentokali 2005). The theoretical perspectives of this experimental process stem from a compound, heterogeneous, contradictory and not ideologically coherent, and therefore slippery, Derridean and Deleuzean background: compound and heterogeneous, since it is composed by more than one perspectives, different by origin˙ contradictory and not ideologically coherent, because some of its component perspectives contradict each other˙ slippery, not only in Deleuzean terms, but also in terms of the intrinsic inconsistency of the contradictory perspectives. The reference of the philosophical thought, classical (Plato) or contemporary (Derrida, Deleuze and Guattari) to the content of the proposed educational process, is not a new condition for architecture. Architectural discourse has traditionally been interconnected with philosophy, directly or indirectly, in one or in another way, particularly nowadays, when this interconnection became intrinsically reciprocal. From the plethora of all the interdisciplinary branches-perspectives converging within this "colorful" and multiple background, two are going to be presented here: The "textual" of Derrida and the "differentiating" of Deleuze.

A "textual" perspective

Under the realm of post-structuralism and specifically of Derrida's deconstruction, in a very schematic way, it could be assumed, that on one hand architecture adopts philosophical, literary and psychoanalytical methods or concepts, while on the other philosophy, literary criticism and psychoanalysis deal with the architectonics of the "text".

Derrida's deconstructive work arose out of a fundamental critique of humanist discourses and their conceptions of subjectivity and language. The complexity of his work has resulted in a variety of definitions and interpretations, although Derrida himself explicitly denies any definition of his deconstructive discourse. His own words, that he investigates "the law which governs the desire of the center in the constitution of the structure" (Derrida 1976, 248), were defined and interpreted from many epistemological aspects and origins, of which only one is investigated here.

The deconstructive endeavour of J.Derrida is to "decentre" discourses, such as the three types of centering: "phonocentrism", "logocentrism" and "phallocentrism". These types of centering consist of binary systems or opposing pairs such as: speech-writing, culture-nature, mind-body, form-content, good-evil, presence-absence, man-woman, life-death, being-nothingness, light-dark and so on. "In these traditional pairs of opposition there is no peaceful coexistence of opposing terms but a violent hierarchy. The first term dominates the other (axiologically, logically, etc), and occupies the commanding position. To deconstruct the opposition is, above all, at a particular moment,

to reverse the hierarchy" (Derrida 1981, 41). Derrida goes further arguing that, in a traditional pair of opposition, any opposition exists, but a difference. He introduces as a neologism the word "differance". According to "differance", in a traditional pair of opposition, for instance *a* and *b*, "that which is different than *a* is not that which is the other, such as *b*, but that which is different within the same *a*, within the same word" (Derrida 1996). In a few words, while structuralism is generally satisfied if it can carve up a text into binary oppositions, deconstruction, on the contrary, has sought to undo them. It is not argued here, of course, that deconstruction is limited to the undoing of binary oppositions; but that even an attempt at a reading, if not an interpretation of Deconstruction, constitutes a very complicated, and always a controversial, task. But the notion of undoing will be discussed later.

Fundamental basis for the Derridean discourse is the notion of "textuality". According to Derrida's notion of "textuality" "the social reality is considered as a 'text'". *Text* though, is "not quite an extension of familiar concept, but a displacement or re-inscription of it...Text is not a mediation between language and world, but the milieu in which such distinction might be drawn. Text in general is any system of marks, traces, referrals. Perception is a text" (Bennington 1989, 84).

Thus if the social reality is considered as a "text", then the way (or ways) of approaching, touching, understanding it, is (or are) through "reading(s)". For deconstruction though, a "*reading*" is not a simple process of interpreting. "A 'reading' does not emphasize only on what is present. A reading emphasizes also on what is not present in the text» (see, e.g., Colomina 1992a and b, 1994; Wigley 1992a and b). "It is nor a process of deciphering. It is neither entirely respectful nor simply violent. Secure production of insecurity. Reading is not performed by a subject set against the text as object: Reading is imbricated in the text it reads. Leave a trace in the text if you can" (Bennington 1989, 84).

The gender branch

Since one of the most historically virulent binary oppositions is between man and woman, the theories of deconstruction of gender are spread over philosophy, psychoanalysis, literary criticism, architecture. Among them, the psychonalytical theories by H.Cixous, L.Irigaray, and J.Kristeva, are the most influential. They do not offer a new unifying gendered theory as a response to Derridean deconstructive discourse, but interpret and further explore it displacing the role of the subject. Instead of interlocking the boundaries between the above mentioned disciplines in their epistemological core, their discourse dismantles them in an inter-disciplinary way. I will be limited here for the needs of this study very briefly on the psychoanalytical discourse of H.Cixous.

Cixous does not impose the distinction between female and male to the biological sexes, but rather argues that the potential for "masculine" and "feminine" is present in both sexes. She shows how our gender identities are not fixed to one sex or the other, but mediate between them over a fluctuating and wide range of possibilities. To insist on the "feminine" as a position open to both men and women does not, however, mean to deny the fact of biological sex differences. If Cixous chooses the terms "masculine" and "feminine", it is because they have a grounding in cultural fact. In a final analysis she calls for a new attitude toward difference, which will involve *as "feminine" the acceptance of whatever is recognized as "other"* (Sellers 1988, 3).

The architectural branch

Two are the most representative deconstructionists architects who introduce the notion of "textuality" in architecture in their theoretical discourse.

P. Eisenman considers "the building as a text, the architecture as language and the architectural practice as representation of ideas". He calls for an architecture as "writing" as opposed to architecture as image. His main contribution to the architectural discourse is on the theoretical exploration of the architectural design process during all his stages, not only during the stage of his "deconstructionism". For instance, designing the House X during the early stage of his life, he argues that "the process of design for House X is not a manipulation of a set of linear and planar elements or a sequential, linear progression through a readily reconstructible series of transformations". His argument is that "the traditional design process which begins with an image already preconceived and thus at each stage has an almost unlimited number of alternatives, since it does not follow logically from the step before but rather from the initial image. This initial image describes and limits the actual choice from the range of alternatives. *In contrast the transformational method instead of narrowing at each step in the process, in fact widens the range of possibilities because it does not move toward any preconceived image"* (Eisenman 1982, 36).

On the same vein, B. Tschumi seems also to equate architecture with language, but in a critical way: «Dreams were analysed as language as well as through language. Language was called the 'the main street of the unconscious'. Generally speaking, it appeared as a series of fragments. So too with architecture when equated with language. It can only be read as a series of fragments which make up an architectural reality. Fragments of architecture are all one actually sees. These fragments are like beginnings without ends. There is always a split between fragments which are real and fragments which are virtual, between experience and concept, memory and fantasy" (Tschumi 1977, 218).

The gendered architectural branch

The notion of the logocentrism has been applied as a way of dismantling the representations of gender into the text of the architectural discourse: "the logic in the system of architecture represses sex in two different ways: sex is understood in positive and negative terms, and woman assigned the negative term (phallocentrism)" (Agrest 1991, 174-196). The impact of this application creates presuppositions for a new, multiple "reading" of the space. A "reading", through which "you can leave a trace in the text if you can", the trace of gender. A "reading" which intends: Not only to understand the architectural discourse, but also to speculate upon the meanings and representations of gender, even if not immediately obvious. Not only to illuminate the representations of gender, as a part nevertheless of the photographic representation of built environment, but also to unlock them.

The experimental educational process of architectural design

The presented conceptual material is based on the educational process of two courses, which are actually one "design studio" and one "theoretical course" during the years

1986-2006 (Tentokali 2005). Complementary in their content, since these courses, referring to the unified educational process of the architectural design, have a focal point of difference, which stems from their by definition location in the two oppositional verges of the architectural design process: the first course contains among other things the core of the theoretical starting point, eg. theory, while the second course the core of the practical application, eg. composition. Both of them deal with the unified process of the architectural design whose one of the verges is its theoretical starting point, eg theory, and the other its practical application, eg composition. That is why architectural design, while explored theoretically, tends to its practical application.

All the concepts mentioned above constitute two fundamental "pre-assumptions", contradictory in their basis, on which the content of the presented educational process of architectural design is laid on. These are:

- The first pre-assumption: On one hand, the spatial object, the building, is considered as a "text" and the process of the architectural design, as a "syntax" procedure. On the other, the identity of gender is considered as a "text" and the process of its social construction as "syntax" procedure.
- The second pre-assumption: The spatial object, the building, as a theoretical conception, but also the identity of the gender are structured (constructed) socially and culturally.

The branch of perspectives adapted by the presented educational architectural design experiment is referring to the notion of "*undoing*". This notion belongs to the same conceptual category with the notions of "de-stabilization", "de-formation", "de-composition", "de-construction". In her thorough examination of Derrida's Dissemination, Barbara Johnson argues that particularly with the latter, its relation is of a synonym: the verb "'to un-do' is a virtual synonym for 'to de-construct'" (Johnson 1981, xiv). Thus the notion of "undoing" can easily appertain to the existing discourse of the leading figures of the deconstructivistic architecture, such as B.Tschumi, P.Eisenman, Z.Hadid, F.Gehry, D.Libeskind and others. Without sharing with them any of the declarations for "a diachronic rightness" and without being identified exclusively with any of their work, this experimental process of architectural design considers it as an endless source of exploration, reference, understanding and critique. The notion of "undoing" (from all the above perspectives) is identified as a route of being aware and conscious, not only of the terms, concepts, ideas, meanings and images involved in the architectural design, but mainly and more importantly, of its own process.

From this particular aspect, as "a route of being aware and conscious" within a working frame of the interpretation of Derrida's Deconstruction into architecture, concerning mainly the process of architectural design, the notion of "undoing" is offered as a generating process. This statement is based on Benedict's argument that "the philosophy of deconstruction is generative" (Benedict 1991, 9). In a few words, it can be argued that as a generative process the notion of "undoing" absorbs. The real question consequently here asked is what and when the notion of "undoing" absorbs.

A "differentiating" perspective

The "differentiating" perspective is a term referring to the concept of "difference", perceived as a dynamic process of becoming. It is introduced here to describe the "non standard" perspective of architecture that has already constituted its discourse which became "differentiated" from its previous counterpart of the "deconstructive" discourse (*). The fact is that its theoretical discourse has not been so much tossed about from the deconstructive thought of Jacques Derrida, that it should be destabilized more from the "differentiated" thought of Giles Deleuze.

The consequences of this tossing about for architecture were a lot. Some of the consequences for its perspective were: to contract new alliances with new epistemological fields, such as the "new sciences"; to absorb the theories of complexity and chaos, the non-linear or topological geometries; to redefine its boundaries; to regain an energetic role to the play of systems which constitute the built environment; to be twisted by the challenge of the virtual. Some of the consequences for its content were: to be awaken up from a "reactionary lethargy of inertia"; to be freed from "its passive relation with the notion of time" and to be transformed to "an endless series of folding".

From the perspective of "differentiating" architecture, only two basic notions directly and/or indirectly related with the process of architectural design are going to be presented: the virtual and the topological.

The term "*topology* is accepted as a cultural and scientific resource of the folded, curved, undulated and twisted architectures. Or in other words, the dynamic aspects of topological geometry are dealing with the more general processes of continuous transformation. Topological transformations are the more general continuous transformations that maintain the geometrical properties of the connection and vicinity of the points of the figure (so that near points continue to remain near and far-off points continue to be far away)" (Di Cristina 2001, 7).

Another basic notion drawn from the Deleuzian reformulation of time and space is the notion of virtual and its relation to the praxis of architecture. As *virtual* here is considered "that which takes place outside the given identities of form, function and place'" (Langer 2001, 31). Many of the properties and aspects of the virtual have been discussed and explored exhaustingly by scholars of the field. A few of those are mentioned here.

One of the properties of the virtual, explored extensively by Picon, is its "capacity to actualization": "Virtual is full of virtue, virtue being taken as a capacity to act.... According to the old philosophical distinction between capacity and act, virtual reality is nothing but a potential awaiting its full actualization" (Picon 2003, 295). This capacity of the virtual to actualization leads to a dynamic evolution and not to another kind of resemblance, as M. De Landa explains, comparing the virtual with the actual: "the distinction between virtual and actual does not involve resemblance of any kind. Far from constituting the essential identity of a given structure, a virtual form subverts this identity, since structures as different as spheres and cubes emerge from the same topological point" (De Landa 30). The argument of De Landa's position stems of course again from Deleuze, when he explores actualization and differentiation and concludes that the process through the virtual leads to the reality of a task to be performed or a

problem to be solved: "Actualization breaks with resemblance as a process no less than it does with identity as a principle...In this sense, actualization or differentiation is always a genuine creation...For a potential or virtual object, to be actualized is to create divergent lines which correspond to – without resembling – a virtual multiplicity. The virtual processes the reality of a task to be performed or a problem to be solved" (Deleuze 1994, 212).

Some other aspects of the virtual seem to be its relations with the real and the possible. Studying the relation of the virtual with the real, or more correctly with the unreal, Picon defines that the virtual has nothing to do with the unreal: "Virtual reality is by no means unreal, but its full effect is not yet in evidence...Virtual reality can be interpreted as a germ, as a starting point of a dynamic evolution" (Picon 2003, 295). Studying the relation of the virtual with the possible this time, Zaera-Polo & Moussavi argue that virtual has always a multiplicity of possible actualizations: "The fact that the word virtual signifies the capacity to actualization does not mean that it is identified with the word possible, which signifies the same capacity...The actualization of the virtual is not the same as the realization of the possible. Where the realization of the possible is a process of achievement, a development of an existing model, the actualization of the virtual can never reach a state of closure. *The virtual has always a multiplicity of possible actualizations and is always the origin or the limit of a new lineage rather than the exhaustion of the possible"* (Zaera-Polo & Moussavi 1997, 103). Unlocking further this aspect of virtual, Zaire-Polo and Moussavi extend their thought to a kind of projection, or not expectation, that "virtual looks like nothing we already know or can see".

The notion of the "other" within the experimental educational process

Now in the end of the description of two main paths of philosophical and interdisciplinary perspectives (the "textual" and the "differentiating"), the intention of the presented paper is more ambiguous than it was in the beginning. The only clear option of the paper's intention is the option concerning the possible meeting point of the two perspectives: Whether or not they interact each other; or more specifically, whether the "textual" perspective can absorb the "differentiating" one; or more specifically, whether the "textual" perspective can absorb the "virtual" and the "topological" as a whole perspective or as a technique.

In the end of the previous chapter concerning the "differentiating" perspective, it is argued: "The virtual has always a multiplicity of possible actualizations and is always the origin or the limit of a new lineage rather than the exhaustion of the possible" (Zaera-Polo & Moussavi 1997, 103). In the end of the chapter concerning the "textual" perspective, it is argued: (In contrast with the traditional method)...the transformational method instead of narrowing at each step in the process, in fact widens the range of possibilities because it does not move toward any preconceived image" (Eisenman 1982, 36). With a kind of skepticism, I can leave both statements in the sphere of imaginary and instead of following any kind of certainty, I would rather point out a meeting point between them: "the widened range of possibilities".

Both presented perspectives are led to a meeting point of "the widened range of possibilities". Of course both perspectives pertain arguments that are not identical. Of

course, they have differences: differences that stem from the approach of the "actualization". It seems to me that the differences between the two perspectives are stronger than their similarities. This is of course true. It is true, if we limit ourselves within our personal, subjective world, enclaved within the point of the teacher, as a self-determined factor. This happens, because we forget the "hetero-determined" factor, which is appeared without any programming, without any intention, at least from the teacher's view point. This happens, because we as teachers, preoccupying with our own subjectivity, forget that the proposed educational "play" has another part too. We forget the other part: the part of student's subjectivity. But if we owe something, epistemologically speaking in terms of the new perspective of the educational process of the architectural design, this is owed to the student's subjectivity: the "differentiating" perspective stems exclusively from the student's desire. Their own desire has urged them to develop in the form of a proposal the "topological and the virtual". We just accept it. Lets not forget them again. Lets not forget the "other". It is needles of course to say, that the "other" is the only hope, and not only in terms of the gender perspective.

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Debate on the papers of Session 1

Chair:

Sean Hanna

University College of London
The Bartlett School of Architecture
Graduate School, London
United Kingdom

Sean Hanna, London, United Kingdom
I would like to thank everyone who has made a presentation in this first session. Let us now proceed to the discussion.

Gustavo Ribeiro, Copenhagen, Denmark
I have a question for the team from Graz. Some of the work you presented emerged from workshops, and I was just wondering how you follow that up. How do the students work further with workshop material, how do they experience it? Do they take some of these experiments with technology and integrate them into the design of a building, or what? Could you say something about how these experiments become integrated in studio work or how they are developed in relation to architectural programmes?

Urs Hirschberg, Graz, Austria
As you just said, during those workshops it is very important for us to frame very clearly what it is that we are doing, which is not precisely architectural design; although it is very much about design, it is not architecture in the full sense, in that there is no programme and so on. So I think that one notion that Martin showed in one of his slides was that we like the students to build the tools that they build with and that they design with; and that is something that they take from those workshops, and that they also bring into the design courses. We also teach a design studio, and the way people use media there is much looser, but many of them do actually set up procedures like that in their design classes and in their design work. This is something that is really important for us, because they develop a certain ease with it; so it is not that the software, or whatever it is, operates on them, but rather that they are able to orchestrate and use these media and immerse themselves in them in a way that is suitable to the concepts and to the questions they are pursuing in their design concept.

Maybe Christian would like to answer that too.

Christian Fröhlich, Graz, Austria
Personally, I do not see much of a difference in this in whether we are talking about a design studio or an elective course or a workshop, because for me design means invention. So if they learn how to invent something, whether they put it into practice in designing a building or in designing a set-up for an installation does not matter – that is a problem of scale: what matters is that they acquire that state of mind. Therefore I use the term workshop more for these special set-up things that means doing things in a relatively short time, very precise, high-powered, intense, then leave it or go on. It is more about bringing the group together and discussing the topics and then letting it flow. So it is more about the concept of how to open the minds of the students, I would say.

Neil Leach, London, United Kingdom
I do not want to ask a question so much as make a comment about the first two presentations we heard in this last session. I enjoyed all the papers, but the last three particularly I found very special. Just to make a comment about Darren's paper and Carmella's paper, because they interacted in an interesting way; to me, there was a dialectic going on. Carmella made the distinction between performance of material and performativity of

people in space; and I think that that maybe opened up an interesting dimension to Darren's paper; that is to say, if we take up Deleuze's comment about becoming and take it to the full, really becoming is a kind of reciprocal process of interaction between yourself and your environment. Of course, Deleuze uses the example of the wasp orchid and how the wasp becomes like the orchid and the orchid becomes like the wasp; but that opens up the possibility of how the kind of spatial performativities that people perform in a particular kind of space might somehow interact with the material space around them, so that maybe architecture can be seen as a kind of exoskeleton of human behaviour, to use a term employed by De Landa. In other words, one can see the possibility of interaction between material performativities of people and materials themselves, and what you see in Deleuze's formulation is something that occurs over time: with time the one becomes like the other and the other becomes like the one. And I want to put forward the possibility of thinking about how architecture might then be designed in this kind of sense, almost a Future Perfect; how architecture will become adapted in order to fit in with the kind of spatial operations that are going on in a particular kind of space; and the example that comes to mind is how architecture might respond to human activities the way that sheets on a bed might describe the kind of nightmare we had the night before. So think about how architecture is actually a kind of material thing responding to or interacting with human behaviour, and you see this kind of dialogue. When you see a handrail, you see it is actually being worn away by the use of the hand, and there is thus an interaction between one and the other. And I think that with Carmella's paper one can possibly be taking that further.

I think that the way that you were looking at spatial performances was very interesting, but how have spatial performances impacted upon the fabric of the buildings themselves?

To me there was a really interesting kind of dialectic set-up about the notion of reciprocal presupposition that comes in Deleuze's work.

Darren Dean, Kingston, United Kingdom
Thanks, Neil. I just wanted to make a quick clarification. From my perspective, and I understand that it is not everyone's perspective, I think that there is a difference between background and foreground and that there may be parts or elements (and to my mind these are not the same – I shall return to that in a moment), there may be aspects of a building that are quite deliberately unresponsive, that frame the background, so to speak. I have just come out of a long PhD that was about the difference between the part and the element. It is interesting to note that it was at the beginning of the 20th century that 'element' began to replace 'part' as the primary descriptive term used to describe the components of buildings. Now, if you think about these two terms, the first, 'element', comes from natural science, medicine, Galen, from a kind of physical, a kind of temporal process. 'Part', on the other hand, comes from mathematics; it may be an old-fashioned kind of mathematics, perhaps, but it is a more stable type of environment. The way those two terms were used in architectural history is very, very different. I think that what may have occurred, certainly from the Enlightenment onwards, is a confusion between these two terms. For me, parts measure the background. For example, if you look at the room we are in, it is quite unresponsive: what is happening is what we are doing. I am interested

in what responds within space and what is responsive within architecture; but I am also interested in the background static components as well, that is, the things that form part of the city, the permanent structure and so on. So I have a slightly more differentiated kind of understanding of these kinds of components and how they operate in time.

I would also like to add that a key point in my history is Hegel. In 1807, Hegel wrote the Philosophy of Nature and in 1817 he wrote the Aesthetics. He wrote the Aesthetics using the language that he acquired in the Philosophy of Nature, so that he takes natural processes and dumps them into aesthetics, and that is a key point in this kind of suffusion. Another episode, and there have been lots of episodes, Moyen Age, the New Vision, the Bauhaus, do exactly the same kind of thing: they take the architectural process and describe it, re-describe it as a natural process. And I think that the confusion between nature and culture, what is natural and what is cultural – the two things are indistinguishable today – has a long history, because we have described buildings in slightly different ways. Josef Rickford, in fact, says that you can describe a building "as a logic of parts and as a system of elements", and what interests me is how you can integrate those two orders within a single entity.

Paul Coates, London, United Kingdom
You know, it says here "Teaching and Experimenting with Architectural Design: Advances in Technology and Changes in Pedagogy". I think that I have sat in on many discussions about Deleuze, Guattari and most of the French philosophers of the 20th century, and they have always been very interesting, and I keep on trying to find out whether or not I understand this stuff, given that I have been plodding away for the last forty years in an attempt to do something that other people tell me in fact derives from de Saussure, Derrida and other post-structuralists. But I have never understood that, so the only thing I can say is that I think that it would be really great if we could somehow tie together the things that we can now think, the new epistemologies we have, just because we have got the hardware and the software. One thing did occur to me a couple of weeks ago at a seminar, where as usual the participants were divided – there were people at the back shouting about French philosophy and other such things and there were just a few of us sitting around the other side trying to work out if one could say anything without looking completely stupid – and that is that one of the things you can say about Deleuze, what he is all about perhaps, is that he is talking about distributive representation: that the idea of the thing, like the neuro-natural cellular automaton or any of the kind of technologies that we can now play with and show our students and use, no longer resides in any one place but is held everywhere. I think that it would be really great if we could make this link between what after all has been something that people have been talking about in schools of architecture for a very long time. It has been rehearsed quite often, of course, but this seems to be a likely time to have a go at seeing whether we can have another think about this, looking at it from the point of view of the new paradigms, the new epistemologies that come out of the fact the you can teach the machine these kinds of ideas and what should happen and make experiments about distributive representations and what the implications are for the space and the form and for everything.

Sean Hanna, London, United Kingdom
Is there anyone in particular that you would like to direct that to on the panel? Or is there anyone who would like to respond to that now?

Neil Leach, United Kingdom
Actually, Paul, I teach a course called "Deleuze and New Scientific Thinking", which does attempt to make that connection, basically picking up on the materialist thinking of Deleuze and working through De Landa into new scientific thinking. De Landa, of course, has recently written a book called Intensive Science, Virtual Philosophy, in which he attempts to understand the scientific thinking in Deleuze's own work. And you can make a kind of bridge from that into the new scientific thinking that Kas was talking about, Stephen Wolfram and his book A New Kind of Science, the work on emergence, and all the way into these kinds of digital technologies. So there is a new kind of paradigm. I teach this course at SCI-Arch and other places, and the student interest is astonishing. I think that you are absolutely right, there is a bridge that needs to be made and it has to be made soon, and it is there.

Darren Dean, Kingston, United Kingdom
I would like to add something to that. I read De Landa's book quite recently, probably within the last six months, and what it did for me was not to change the output, the architecture – I did not read it and then sort of literalise it or use it as a kind of generative diagram –, but to help me think about the patterns of thinking behind the work. And the point I tried to stress in the paper was that the diagrams came after the work, not before. Maybe I am declaring my colours here, and I do not literalise them, but on one level they were reflective things that kind of talked about processes that were in the work but did not seem to be. And to address the first question, I would say that the connection you are looking for between Deleuze and others of that sort might be more indirect and less focused on earlier questions.

Vana Tentokali, Thessaloniki, Greece
I am not particularly familiar with the theme of differentiating perspectives on architecture, but I dare say that I am not sure that the connection between the philosophical discourse of Deleuze and the applied part of it is something that can be considered as an application. To my way of thinking, it is not an application at all. I do not want to say that it is a paraphrase, but I am very sceptical about the question you are asking regarding the connection or relation. It is easy for us to say that of course all of this literature uses the philosophical discourse of Deleuze as a theoretical, philosophical refuge. This is very direct and very much expected, but I am raising the question in the respect of whether Deleuzian theory could be applied to these architectural idioms we have.

Paul Coates, London, United Kingdom
I think that you have actually answered my question. The connection between the philosophical and the as it were electro-mechanical, or the virtual or the digital, not architecture as such, if you see what I mean.

Sean Hanna, London, United Kingdom
I think while we are on this discussion I will just say that your point, Darren, about the connection being less literal is well taken; but there are certainly a lot of students and a lot of other practitioners making it very explicit. I do not know whether the Graz team might have a contrasting view on that, in terms of visualising things.

Urs Hirschberg, Graz, Austria
Do we think of our work as being a sort of applied philosophy?

Sean Hanna, London, United Kingdom
No, not philosophy so much, but I guess the ideas of explicit processes – I mean your presentation, the Formotions, in particular, are literal embodiments of an idea of movement.

Urs Hirschberg, Graz, Austria
Yes. The notion of processes is obviously important – or rather, has become important in architectural education, for it has not always been like that. So there is this interest in process as a way of understanding how things come about: instead of attributing things to a mysterious faculty like inspiration, you focus on the process in order to find out how you get from an initial idea to a design. Figuring out how processes can be orchestrated, what happens during them and what kinds of tools you use is an important part of that.

So, I would say that I am bit sceptical when architects dabble too much in philosophy. I like to keep things grounded in the sense that in the end you want to also have a result of that process, so our approach is very much about doing things and trying things out that have not been done in that way before.
I do not know if that answers the question.

Carmela Jakoby-Volk, Israel
I just want to say that I agree, but I think that the shrinking cultural aspect of education diminishes the ability of students to navigate a critical path; and I think that when they do not have this ability, I think that the doing is very much impaired.

Urs Hirschberg, Graz, Austria
I am not saying that they should not be critical. I mean, I do think that there is a certain danger in getting a little lost in being only critical of being critical. In order to apply this critical thought you actually have to have something to oppose it to. So that is why we are interested in the processes and the result of these processes. Also, when you are working with these new media – and we are dealing with these virtual things where anything is possible – what you discover is not that anything is possible: you actually have to do it, and you learn things by doing it, and then of course you reflect upon it.

Neil Leach, London, United Kingdom
I think that there are a lot of things that have been done with Deleuze which are very regrettable. And just taking notions of fold and using Maya programming and so on is like that, because I think Deleuze was never dealing with the language of form; he was

dealing with ideas and with theoretical tools. But I think that there is no kind of innocent practice that steps outside of some kind of theoretical framework. In other words, I think the possibility lies in using Deleuze in terms of questioning the thinking behind the making, and that is the level on which I am saying that. There are always comparisons that can be made. One thing I find interesting is that when you talk to an engineer like Cecil Baulman, he uses terms like connectivity and non-linearity that sound straight out of Deleuze. I once asked Cecil Balmond if he had read Deleuze, and he said, "Actually someone gave me a copy of the Thousand Plateaus, and I read the first five pages and then put it down because I wanted to think it out for myself". But I think, ultimately, that the point De Landa makes is that engineers like Cecil Balmond are a kind of material philosophers; and I think that is the interesting step that has been made, opening up to the possibility of understanding materials in a different way, theorising them in an important way, and realising that one cannot just conflate the world of Deleuze with the world of Baulman or indeed the world of digital processes, but that one has somehow to engage with this new domain with a new theoretical framework; and that is what Deleuze opens to us: the possibility of a kind of critical enquiry, of looking at technology and materiality in a different way. Ten years ago, nobody theorised this world. People spoke of history and theory, and they were looking back at the past. Now, the possibility of looking at technology and materialism and theorising it is, I think, an important step forward. And I think that is the kind of opening Deleuze makes for architecture through other people; and that, in my opinion, is a very healthy development.

Sean Hanna, London, United Kingdom
Does anyone else from the Graz team want to answer the question?

Urs Hirschberg, Graz, Austria
No, we agree.

Darren Dean, Kingston, United Kingdom
I think Bachelard called it the material imagination, to throw another piece of philosophy in as well. It is kind of how when you are working implicitly, when you are doing things, there can still be a rigour but it may not necessarily be explicit; and then when you do read the philosophy and a bit of critique you reflect on what you are doing – but these are not necessarily the same things, so, yes, I agree as well.

Sean Hanna, London, United Kingdom
One possible extension to where we are going. We have talked a lot about process and I think mainly a lot of the discussion has been in terms of experience and in terms of input from a technological point of view, certainly with regard to motion capture and things like that. I am wondering if there is a bit of polarity on the table, from slowness and mass at one end, with Darren Dean and Eleanor Suess, to quick virtuality at the other end, with the Graz team. And I just wonder if a difference that one might follow is the next step, the output, the actual making of things, which is also of course a process that is very specific in making physical objects, in making architecture, if there is a difference in opinion of how the various strategies would be extended into that.

Christian Fröhlich, Graz, Austria
I think it is not a difference of speed, of being slow or fast, because in our case the only reason it has to be fast is so that it is precise. Since you mentioned this, I am highly interested in simple things, like how a space is transformed through its uses, through the appearance of people. When we tested some techniques in the model in the building in the afternoon there were only two or three people inside, and the ambience was completely different to what it is now. Of course what we are doing is very technical, but I am also keenly interested in these simple things. And whether it is theoretical or whether you just put it into practice is just a question of approach.

Eleanor Suess, Kingston, United Kingdom
I have been thinking about comments made earlier about how digital tools are tools and that is what is important, that is the distinction that should be made. In Kingston we do not really do computer models, but we see the digital tools that we teach our students and that our students teach themselves and they bring to us, as part of that toolbox, as it has been called, and we very much encourage them to combine those tools; and so in our presentation we focused on one particular tool, which is the moving image that digital technology has put into the hands of architecture students. When I was an architecture student and a fine arts student I made films, analog handmade films, films with video; then, when I started to make digital films, just that kind of change in technology allowed a certain exploration. So that is one small aspect of our teaching in digital media. We teach 3D modelling and CAD, but we have a huge emphasis on physical models as well, and we understand the difference between a physical model and a computer model. They are different tools, they do different things in the way a model is different to a plan, different to a film. And so we chose in our paper to focus not on the 3-D modelling side of the work we do, but rather on temporal relationships. So I do not think we are necessarily in the kind of opposition that may have come about. We are possibly slightly less formalist as a school. Take the term virtual. Think of a plan: basically, most architectural representation is virtual. It does not matter whether it has been produced on a computer or not, it is separate from the actual – and that is a distinction that we quite enjoy thinking about – and it is a combination of those, it is strands threaded into the project as a whole. This makes a wider view, and that is what we mostly wanted to talk about.

Antonino Saggio, Rome, Italy
I am part of the review committee and I want to begin by conveying my compliments because this first session has been wonderful, I think – really, really great. I enjoyed it immensely. All the presentations look at the theme from different perspectives, and I found them really fascinating. I will come to my question in just a moment. To my mind, we must take care of the old issues regarding pedagogy. We really do not care so much what it is about. The real interest is how much the teacher believes in it and how much he is able to transmit the energy through it. At one point Kas said "I am really an activator, I do not even say what they have to do". Well, it is very well known that teachers always have to be activators: teaching is a transmission of energy. So at this moment I am not really interested whether it is slowness or fastness, whether it is Deleuze or anti-Deleuze: what I see here very clearly is that these

teachers are able to transmit an energy. If they gave me Deleuze I would not know what to do with it, but it is clear from this fantastic final presentation that wonderful things can happen, not because of Deleuze but because of the combination of this professor and whatever she loves – that is the issue about teaching. So do not be trapped in abstract discussions that are of no real significance Deleuze is important for her and she is able to build around it, but for another person it means nothing, and that too is perfectly fine.

Moving on to another issue, I think the title of the conference has been very well framed, but we have to pay a little bit of attention to it. "Teaching and Experimenting with Architectural Design: Advances in Technology and Changes in Pedagogy". Fine. We can discuss that all day, going into all the details, etc.; but the real essence is not, from my point of view, the advances themselves but our changes in pedagogy; these are what are interesting in reality. And I think we should make some kind of effort in this discussion to focus on this to a certain extent. We should focus on the changes in pedagogy, and then we can continue talking about all our fascinating experiments, and I am sure that we have a lot to learn from each other, from our different fields. And so in order to steer the thinking in this direction I have to come back to what Per Olaf Fjeld said at the beginning of our session. He made two very important points that I would like to rephrase as questions addressed to everyone on the panel here, because I think that if we try to answer these questions we will start to understand some very important issues, namely the changes in pedagogy and the changes in pedagogy as implications that have to do with politics, the economy, strategy, and so on. These are extremely important.

So what are the two basic questions that I share absolutely with Per Olaf? First of all, Per Olaf said that he has the feeling that the idea of space is changing, that what we are used to defining as space is not the same thing that previous generations were working with. Now this is absolutely a key question. Lately I have been doing conferences only on that point. What is the new condition of space? Why does it change? How we are going to rethink it? How we are going to go about teaching and experimenting with it? This is a very important point, I think, with regard to changes in pedagogy, and it also has to do with technology and at the same time with some basic philosophical thinking. The second important question is the relevance of tools to the basic very powerful idea that there is a strong relationship between the tool and the product. It is like a Möbius strip: you cannot separate the tool from the product, the vision from the way to look at it. And then there is a third, even more important question, which is: what do we do with it? So it seems that we have a new idea of space and we have a new tool to pursue it with, but why, in the end, why do we want to do this? What is the purpose, or the many purposes? Per Olaf mentioned a multiplicity of choices. Some hypotheses were also advanced during the discussion: for example, the idea of embracing the other, which is a very strong statement. We may also look at it from the point of view of how we use it in various circumstances, how we can address crises, how with all this effort, this understanding of new space, new technology, new tools, we can deal with this crisis.

Anyway, to go back and phrase it very simply, I think it would be interesting if some person on the panel tried to answer whether there is a new vision of space, whether there is a new tool, and what do we do with it?

Sean Hanna, London, United Kingdom
Does anyone have a ready answer to that?

Darren Dean, Kingston, United Kingdom
Are you asking for a paradigm?

Antonino Saggio, Rome, Italy
No, I will leave it to you.

Urs Hirschberg, Graz, Austria
I am not going to try to give a direct answer to that, but I think one can have a strategy in relation to it. I briefly presented the initiative at my school about these research labs, and I do think that this is something that has to change in architecture, that we have to take our own field into our hands in a different way by researching it more. Something that is actually happening in practice is that you have cross-disciplinary collaboration with specialists in energy simulation, structures, and so forth. You have that happening in big international projects, but it is not really happening in architecture schools because they are not equipped to really come up with these means in order to run these things as part of a design process. So I think that bringing these means in and making them part of the normal design experience of architects is something that we need to see to, something that needs to come about in architecture schools. That is the background to this initiative, which I think is really important; and the new notion of space will, I think, in a sense come as a by-product of that. The other important thing that Kas Oosterhuis and his work embody very clearly is this shift towards non-standard architecture, as we move from mass production to mass customisation. I think this is tremendously important and something that needs to be addressed in the schools, and we have to get people thinking in those terms; and then maybe a new concept of space will emerge from that. But actually, it is a question of making an effort to really address that in teaching.

Carmella Jacoby-Volk, Rishon LeZion, Israel
I think space somehow got lost and that the question is really about trying to find space again. I think that asking the question is new in this way. Because when space got lost it seemed that nobody cared, and now people do care, people care about people that live in these spaces and use these spaces; and I think that what I was trying to emphasise is the role of the programme in the space and that finding the space is finding the space through the programme; that is, the programme of the other and the programme of the identity and the performativity and often the programme of the performance. I think that this is the way to find the space again.

Rivka Oxman, Haifa, Israel
The word design is used as a verb, designing, and as a noun, design. We heard a lot today about designing – design process, technology, etc. – with reflections on philosophy, on media, on film, and much more. My question is whether it is our responsibility, as people who are responsible for our domain, architecture, to create a new knowledge in architecture and to speak from the knowledge we create or understand or reflect.

We are always borrowing from other fields, but it is our responsibility to build our domain knowledge, and I heard very little today about the domain of knowledge in architecture.

Christian Fröhlich, Graz, Austria
Sorry, what is the domain?

Rivka Oxman, Haifa, Israel
The domain is architecture. I mean, design is not just about innovation. Do you accept any design as long as it is innovative? I mean, architecture has a lot of knowledge in it and a lot of responsibility.

Christian Fröhlich, Graz, Austria
Yes, but what do you mean? Which knowledge do you mean? In terms of teaching and experimenting?

Rivka Oxman, Haifa, Israel
No. If you go back to the history, Palladio created a body of knowledge which was suitable to his period, and if you go back to the French school, the same. Even if we talk about architects, does Libeskind, who designed the Jewish Museum in Berlin, belong in our discourse? Does Eisenman belong in our discourse?

Christian Fröhlich, Graz, Austria
Of course.

Rivka Oxman, Haifa, Israel
Libeskind belongs in our discourse here? I do not think so.

Carmella Jacoby-Volk, Rishon LeZion, Israel
Why not? Why do you think he does not belong here.

Rivka Oxman, Haifa, Israel
Because he belonged to post-modernism and in my opinion, the whole process of doing, the whole process of composition, the whole notion of composition, has been lost in the digital age. The fact that we are dealing with technology actually characterises the type of architecture we create. And I think that this should be one of our goals. It is not just a tool. I mean of course other architects can model, can build their projects using the tools, but the tools do not contribute to a unique architecture. And if media and tools and technology today contribute to a new architecture that could not be made before, then please stand up and say something about it.

Sean Hanna, London, United Kingdom
Yes, we will have a response to that.

Vana Tentokali, Thessaloniki, Greece
In my opinion you raised two questions. The first was, what about architecture? Is it

autonomous or is it dependent on all the other fields? I agree with you on that for, as I understand it, architecture learns its own state through another kind of dependence, although it has declared in the post-modern condition that it is autonomous. We have this huge literature on the autonomy of architecture, with Tafuri and so on. On the other hand, another kind of dependence comes up when talking about architecture, and it comes through philosophy; because, historically speaking, architecture became autonomous from social reality, economic conditions, etc., with the post-modernists. Now it is at another stage and that dependence comes through other things, including philosophy. Who can deny that a non-standard attitude is not somehow related to Deleuze? Everybody talks about Deleuze. My question right now is that if we want and have any right to study this connection, it is, I am afraid to say, a one-way, and not a two-way, relationship. A non-standard approach that respects its own contribution is referred to Deleuze. I do not know if there is any discussion on the relationship between the theoretical-philosophical discourse of Deleuze and the equivalent architectural discourse. Historically speaking, that is something that we do have regarding Derrida, because he designed the "Chora", in Parc de la Villette, with Eisenman. So there we have a historical example, an architectural example, that we do not have with Deleuze.

I agree that there is a lack of autonomy in architecture right now. It is not only philosophy: I was talking about philosophy, psychoanalysis, gender studies, literary criticism. The people who are involved with Deleuze and non-standard architecture talk about other fields – biology, physics, mathematics, etc. – again another paradigm that supports the idea and declares a new kind of dependence of architecture on other fields.

Rivka Oxman, Haifa, Israel
How do you teach your students? These things are so abstract, so high level. How do you criticise the project? What discourse do you develop? How do you speak in a down-to-earth way, not just in the abstract? Because with the students we have to be very, very specific.

Vana Tentokali, Thessaloniki, Greece
Who says that I do not have experience talking with students on a lower level?

Rivka Oxman, Haifa, Israel
I did not say that. I was not referring specifically to you.

Vana Tentokali, Thessaloniki, Greece
Very low, I can prove it. I am talking now about your second question. I do not agree at all, because you mentioned Daniel Libeskind, and I am referring to his older work, and particularly the Jewish Museum in Berlin. I think that this building is a historical monument in our era, because it was designed based on one of the underprivileged notions, one of two opposing concepts, presence and absence. He made...

Rivka Oxman, Haifa, Israel
I respect your rationale, but what I am asking is what language, what is the architectural language that you use to describe this? Apart from the rationale, despite the influences etc., we have to develop our own terminology.

Vana Tentokali, Thessaloniki, Greece
I thank you because you have helped me mention the second part of my speech, which I did not make.

Sean Hanna, London, United Kingdom
I am sure we would love to hear it, but I must warn you that we do not have time to hear the whole thing, because we are running out of time. But please continue.

Vana Tentokali, Thessaloniki, Greece
The students are following two paths. One is from the concept to writing, and the other is from the conceptual reading to the writing. They sound the same, but they are not. The first refers to a text, a book. For instance, I choose a book – the last couple of years it was Homer's Odyssey – and the students choose a piece and design in an automatic way, writing automatically whatever comes to their minds. The second has to do with conceptualising whatever the first text included in a rational way. They catch and choose the concepts, which they had already used unconsciously. In the second part they conceptualise these concepts and derive rules and canons; this is their own study. In both of their assignments they have to write three kinds of texts, the first with words, the second with designs and the third with constructions. All three texts must say the same things. The point I want to show them with this is very difficult, almost impossible, to have consistency when we talk, when we design, and when we construct. This is the assignment. It is hard for creative people to do that, and it is very easy for teachers like myself to grade.

But I am getting carried away. I wanted to say something about Daniel Libeskind. He designed the Jewish Museum in a way that I think was used for the first time in architecture. He used theoretical concepts based on one of the opposing themes I was talking about, presence and absence. He made space based on the underrated notion of absence. He is talking about the absence of Jewish civilisation, the absence of the Jewish population, etc. The whole building is built on the notion of absence.

Urs Hirschberg, Graz, Austria
I would like to answer that in a completely different way, and to add something. I understand Rivka Oxman's question as something that I often hear in connection with the hostility that someone described earlier. The kind of thing we hear for instance, that we are talking about architecture and not about technology or that if we are talking about technology we are really missing the point because it is about architecture, and my reply to that would be that obviously technology is not going to answer this question. Technology, and I think this is true quite generally, is what enables us to express ourselves. So if we just take it as that, then it is a different discourse, and I do not think your question can be used as a weapon against technology, in the sense that we should not talk about tools so much. On the contrary, I think that we should talk about tools,

because it is those tools that allow us to express ourselves, and that I think is something that is extremely important and interesting. And if those tools are not good enough for us to do what we like with them, we should improve them. One of the things that we wanted and tried to do with these immersive things is to bring intuition into the design process and to make those tools receptive to it.

Rivka Oxman, Haifa, Israel
You misunderstood me. I was very impressed by your project. But you described the whole process and everything you do, whereas if you could describe the results you have shown us, you would describe them in a different way. You have to categorise them. You have to make categories. You have to say what the difference is between the first one and the second one, because the first one is associated with the track movement. I do not want a traditional way of architectural expression, I want a new way of architectural expression, and perhaps your demo is a fantastic thing to try it on.

Sean Hanna, London, United Kingdom
We will have just one more comment from the panel.

Darren Dean, Kingston, United Kingdom
I want to make a comment on the students' perspective. I do not believe that students are unresponsive to abstract explanations; it depends on how you place them around a project. As everybody in the room is aware, there is a difference between a project brief and a module structure. Now, what we use to describe one is not the same as what we use to describe the other. They are two separate things. Abstraction is distillation; it does not necessarily mean making tangible. So if a student came to me and asked me to explain what the course was about, where it was leading, how the parts interrelate, I would probably show them a few of these diagrams. These are early stages and we will try to develop them; but whatever you think of them, we ran two or three of them past a group of our students a week ago and they were quite enlightened. So it is a kind of the umbrella. Now, you were asking how to talk to a student on a day-to-day basis. That depends very much on the problem. Let us say, for instance, that a student came to me with this big question "space", which encompasses quite a few questions. What I would say to the student is that maybe there is a difference between room and space, and suggest starting with that as a difference. And I think that what we have tried to do with our paper today is to show that maybe what is happening in architecture is that we are becoming more and more accomplished at explaining the complexities of a building, and that you do not search for one kind of defining order, which is why I was referring to the question of parts and elements earlier on. I am a young man, I am 36, so I am still coming into it, but I have been teaching for four years, and I think what interests me is how, as teachers, we can explain buildings in slightly different ways and facilitate projects and so on and so forth. I think that is a key skill. Now whether that means that we have a new paradigm, I am not sure; maybe it is too early for us. What I can certainly say, in terms of my own personal position and Eleanor's, is that because of our age and our work to get where we are, we have something interesting to say; but we are also part of the rearguard, and we must not forget that. We must not forget that word either. It

is a word that comes from Kenneth Frampton, so we inherit things as well; but then we also add things to that lexicon. And I think that what interests me as a teacher is how you actually combine those two. I think the first speaker talked about knowing your classical references, of course, but then you also have to have these ideational tools at your disposal which Neil Leach spoke about. I think it is the coming together of that kind of whole whatever-you-want-to-call-it, sponge, possibly, that interests us as teachers.

Sean Hanna, London, United Kingdom
I wish you had asked that question at the beginning because there is no doubt a lot more to say, but I think that we can have one final question from Constantin.

Constantin Spiridonidis, Thessaloniki, Greece
It is not exactly a question. I raised my hand just as Antonino Saggio started to speak and so the moment has gone; but I would in fact like to make some comments about what he said. And I would like to start by saying that when Maria Voyatzaki and I tried to define the text that you received and the title of this event we decided to include the word pedagogy, because whenever in previous years we tried to initiate a discussion about education the reaction was more or less the same. We would start a discussion on the subject, spend the first five minutes talking about architecture, what architecture is, then move on to design and what designing is, and whether God exists, and we never spoke about education. So this time we wanted to make it explicit that we want to talk about pedagogy. This session, in my view, was absolutely successful, for it started with the statement "I do not teach, I open possibilities" and closed with the statement "I do not teach, I play". This shift from teaching to something else is something that is of tremendous significance that is happening right now. Coming back to pedagogy, I would say that if we are looking at pedagogy as a science, we will see that over the past 50 years or so there has been a shift in the model or in the paradigm of educating, because pedagogy is more or less addressed to young children, from a problem-solving to a project-oriented approach. And I think that what is behind the notions of teaching as "opening possibilities" or "playing" is precisely this notion of project. What is very interesting to see is that we architects, and more specifically the teachers who are the specialists at teaching projects, have some difficulties in speaking about the project of teaching; and these difficulties are evident in all the discussions we have had, because of the phenomenon that I mentioned previously. So I think that it would be very interesting if our debates over the next couple of days could illuminate this shift, that now we are teaching not a problem-solving activity but a project. This means that we have moved from determinism, from certainties, from laws, from the very precise and predefined, towards something that is multidimensional, multi-perspectived and open.

A few days ago, at a SCOSA meeting, a student told me that he was planning to begin a Master's programme and would "see how it went" before deciding how and in which direction to continue. This illustrates an interesting and very significant difference, that young people are not fixed on one objective, do not have very specific goals, but deal with their lives as projects which by definition from the very beginning open onto multiple choices, possibilities and modes of development. And I think that this is the

real change that we have to look for, because behind this conception of the individual I think that we will probably find the answer to the question, what has changed? For I think that what has really changed is our conception of ourselves, the conception of human beings at this time in this world, which has also created concepts about space, about architecture, projects, design, etc., etc.

Sean Hanna, London, United Kingdom
I think that is a possible answer to the debate we have just been having.

Antonino Saggio, Rome, Italy
Since I have the microphone, I just want to mention two things. At some point Kas asked a very interesting question: we have this new tool, what do we do with it? This is a very fundamental question and the way he put it is equally significant. And I think we should recall Urs's approach to it, that if we have a tool that is not good enough for what we need to do then we need either to improve it or find another one. And with regard to the creative use of technology, there was one presentation – I do not remember which one – that showed Caravaggio (you probably do not know that I am paranoid about Caravaggio...), which was extraordinarily pertinent in its relevance to tools, with the mirror, the camera obscura and all that, because the whole issue is what do I do with the tools I have, and what Caravaggio did was to make a complete revolution in painting. The question, what do I do with it, is not just a stupid question: it is the basic engine and impulsion to a total revolution.

Another thing I really loved and it goes with what Neil Leach was saying earlier, was the phrase "I wanted to make an architectural depository, but I failed". This I think is fantastic too, because it really shows that you have to experiment, you have to try again and again; and it goes with Neil Leach's idea that you are not only delivering a product with absolute success, you are displaying an attitude oriented towards creating hypotheses to make projects. We have all this knowledge today that enables us to realise things that work. We are so powerful today, we have all these incredible tools. Think about all the calculations needed to make a building stand up today, or functional calculations or whatever, and how much easier it is than it was ten years ago. So I think it is important that these tools are helping us to solve problems if that is what we want to do; but in terms of pedagogy I think that it is very interesting to start addressing exactly the thing that you are saying. In my view both "what do I do with it" and "I wanted to make an architectural depository but I failed" are two great and true statements. Thank you, and sorry for interrupting.

Sean Hanna, London, United Kingdom
I would like to thank all our speakers now, and all of you for a very good discussion.

Sean Hanna, London, United Kingdom
It is my pleasure to introduce our second keynote speaker, Bob Sheil, who is a colleague of mine from the Bartlett. It is a pleasure to have him here today to speak. I will not go into too much of an introduction but I will just recall Rivka Oxman's question at the end of the last discussion, mentioning the difference between design and architecture. We have spoken quite a bit about design, about the act of drawing and the act of setting

things out, but not quite so much about the actual process of making things, the process of making real tangible objects. Bob is going to speak about two things: primarily about that, but also about pedagogy, and will focus his presentation mainly on teaching. It is my great pleasure to introduce Bob Sheil.

Keynote Lecture*

Bob Sheil

Design through Making

University College of London
The Bartlett School of Architecture
London
United Kingdom

***Bob Sheil** has worked as a designer and maker in architectural practice, furniture and exhibition design, fabrication, information management and education. Following 10 years in practice, his teaching career began in the Bartlett workshop in 1995 where his key interest and curiosity in the relationship between architecture and making evolved into his present research interests. Since then he has taught extensively at undergraduate and diploma levels, running BSc Unit 6 between 1997-2003, undertaking the role of Year 1 technology coordinator and lecturer between 2000-2004, and coordinator of Diploma Unit 23 since 2004. In 1994,he co-founded the workshop based practice sixteen*(makers) with Nick Callicott, a research organisation that now includes Phil Ayres and Chris Leung. Sixteen*(makers) have exhibited and been published at international level, incl AD and FRAME, the RIBA and The Crafts Council. In 2004 Bob was appointed coordinator of the Bartlett's Diploma Programme.*

**included in the attached DVD*

Session 2

New Teaching Principles, New Concepts

Chair:
Johannes Käferstein
Liechtenstein University of Applied Sciences
School of Architecture
Vaduz
Liechtenstein

Keynote Lecture*

Paul Coates

Teaching Architecture through Algorithms - the First 15 Years

University of East London
School of Architecture and the Visual Arts
London
United Kingdom

***Paul Coates** has been publishing papers on computing and design and design education since 1981 starting with a joint paper with john Frazer on the 'shape processor' a language to construct patterns and drawings on microcomputers. In 1984 worked with bill hillier on developing computer based applications as part of the space syntax project since 1991 has been running the masc. computing and design at University of east London. In 2002 he and colleagues set up the 'centre for evolutionary computing in architecture' (CECA) that has been responsible for a number of projects - a partner in VIPA ,an EU funded project to design an online virtual campus for teaching architecture in europe(2005-7), and the urban buzz smart solutions for spatial planning (SSSP) - a government project to use generative models of urban structure with Local authorities in London to define sustainable development options in planning. He will be publishing 'programming architecture' (Routledge) JAN 2008.*

**included in the attached DVD*

Stefano Converso

Shared Design
An applied research on community-based web portals in the Laboratories of Architectural Design Teaching

Facoltà di Architettura
Università degli Studi Roma Tre
Italy

Unlike a lesson, a Design class that we define and organize as a laboratorio (i.e. laboratory) is based on the sharing of both thinking and doing. It implies the presence into the same room of professor, teaching assistants, students, producing projects, maquettes, digital models, pictures and drawings.

The main problem of this kind of organization is when the collective experience makes a shift into a direct relation between teacher (or teaching assistant) and student in the form of a "confession". What we mean for "confession" is the secrect, one-to-one conversation about the project. A situation where everybody just waits, sometimes a lot, for the moment to talk to the professor or to a teaching assistant, and then goes home. This kind of approach makes very often classes empty with people looking only to their own project and not to what others do.

What we found useful in our past experience was on the contrary the shared analysis of single projects. In the past we were used to organize public discussions through various media, such as the exhibition of printed drawings on the walls and on large tables, or the video-projection of drawings photocopied on transparent paper.

Our view of the most natural evolution for this kind of approach is the shift into an open space based on the dynamic features of the world wide web such as the community portal. (fig. 1)

Fig. 1
A professor making public comments on a student' project in front of the whole class, using as reference the course webportal. Student Katarzyna Urbanowicz, lab2m 2007

Fig. 2
The home page of the class' portal. It features an instant overview of the dynamic elements of the system such as the last updates from students' forum, a "who's online" box, articles and events published by both teachers and students. The graphic grid is limited to the minimum required.

We started a research in 2001 by installing in the building dedicated by the faculty entrirely to the laboratories a Linux webserver, where we wanted to "mirror" the lab activity. The research was part of a wider university network called UniET (Università Emittente Telematica – University as Telematic Emitting source), that is now hosted by C.A.S.P.U.R. Consortium (Inter-University Consortium for the Application of Super-Computing for Universities and Research), which is one of Rome main net hubs and took part to the network since the beginning.[1]

The group made an overview of existing software at the time, deciding to experiment the use of a Content Management System software platform called "php-Nuke".[2] From the first moment, the focus of the research was to set up a system based on the direct work of the participants. We were looking for no mediation between web technique and work. We basically wanted to fight the specialism, and subtract the net from the hands of webengineers. In that sense the UniET research project was intended to open up the technical panorama to as many "untechnical" people as possible.

The experience of a student in our laboratories starts from his personal design which then becomes part of a collective thinking. This evolutionary process enhances a shared research around the topics of the course and it avoids at the same time to flatten from the beginning all the different points of view. In the on-line architectural design labs whatever the student produces for his project becomes instantly and permanently a resource for the collectivity. Suggestions, thoughts, examples, the all teaching materials usually given in a one-to-one relationship teacher-student are automatically available to everybody, thanks to their publication in the forums.

This way doubts, errors, but also intuitions and solutions proposed by a single student potentially become elements that increase knowledge of the whole lab group. Therefore, as in a team work, there is not a single author of the published web pages, we can in a truly sense mention the collective authorship. There is not a single, or maybe a very small editorial staff, performing in the system a selection of the materials produced by the students. We built an instrument allowing shared working.

As noticed very clearly by Derrick De Kerchove in many occasions[3], sharing knowl-

edge is the true essence of the web, and in that sense the software system that we use for the design labs is both a witness and a player of the open source culture. In that sense, the keyword for all our work is networking, that means a personal use of Internet, nor passive neither cold.

Every student is at the same time user and editor of the portal: he owns and updates directly a forum about his project[4]. In the forum he's completely autonomous and he can upload pictures, animations or vectorial materials (dwg, pdf and so on) that are visible and open to comments and upload of similar contributions by everybody. The teachers collaborate to the forum by adding pictures, scanned sketches of by modifying files previously uploaded. In our experience, this continuous updating is a strong source of inspiration for new contributions by everybody in the lab.

Fig. 3
Two examples of the course' webportal articles with pictures taken to students. The article includes a link to launch the forum on the project.

Of course managing the online aspect of the class and making every student participate is not easy. It implies, moreover in the first days of the website existence, a continuous check of what is happening online, and the continuous direct publishing of examples, ideas, sketches, to make the networking increase.[5] This approach usually gives anxiety to the teachers involved into the research program: they are scared to "lose time" on the net. But this attitude seems to be much more natural to the students. They have at present made unuseful the old computer room of the faculty, because they all own a laptop where they are always connected, practicing continuously instant messaging and peer-to-peer activity. What is interesting in their attitude for our context is the relation with the tendency arisen in the web under the definition of "life sharing"[6]: *"Life Sharing is a real-time digital self-portrait. Started in the year 2000 and active uninterruptedly until 2003, Life Sharing is 0100101110101101.ORG's personal computer turned into a real time sharing system. Any visitor has free and unlimited access to all contents: texts, images, software, 01's private mail. One can get lost in this huge data maze. Based on Linux, Life Sharing is a brand new concept of net architecture turning a website into a sheer personal media for complete digital transparency. Permanent infotainment pioneering the peer to peer mass diffusion. Privacy is stupid".*

Going beyond the extreme experience of this definition proposed by the two artists, and according to the theory expressed by De Kerchove, we basically just asked the students to "externalize" electronically their work and their reflections on the class'

web network.

We established “steps” of file submission in the continuous process of the project development enhanced by the digital tools, where 3d modeling and digital drawing have the tendency to never come to a fixed form.

We made the steps official. So everybody, at given moments, needed to update the project forum with new materials. To do that everybody was forced to make a synthesis of what done until then, and to decide what to share with the rest of the lab. This implies from the students side a critical analysis of their own work, and the careful selection of the images that must communicate it publicly.

From the technical point of view the system used is very basic: we modified an existing “php-nuke” module made to upload files. The student can choose if he wants to send an image to be shown directly on the forum (the majority of them uses this option), or rather to upload a file to be downloaded through a link. After the file upload, the user gets an HTML code with the address of the file on the server. By copying and pasting the code, the user can use the uploaded material on the forum. The fact the publication is done through a text where the graphic material is identified by its code, allowed a lot of students to structure the publication as a “story” (fig. 4).

I want to design a building with a nice working atmosphere inside. when you look at the environmental psychology theory of Kaplan and Kaplan, you will see that people like environments that are clear, but also mysterious and complex. so I want to design a building that is clear from the outside and mysterious from the inside.

<img src="archivi/easyup/upload/ElineJonkers_SCAN1A.jpg" alt="" width="340" height="220">

I want to make the building interior more mysterious/complex to use different floor levels, big stairs and hiding places.

<img src="archivi/easyup/upload/ElineJonkers_SCAN2A.jpg" alt="" width="302" height="431">

I have tried two possibilities, one with one big block with different floor levels inside this block. And one with different blocks in different shapes. which are places on different levels.

My source of inspiration is the Villa VPRO in Hilversum (the Netherlands):

[img]http://archinet.uniroma3.it/lab2m/archivi/easyup/upload/ElineJonkers_model1.JPG[/img]

Fig. 4
The typical source code of a message in a student' forum. The images or the files are included in the text as chunks of code (HTML or BBCode). Extract from the Forum of student Eline Jonkers, lab2m 2007.

We used the steps as sources for public discussions of the projects: in the discussion every student was called to discuss the project in front a video-projection of his personal forum. The discussion was public, as it was in the past before the class' website, and it was focused each time on the topic proposed for the step of file submission.

After a few days the class began we established a first step making it as much free as possible, to allow people being familiar with the system and to accelerate at the same time the project development. Following steps were the request for a 3-d visualization of the structure, the request for floor plans, the request for circulation paths and so on. Each time the common issues arisen were discussed in the classroom.

Fig. 5
Group of images: Screenshots from students' forum

Fig. 5A
Students' forum. First submission. The first idea.
Student Antonio Atripaldi, lab2m 2007

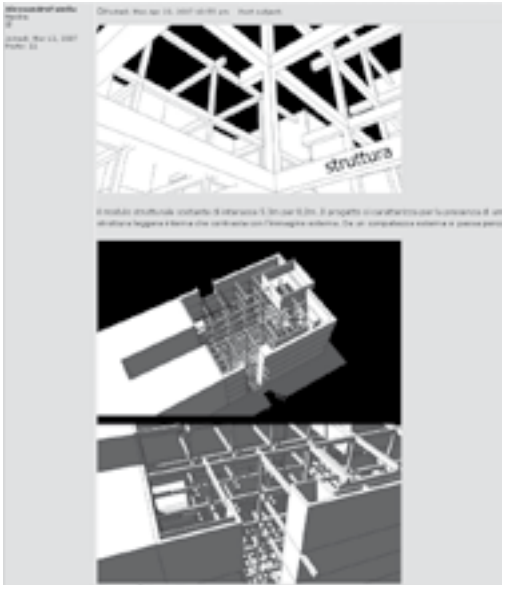

Fig. 5B
Students' forum. Second submission. The structure
Student Alessandro Faiella, lab2m 2007

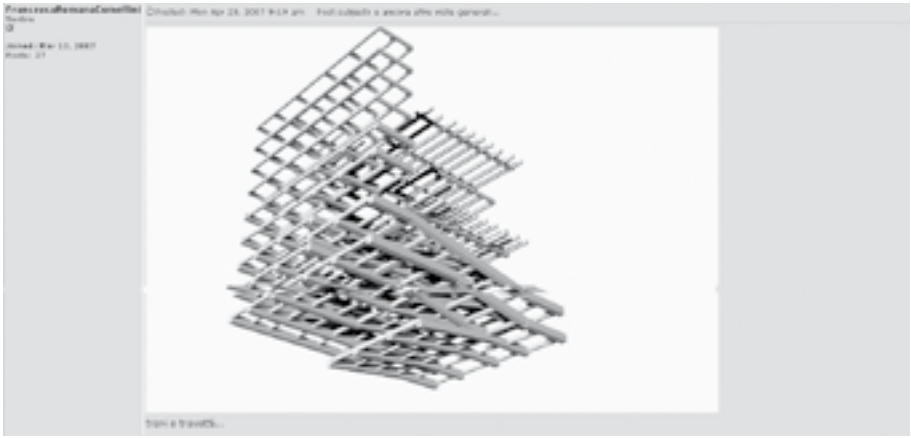

Fig. 5B_2 (alternative to 5B)
Students' forum. Second submission. The structure
Student Francesca Romana Comellini, lab2m 2007

Fig. 5C
Students' forum. Third submission. The floor plans
Student Giampaolo Fondi, lab2m 2007

Fig. 5D
Students' forum. Activity between the steps: the continuous updating of the forum.
Student Alessandro Di Mario, lab2m 2007

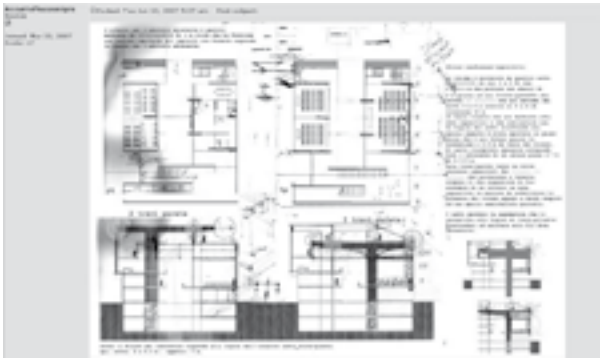

Fig. 5E
Students' forum. Activity between the steps: the continuous updating of the forum.
Student Azzurra Muzzonigro, lab2m 2007

Fig. 5F
Students' forum. Activity between the steps: posting references.
Student Alessandro Faiella, lab2m 2007

All the work is archived and it's managed through a database system. So all the stuff being uploaded is archived, named and is available both in indexes and by keyword search.

In parallel to the forum -where all the projects and the general reflections are collected- the database also includes documents provided exclusively by the teachers. In this section are included lessons and materials used during the projections, digital drawings and pictures of the site, catalogues of examples, links and bibliographies etc.

In every moment, in just one place, everybody has the possibility to get an image of the all work done until that time. The dynamic website represents a real-time "corpus" that allows the teachers to coordinate the production and check it during the whole period of the lab and not only at its end. At the same time, students have the possibility to look at the collective experience every time they could need it. This limits the loss of material and experiences and at the same time it increases the time for reflection on the projects. The student with his laptop can take beside his digital design application a window with the course' portal, where he can in real time publish his work. This builds up an intimacy without lack of privacy. One has the possibility to look at the project in different moments, to update parts of it or to publish ideas, waiting for the physical meeting in the lab. The forum becomes for him a reference.

This is a crucial point: the "virtual" is not a substitute for the physical, it works as an instrument and as an integration of it. In the web there is not a parallel world, but a stable image of what happen in the real world. In the portal we archived for example the faces of the students, taken inside the lab, that are connected to their work with continuous new pictures added from the exterior spaces of the faculty of from the rooms in students' houses. The space of telematic is tightly related to the physical, and vice versa, with a continuous interplay of the two spaces.

In the end there is a very important aspect to underline. The continuous updating of the portal, due to the uploading of text and images, keeps fresh this kind of website making it very similar to the use of e-mail, of newsgroups and of all the recent dynamic systems such as "YouTube" or “My Space” for example.

The kind of technologies that we are using are now of course well diffused, and the further research must now be directed into a more deep integration of design technology into the system. But we want always to take care of the basic aspect of the system. It is important that everybody could act on it, and experiment it directly and personally. This is a well recognized tendency on web 2.0 development, that finds its main reference in the Google strategy and development of web-based applications. In our case, the direct work and the continuous updating empowers the process of identification, which is the most important aspect of every true community.

Notes

1 The CASPUR consortium is non-profit organization financed by MIUR (Ministero dell’Istruzione, dell’Università e Ricerca – the Ministry for Education, Universities and Research) and by associated Universities. More informations on: www.caspur.it

2 PHP-Nuke is a free software released under the GNU/GPL license. www.phpnuke.org
3 Cfr. for example: De Kerckhove, Derrick (1997), *Connected intelligence: the arrival of the web society,* edited by Wade Rowland, London: Kogan Page
4 In technical terms, he has a forum post dedicated to the project, and not an entire forum. The post is opened by the teaching assistants and t then updated by the student just using the "post reply" tool.
5 We realized, then, that once established as a stable place for networking of the lab, the website requires much less effort to be managed. It lives almost autonomously.
6 In the quotation is described the theory of the "life sharing" as subject of an interesting work developed by the group 0100101110101101.ORG (the artists Eva and Franco Matten) in 2000. It has been exhibited at the Walker Art Center A short text is available on the web at: http://0100101110101101.org/home/life_sharing/concept.html

Credits

Web server and networking system "archinet": http://archinet.uniroma3.it/
Installed in 2001 at the Design Labs of Roma Tre Faculty of Architecture.

concept: Arch. Stefano Converso
webing: Ing. Nicola Campopiano
sysadmin: Saverio Salatino (2001-2003), Francesco Marasco (2004-2006)

Main Technologies used:
Content Management System php-Nuke 6.0, scripting language PHP on MySQL database system
Linux Debian and Slackware operating systems, webserver Apache 2.0 with webDAV module and SCP secure tranfer

The system is part of the research network "UniET" (Università Emittente Telematica).
The network main server is hosted by C.A.S.P.U.R. Consortium
http://www.uniet.it/; http://www.caspur.it/

UniET director: Prof. Daniele Gambarara
CASPUR partner: Dott. Ugo Contino

Courses at Roma Tre University Faculty of Architecture that used or still use the system:
(An updated list of the classes active on the server is published on the home page)

2001 Italian Seminar "Villard3" 12 italian faculties of architecture. Directed by Prof. Alberto Ferlenga IUAV Venice
2002-2003 2003-2004 Design Lab 3A. Prof. Francesco Cellini
2005-2006, 2006-2007 Design Lab 1A. Prof. Mario Panizza
2005-2006 Design Lab 2B. Prof. Lorenzo Dall'Olio
2005-2006, 2006-2007 Design Lab 2C. Prof. Michele Furnari
2005-2006, 2006-2007 Design Lab 3C and digital archive. Prof. Andrea Vidotto
2005-2006 International Conference "REProject". Directed by Prof. Andrea Vidotto
2005-2006 Design Lab 1M/Workshops Proff. F.Careri, F.Cellini, V.Quilici
2004-2005, 2005-2006, 2006-2007 Project Estimation class. Prof. Alfredo Passeri
2004-2005, 2005-2006, 2006-2007 European Doctorate Program "Villard D'Honnecourt". coordinated by IUAV Venice
2006- 2007 Design Lab 2M Prof. Francesco Cellini

Hernán Marchant
Cecilia Mouat

Designing in Motion

Universidad de Chile
Universidad Finis Terrae
Chile

"Arabian architecture teaches us a valuable lesson. It is best appreciated "a la marche", on foot, walking, moving around, where you can see that the architectural orders are developing. This is the opposite principle to that of baroque architecture conceived on a piece of paper, around a fixed theoretical axis. I prefer the teachings of Arabic architecture".

Le Corbusier

The studio should insist upon stimulating the students in the pursuit of the true sense of spatial experience. For this purpose, it is possible to make use of the new technological tools which nowadays are widely available, such as digital videos and three-dimensional visualization.

Designing usually involves a number of phases where the capture of information is acknowledged, where ideas are developed, and later the shaping of the project. However, it is possible to identify a phase prior to the process of design focused on the idea of teaching/learning to look, so that the student can see through his own eyes, but also in a kinetic way. For this kind of learning we need tools that are capable of becoming instruments.

A tool only allows measurement from an external, normalized reference. An instrument allows this measurement but, in addition, gives the possibility to INTERPRET, TAKE A STANCE, and build the foundation for an internal, built in reference.

Working by hand and pencil, or equivalents of the latter, were used in the three phases. In the teaching process of the project a particular way of teaching/learning how to draw was assigned to each phase: Drawing sketches, drawing of rough drafts, and rigorous, precise drawing (plans, cross sections and elevations).

Many architecture schools still do not make an explicit distinction between these three types of drawing and their corresponding phases in the process of design. From the first week on, pupils are obliged to present rigorous, precise drawings during the phases in which sketches and rough drafts should be predominant.

Are we creating the same confusion with the new technological tools? If so, the results will be far more serious. The new technological tools allow us to automatically reach a high definition result, making the lives of students much easier since they are excused from looking, seeing and experimenting emotions, they are exempt from having intuitions, from conceptualizing, from thinking, and from conveying their emotions…They are pushed into using the automatic pilot, looking for solutions rather than asking themselves questions.

We have been unable to improve or exceed the most essential foundations of the first exponents of modern architecture, and in opposition, we have seen the apparition of interesting technological tools which provide us with new more efficient representation and production formulas. History is there to be witness that changes in representation formulas have always modified architecture.

The influence of representation formulas on the architectural production is undeniable. Leonardo Benévolo calls the process of "going from the Renaissance perspective of a narrow world with ancient traditions to the wide open world of modern science": "capturing infinity"[1]. The importance of the invention of perspective in the development of architecture and urbanization supports the thesis of the tremendous influence

exerted by the changes in representational forms in the architecture that is produced, even more so, if based on a new conception of the world.

This essay proposes an analysis of the so called fourth dimension, understood as the one involving the motion of a body moving through space, a dimension which we believe is fundamental in the conception of architectural projects.

With this análisis as a starting point, we propose a reflection on these new technologies and how one can approach, through them, the conception of what we call "designing in motion". In the same way we intend to sketch out the use of new technologies in the architectural workshop, those understood as technological tools that give value to the body in motion in space, thus enriching the process of the teaching/learning of design in the stages of: 1) Capturing information, 2) development of ideas, and, 3) shaping the project. We also think there is a phase prior to the process of designing (teaching/learning to look and to see). We call it "stage of nourishment of the imagination's or active memory; a gratuitous stage without clear objectives in the short term (it becomes part of teaching history, part of the workshop and/or architectural theory. It nourishes what we call projective culture)"[2]. We are then, facing four different phases in the process of conception and development of the project.

Fixed image versus image in motion

The forms of representation traditionally employed in the processes of design, are based on two-dimensional drawings, in physical and virtual three-dimensional models, and in photographs. All these expressions are fixed, exterior and motionless. Even though they represent space, they are unable to contain the perception of architectonic space which is an experience of the body going beyond what is merely visual, and accounting for the indissoluble link between space and time, which characterizes and differentiates architecture from other arts.

In recent years, thanks to the progress in computing tools, experiences of "three-dimensional visualizations" have been developed in architectural teaching and practice. These representations are usually used as a way of verifying what was projected. We propose that it is possible to add these tools to the process of project formulation in the studio, as long as, the sense of motion in relation to space-time and in the creation of architectural elements, is understood.

Representation limits:

"We already knew that every representation is a reduction (in scale, in proportions, contents, nature ...)"[3]

Dimensions and measures in architecture have often been related to human dimensions in order to give them an aesthetic value.

"In any building you can distinguísh three things: the dimension it really has (mechanical measure), the dimension it seems to have (visual measure) and the sensation that such dimension conveys (corporeal measure). The last two have often been

confused, but the only one having aesthetic value is the sensation of magnitude"[4].

If we refer to the most recent forms of representation, that through computing tools permit the vizualization of the projected spaces, we often come in contact with projects that overvalue this visual conception, or with technological tools based on non Euclidian geometries, that computers can generate.

"The fact that students achieve a complete representation of the work being done with imagination, transforms them into spectators rather than participants in their own designs..."[5].

The Fourth Dimension

Architectural experience implies a perception of space in time with all five senses, way beyond that of mere visualization. Senses are used in the perception of architecture, but it is fundamentally a "physical experience", which is developed through body motion in space during a fixed period of time.

The elements that compose the resources of architecture are referring to the dwelling of the body in its surroundings. Be it to welcome the movements and permanence of the body through, travel, visits and limits, or to provide the body with the life and hygiene conditions it requires through proper lodging, illumination, sunlight, ventilation etc. Thus walls are built, roofs, doors, windows, pillars etc. In this same physical dimension and through the organs of perception which are defined through the characteristics of the body's senses, referring to space as in front, behind, beside, up or down, directions which summarize the physical possibilities of bodies moving in space.

"The plan of every building, because of its organization of passages, thresholds, corridors, series of doors, imposes a certain number of gestures... The body is a place. of memory... The gesture gives the measurement and, associated to the other senses, reveals the space. Classical architecture has not ignored corporeal inscriptions. It has often associated the movements of the body and the gaze. The obligation to climb steps to get to an important place is very frequent: temple, town hall, court. The Buddhist architecture in Japan has made ample use of this. Thresholds where it is necessary to bow ones head and raise ones foot are associated with the entering of all temples. The changes of direction with a necessary rotation are often used several times when going in the same direction. Why such interest? Why create incidents on a stroll? It is necessary to associate the body with aesthetic impressions, give them a physical reality. A gesture registered in the body, an encounter with a remarkable place."[6]

Architecture develops in the ambience of the basic physical laws, which are the same that apply to the human body, this way gravity and the phenomena associated with light, become central topics of architectural thought and development.

In architecture, technology gives us systems of representation to visualize the projected spaces, but we tend to forget the architectural experience of our body moving in space: the heat of the sun coming through a window, the sound that our footsteps make on a flat wooden floor and the dizziness caused by looking out of a balcony onto a big room full of people chatting.

Current architecture, more and more abstract and devoid of the experiences that are fundamental and central to the human dwelling space, urgently needs the rescue of these values.

The Unspeakable Space

The space - time concept was considered to be an element of work, consciously or not, by many great architects of the first half of the last century. However, in Western culture it has not been given the importance and the place that this idea occupies in the spatial conception of Japanese architecture. Proof of this is that it exists in the common Japanese language, which is untranslatable into any western language, the word "MA" that relates the indissolubility of space and time. To give a definition that comes closer to a concept of this complexity, and of which, in some Japanese dictionaries you can find up to eight definitions of the term, we will refer to the one that Augustin Berque delivers, from the dictionary of ancient language *Iwanami Kogo jiten*. The definition is the following one: "...fundamentally, the ma is the interval that exists necessarily (*tôzen*) between two things that follow each other (*renzoku*); giving the idea of a pause. These two ideas of need and succession, that is to say, of union and of movement, introduce, beyond a doubt, the notion of sense. The *ma* is, as a matter of fact, an intermediate space loaded with sense"[7].

Le Corbusier writes the article "L'espace indicible", published in April, 1946 in L'Architecture d'Aujourdhui. "Without the slightest pretension, I make a statement regarding the "exaggeration" of space with which artists of my generation have tackled around 1910 in such creative prodigious impulses of cubism. They have spoken, with more or less intuition and clairvoyance, little matters, of the fourth dimension."[8]

The interesting thing about the conception that Le Corbusier gives to the " fourth dimension ", can be related to the ambiguity and suggestion contained in the definitions of the word ma. He says: "Then a depth without limits is opened, it erases the walls, banishes the contingent presences, works the miracle of the unspeakable space. I ignore the miracle of faith, but I often live through that of the unspeakable space, the crowning of plastic emotion."[9]

The influence of the cinema on architecture

Just as during the 19th century novelists like Dickens, Flaubert, Víctor Hugo or Balzac, were in charge of portraying through their stories the overpopulated cities of that time; the cinema was responsible for showing and providing images of the cities of the 20th century. Then, widespread television took charge of showing spectators those places that otherwise they would never have had the opportunity to know. Referents broadened and allowed a transformation of the way of seeing and of understanding reality. Most of the connections that have been established between cinema and architecture refer to the forms of architecture that appear in the cinema, and the recurrent analysis is focused only on these formal aspects. However, the similarities

between cinema and architecture repeat themselves. All are perceptual experiences that incorporate the variable of time related to image. The trip across an architectural space is always made up of a sequence. A movie incorporates the sequence as the foundation of its narrative construction. Nevertheless, in cinema, the spatial sequence of the architectural trip is guided by the outlook of the director. Fixed planes (fixing the eyes), zoom in (identifying a precise point in which the spectator is led to focus on a determined element), zoom out as the form to contextualize an element starting from its own self, or the horizontal panning, as a way of counting space sequentially and gradually, etc. One might analyze through framing, the planes and the movements of the camera, the guided look of the director, the dictatorial imposition of how he wants the spectator to see and perceive. If we were applying the same criteria of spatial perception used by some cinematographic producers, the source of inspiration for the architects is not minor at the moment they design their work, considering the movement of the body, covering space in time.

The cinema or video are tools that produce "audio-visual" works. In contrast to those that visualize virtual spaces used by architects, the audio-visual incorporates sounds associated with an image in motion. In that way we can perceive the footsteps on the smooth stone pavement, or the creaking of the wooden steps on climbing the stairs. The inclusion of a sound-track brings us closer to the reality of our perceptions. The recent phenomenon of democratization in the use of the audio-visual technology, allows us to think about video cameras and editing equipment, now installed in personal computers, as an attractive tool for students of architecture. The current age is an age of an overpopulation of images. Young people grew up seeing a lot of television, playing computer games, seeing videos, music, clips in which the speed with which the sequences of consecutive images being generated, surpasses the capacity of retention that any adult may be capable of processing.

The use of the video in the studio

In any creative process involving a "construction" with formal elements which contemplates a certain expression and that provokes a relationship with the user, these elements do not necessarily contemplate only one meaning. Therefore in the development of an architectural project, speaking about “methodology” seems suspicious.

The process that implies tackling the aforementioned construction moves away completely from the scientific method of traditional investigation. Already we are speaking not only about information, nor about precedents contributed by others. We speak about a representational system of ideas, concepts and wishes. To claim that the form of a pillar, a door, the colour and texture of a material, or the sound of our footsteps, does not have an intention would be ingenuous.

Therefore, the first premise is that everything chosen as material, form and proportion, constitutes a given position of the architect.

Although this premise is applicable to a scientific investigation, in the case of a construction with significant elements the process is more complex. We can no longer say that the meaning of every element itself is the only thing that plays a role. The intention of the architect is also determined by the sum of the elements, and what

they provoke as a group, and through their closeness or contrast.

Because of this, the first and most basic thing is to be conscious of this valuable resource: the power the architect has to "provoke" with his work, and how the deep reflection on this fact can become the first tool that it is necessary to handle with conscience. For the benefit of this essay, we will call this “THE HOW” in the development of the architectural project.

The second concept to analyze is the election of the idea that wants to shown in the project. We will call it “THE WHAT”.

It is very different to speak about a topic versus a case. A topic is shaped by as many cases as we want to discover. For example, if the topic is “scale”, we will find hundreds of cases to portray this concept. It is fundamental that in the first decision to face “THE WHAT”, we are capable of distinguishing, and then deciding, if we are heading towards the development of a case or of a topic.

This "apparently" simple decision, determines the form in which video, as a tool of spatial recording, can be used by the student. If we think of using video to register cases, like for example the study of educational enclosures for preschoolers, the focus will have to be on the recording examples, tackling elements such as the context, the form in which the program is distributed, the play ground spaces, etc.

The study of the case centres on certain works that include programs similar to those of the study. If the recording centres on a topic, for example the scale, the program of the chosen space will no longer matter, since what is captured on video will try to look for the spatial experiences that give value to this topic.

We understand the use of a video camera in the study of architecture through two principal channels:

The first has to do with the use of an instrument that allows us to systematize the observation of study phenomena, incorporating the variable of time. In contrast with a photograph, which is only capable of capturing a motionless instant, video allows observation for a certain period of time. The possibility of registering this material allows infinite approaches in addition to registering sounds, movements, intensities of activity, lighting, climatic changes, context, etc. Relying on these images for a study permits “rewinding the tape” as many times as needed, and the in-depth study of objects that are being observed, be it the analysis of cases or of topics. We do not believe that video replaces the sketch or the photograph, but it does complement it.

Thinking about architecture imposes thought in images and in audio. It is not possible to think without their invading us. This is what we call “the imaginary” that everyone brings with them; they are the choices that our eyes have made during our life.

The other way of using video in the studio is related to the recording and study of spatial experiences. It is then that the student can connect with the bankruptcy that we detect today in the way of projecting. Including records of trips, using the camera as a second eye and an ear that captures sounds associated with spatial experiences, allows us to approach the conscience of the effect that a certain proportion, height, colour, or material provokes. It is also interesting in these types of exercises to give the student freedom in the sense that he can freely choose those places that impress him. The conscious or unconscious election of certain spaces, those that somehow

appeal to them, those that make sense, that provoke some type of stimulus, that allow for the understanding of the topics that they are really interested in, in the architectural development. Time plays a double role: On one hand time is the space that passes, but it also turns into memory, into memories, and into the history of the student.

Projecting and shaping from a close understanding of a corporeal experience in a trip around a space, allows students the chance to open up to the things that make them tremble, to search through their memory and memories, their fixations, and to find what, in some ways, tells them who they are. To use the video camera to experiment their spatial choices not only allows them to consciously connect with the stimulus which a certain space provokes in the moving body, it also enables them to register for the subsequent analysis, the varied characteristics of spaces and its impacts on the project. Thus they are no longer spectators of their works, but these arise from a deep analysis of the spatial sequences, of the proportions, of the luminosity, and from everything that allows architecture to recover its focus as a discipline that contains and receives the experiences of man. The time - space relationship was the variable considered by the great architects, whose works, some of them dating back almost 100 years, keep on being valid for the richness in their understanding of formulation and spatial conception.

In current times, each person's imaginary is nurtured by millions of stimuli. That is why the imaginary changes from one society to another, from one period of time to another and from one person to another. This is because regardless of the collective history, each person has their own history, and their own way of processing this history, being selective about the images, memories and memory that each one of us keeps.

This reflection takes us to the third premise, the search for the imaginary that represents the student. It is then, the first images that will determine some elements that should necessarily be in the project, still alien to the structure, thread, relation between them, etc. If you try to discover these first images, they appear without any order of priority, because another characteristic of the personal imagination is that there is no hierarchy, structure or order but complete simultaneousness. Despite that, the images we save in our memory always have a meaning.

The studio must insist on stimulating the students in the search for a real sense of space experience. With this purpose it is possible to use the new technological tools that in current times are widely available, such as digital video and three-dimensional visualizations. In the future it will be possible to add other tools, such as virtual reality simulators, which today are too expensive.

The final reflection about the use of new teaching technologies in the studio forces us to think that it is not enough to experiment with them, if there is no clarity of what you want to achieve with their use.

"When it is known that by studying the regulation of movement man can live in the same place, a relationship with space without charm or another even more agreeable. When it is known that this regulation is the space for excellence in architecture and urbanism, you ask yourself the reason why so little attention has been paid to this."[10]

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Suzanne Ewing

Experimenting with a *performative* project: The Cadiz City Plan(ning) Office

School of Arts Culture & Environment
University of Edinburgh
United Kingdom

Experimenting and teaching

Experiment 'a test or investigation, esp. one planned to provide evidence for/against a hypothesis; an attempt at something new/original'

Experimental 'based on or derived from experience; empirical; tending to experiment; tentative or provisional'[1]

What kind of experiment or experimental practice is relevant to the pedagogical design studio against a backdrop of new technologies and electronic culture spliced with varying degrees of engagement and enthusiasm into, across, within existing and aspirational design culture(s)? This paper explores the benefits of experimenting with a studio methodology/pedagogy in a one-off recent Masters level architectural project, *The Cadiz City Planning Office*, which took place at the University of Edinburgh in January 2007. While this project does not ostensibly engage with digital technologies, the operational paradigm was one of vector-field-time with associated machinic transformative potential, and its essential generative potential for design in an urban context was a focus on linkages and methods rather than forms and objects. I argue that there is currently a heightened need to counter the detachment often embodied by digital design practices, which struggle to deal with the issue of context beyond reductive physical form. This project demonstrates that abstraction is not only achieved via digital processes. There is a need to critically assess the appropriate application of digital technology/information society processes in relation to understanding what it is to act as an architect in social, economic, political as well as material territory.

In order to explore the question of design in an urban context as a collective practice which involves making, thinking, organising, implementing, the project became a game without consequences, open-ended and generative, not just an experiment testing a hypothesis. The *CCPO* project provoked an entirely unexpected output, augmented by an unexpected depth of student learning. It was certainly a pedagogical experiment- would the students take seriously and commit to their fictional bureaucratic city roles? Would the project grind to a halt and need tutor intervention? The objective directing this experimentation was a belief in 'uncovering' aspects of the city, which suggests new or unexpected possibilities, rather than applying pre-determined objectives. Of course much was brought implicitly to the experiment- ways of thinking, material researched, an attitude to what to look for. Our undeclared premise was a scepticism about the relevance of a resolved, unified plan, a single way of understanding or acting on or with the study city, an expectation that the brief would force negotiation in terms of process and content, and to some extent we were anticipating the project to be a glorified failure.

"The temporary removal of ownership/attachment to projects, fear of failure and responsibility created a fertile environment that allowed us to step away from individual ideas and reflect on what, as a group, we see Càdiz as, and what we want it to be."[2]

Fig. 1. Installation of the Cadiz City Plan, photograph taken after presentation

CCPO: pedagogy and collective practice

The *Cadiz City Plan(ning) Office (CCPO)* was a short project which took place in January 2007 within the Masters Architectural Design studio at the University of Edinburgh, UK. The MArch (Design) is a two year professionally accredited programme, and is distinctive for its emphasis on an in depth pedagogy allowing students longer periods to work through carefully defined contemporary problems. The course begins with a field trip to a significant international city which forms the context for the thesis. Initial strategies for interpretation of the city are conceived and presented in techniques appropriate to the reading of the city. These territories, and the spatial, political, philosophical, cultural and material concerns that this work opens, form the focus for continuing work. The course operates within the general theme of architecture in the urban context. It involves making a series of architectural projects and deals in a critical way with issues and questions of contemporary relevance[3].

The current studio theme of city field*works* is premised on a need and desire for architectural design practice to be self consciously situated. Rem Koolhaas talks of the future role of architecture as "the irrigation of territories with potential" rather than "the arrangement of more or less permanent objects"[4]. This statement provokes an exploratory approach to understanding 1. territory *(field, ground, site)* 2. what 'potential' might be *(programmatic attitude)* and 3. what constitute acts of 'irrigation' *(erasure, purging, resistance, friction, intervention, augmentation, accretion)*.

Preoccupations of the studio inquiry include what city field*works* might mean or signify in relation to territory, city, sea (productive land, site of conflict, implied expanse), *operative field* defining extents/limits of productive action, operation,

observation, intellectual activity, and as metaphor/myth *(field of knowledge, field of dreams, field of the cloth of gold, killing fields)* how it is used in relation to theoretical discourse, and how these understandings may point to ways of understanding a terrain/territory (fields, zones, patches). *Urban field* is a term that is used in relation to constructed territory of or related to the city. In what context is this term used, by whom and why? What does this mean in terms of shedding light on the contemporary city and how we might act more precisely as designers/architects/urban policy makers?

Cádiz is an Atlantic city on the southwestern coast of Europe[5]. The Bahia of Cádiz, comprising the city on the isthmus and four other towns, is currently perceived of as one metropolitan area, raising questions of how to define urban field within a loose city/land/aqueous topography.

Prior to the *CCPO* project, students had undertaken small group projects, a Symposium on themes related to Cádiz, an 8 day fieldtrip, and an individual thematic design proposition. Fieldwork tools, guides and devices were consciously chosen, designed and utilised, augmenting and perhaps contradicting desk based research, as the 'space of design'[6] shifted between a design studio in Edinburgh and less well known (to us) territory in south western Europe. Components were sequenced in order to focus on possibilities and interrelation of practices of research[7], fieldworking and design. The pedagogical intention is that triggers for exploratory practices in Semester 1 courses are tested and developed through the more individually focused work of the second Semester. The *CCPO* was a hinge project provoked by Visiting Professor[8], Ben Nicholson.

After this collective experiment, students mostly worked in small groups for the next 3 weeks devising and developing a crafted form of constructed or drawn representation revealing urban, spatial, material, tectonic potentials of identified territories (eg. time and urbanism, institutional control, infrastructures, shifting ground, city edges, hidden mechanisms). The project helped to clarify how students organised themselves in subsequent groups.

The brief for the CCPO was to work together to collate and to consolidate the 32 territories and themes identified so far by each student. The 4 Objectives were:

- To choreograph a collective City Plan
- To collate pertinent themes and aspects of urbanity (city needs & desires)
- To run an efficient open-source system supporting the making of The City Plan
- To enable the installation and presentation of The City Plan

These roughly mapped onto 4 'divisions' which the students were divided into, and instructed to work simultaneously to achieve the collective goals. The limits were temporal: Project start was 9.30am Wednesday 10th January; deadline for CCPO and City Plan launch was Thursday 18 January. Division responsibilities were set out:

- Division 1: *collagists* (Presentation of The Cadiz City Plan: The Manual Version, The Digital Version).
- Division 2: *programmers* (Presentation of Cadiz Themes of Urbanity Manual: The

Manual of linkages, The Manual of absences).

- Division 3: *administrators* (Support, evaluation and monitoring the process of making The City Plan/Manuals; Finance; Communications; Records; Systems)
- Division 4: *facilities managers* (Working landscape, installation of The City Map/ Manuals; Making; Documenting)

Images from Dziga Vertov's *Man with a movie Camera*, 1929, Jacques Tati's *Playtime*, 1967, Nate Salsbury at Buffalo Bill's Wild West Show, Brooklyn, 1894, www.early-officemuseum.com, www.cisco.com were placed in the brief, and the project was introduced verbally to the studio cohort by Professor Ben Nicholson. Immediately after 2 minute presentations by each student of their previously installed work from the first Semester, the CCPO was required to negotiate a way of working collectively through the project. "The Cadiz City Plan" was presented on schedule to course tutors, Suzanne Ewing and Victoria Bernie, joined by Ben Nicholson and Professor Andrew Benjamin, also visiting the School.

Fig. 2. Review discussion of the CCPO project

Student reflections on the project highlighted the significance of the collective organisation of the project:

> "How a group of people choreograph themselves and motivate themselves is probably the most difficult challenge of large group projects. The matter of who is in charge or apparently telling people what to do, whose ideas you use, whose ideas you don't use and who goes to buy the coffee are the issues that become more and more insurmountable the larger the group becomes...The success of the CCPO came from the

fact that everyone had a clearly defined role within the class; the four separate groups allowed all the parties to unfetter themselves from the worries of the entirety of the project allowing the project to move forward at a fast pace with interlocking system."[9]

"I found that collective work expose some extensions that individual work couldn't obtain…During these days I apprehend using "WE" as the substitute of "I"[10].

"The project success lay in systematical division-of physical tasks, of responsibility, of communication and information. Where an individual or team move becomes the start, or another link, of multiple chains of action or thought-whether made with complicit understanding or, more often, without question. The piece reflects this tangibly. Each of the 32 class members could point to the part that is them. But it is insider knowledge, coded from the viewer."[11]

Fig. 3. Still from film of the making of the CCPO

In this project, the key experimental move in the pedagogical brief was to set up the temporary artifice of a City Planning Office- what this might be, how it might operate, how it might develop and implement Plans and other Works. It was set up as a loose role-playing scenario where makers (collagists), thinkers (programmers), organisers (administrators), and contractors (facilities managers) were set up to act together. In this sense the project was a 'performative'[12] experiment related to the enactment of practices of design in an urban context. The output became a performed installation in the studio space, a film of the making process, website pages and documentation of the communication and negotiation procedures of each Division. Students set up a School tuck shop which covered around 50% of the project costs. Presenting the collective generative script(s) and individual re-scripting became an important element of the teaching-learning process.

The still images of the project are intriguing and seductive, although require de-coding as to how they came to be like this, how strategies were developed by the thinkers and makers, how the installation is 'seen' detached from the process. In the final presentation, the audience/critics were confronted with an unfolding sequence- first a performed presentation, then an invitation to explore the installed

work, third a presentation of the methodology through the documents of each *CCPO* division, and finally viewing an edited film of the process. Discussion and comments followed, the silent installation remained accessible to others in the school for a few more days.

The *City Plan* evolution was described by the programmers. First written summaries of 32 individual projects were gleaned from 2 minute verbal presentations made next to their Semester 1 work. The sentence was translated to an image then coded as a single word. Then these were qualitatively positioned on a value scale of projected futures for the study territory: x=apocalyptic to elysian; y= self-sufficiency to dependency, and these became x and y coordinates plotted on 2 axes. Relationships between projects were identified and became potential vectors. A summary diagram identified a centre of gravity just off-median. The whole process was retraced with student responses to the programmers' plotting, resulting in the studio group median shifting a short way further to the elysian. Thematic sequences of coded verbs (image) and objects (text) were subsequently brought to the final installation and translated through the medium of choreographed nodes of tights/light/ tape/ found objects.

The next move was to plot the final positioning of each shifted project node. The students set up moves related to the defining and remaking of a field of vector shifts which denoted linkages between individual student projects. These were translated into 'territorial choreographies' performed as the *City Plan*.

Fig. 4. Still from film of the making of the CCPO

Performing and learning

An insight into the actual process of the project was gained from the documentation produced by the Administrators, who set up a system of colour coded request/ response/memo sheets which became an archive of communication between the groups. These ranged from requesting practical items to exchanging comments/ queries on what was being asked for ("14.01.07 12.00 collagists to facilities managers: 1 metronome, 8 chairs without rollers, 8 pairs of white gloves, small sponge, video camera…") The Administrators also required daily feedback sheets from everyone, which included quantitatively recording morale and how time was spent. It included a question 'In one word, how would you sum up your role in the project today?'. Answers ranged from occupational descriptors (skivvy, cleaner, builder, circle maker, calculator, actor, writer, sewer, shopper, mapper, thinker, Mr Photoshop, choreogra-

pher, convenor, worker, maker, organiser, chef, planner, photographer, website-maker, note-taker, runner, CAD monkey, buyer-seller-entertainer, printer, sentence-compiler, editor) to responsive descriptors (irritator, UN peacekeeper, mediator, dreamer, talker, disaster-control, spokesman) to self critical descriptors (non-thinker, speeder-upper, paralysed, lightweight, heavyweight, dictatorial, absent, quarterback, smiling and nodding, hungover, quietly peeved, different, maths genius, an ornament, moody). Individual assessment of contribution was often detached from assessment of project progress. A visual diary of the project was also compiled.

To some extent the project was subjective at every move. In order to encourage precise critical thinking, students were asked to write short written reflections on 'What went on in the CCPO project /presentation?' Comments covered the actual process of the project, attempting to name it, an appropriation of relevance to individual work, and an interpretation of the value of the project (as success/failure). Most were written in the first person, a few chose third person narrative.

Process:

"Which is the most important issue, operating the office or designing the plan?"[13]

"On the fourth day the programmers found the plan of the installation, based on a series of diagrams, was probably going wrong when it started to be oriented towards the collection of individual projects rather than the consequence of a comprehensive and coherent concept."[14]

"I couldn't really understand the hidden concept…but the feeling of running from one project to the another, in the dark, gave a new aspect to the whole construction. I was one of the linkages between the projects."[15]

Naming:

"the plan is a temporal field of application and movement"[16]

"a museum of silent cocoons"[17]

"a textile imbroglio…always a moment of middle (milieu) and multiple entrance-ways."[18]

"..the work is a reality in itself."[19]

Appropriating:

"The generative methodology is something that I would like to utilise throughout my thesis project, regularly reducing my ideas and aims to one sentence/image/adjective/noun/verb."[20]

"My project, the wall of Cádiz, is in the same quandary as the experiment."[21]

Interpreting value:

"able to recognise the dense quality of the old city, open space of the new city"[22]

"hard to translate…much more game elements than aesthetic feeling"[23]

"it is the process of making and assembly and the creation of connections between the projects that acts as the architecture."[24]

"Lack of rigorous orientation…the linkage between elements paused on the surface"[25]

"The piece can stand many unpickings."[26]

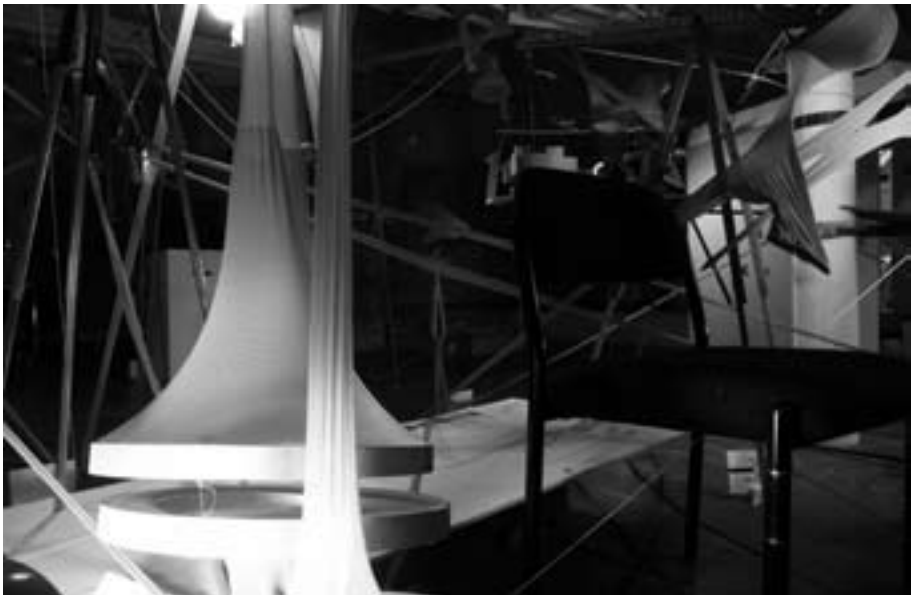

Fig. 5. Still from film of the making of the CCPO

The project output drew attention to a rich discussion relating to temporal aspects of urbanism. Comments and observations from the review panel included 'A project about time and urbanism', 'a performative articulated drawing', 'the necessity of the body in urbanism', 'Apollo and Dionysius', 'tensions and relations- what happens when a part is taken away or fails', 'abstraction rather than representation'. It was generative as 'a new' piece of work, providing ways of thinking, acting, and specific connective moves to take back to the study city/project territories. The performative mode of practice which was set up enabled ideas and implementation to shift from individual outlook to collective endeavour, and students to some extent became 'machine' as well as 'operator' in Eisenmann's terms[27].

Peter Eisenmann has described that he sees one of the key functions of the computer as a tool/ instrument which makes possible a detachment or displacement of 'what we see' from 'what we know'. In pursuing architectural knowledge through 'pure production', he has written about electronic culture as a method, instrument, inspiration, tool and guidance of the process of design practice/production. Agents are the operator, the machine, and the model laboratory. While much has been focused on possibilities of the machine's transformative actions, and a paradigm shift from static *point-plane-line* to dynamic *vector-field-time* conceptualising, less explicit is the often intuitive role of the operator in relation to the machine, and the machine and operator(s) place(s) in the often contingent context of the laboratory/ studio. Eisenmann's design practice, while explicitly celebrating electronic culture, also continues to defend processes of manual making, testing and collaborative dialogue.

Summary

'To experiment' encompasses a range of activity and methodology ranging from the test of a very particular limited question to investigations, attempts, sometimes tentative or provisional speculations. In all cases experiments deal with some sort of new ground. In architectural design, where studio teaching is often perceived of as essentially experimental, the role and placing of an experiment needs to be carefully understood and defined. How does it differ from design knowledge, design exercises? Are the framed question(s), objectives, methodology, tools, conceptions about architecture and the architect or versions of an 'innovative' design solution, the experimental aspects of the pedagogy? What is discovered about the new ground, and how does this inform future experiments and/or design practice?

The one-off project scrunitised in this paper, the *Càdiz City Planning Office*, was experimental in terms of pedagogic methodology in the design studio. This can be understood as a performative framework or practice and was fundamental to project conception, implementation, and enhanced student learning. Collective practice clearly provides opportunity for an alternative to increasingly individualised/atomised digital modes of working, consciously enabling the acting out and negotiating of roles and working relationships between students detached from individual project egos. The studio is understood as a contingent context of operator-machine-laboratory production. I would argue that the new ground discovered in this experiment was primarily the possibilities of collective design practice, questioning the implementation of design ideas and of the role of the architect in an urban context, worked through one loosely normative bureaucratic model. The project gave the studio cohort a collective confidence which has impacted on attitudes to subsequent small group and individual production, Secondarily, new ground discovered for this cohort of students was the generative potential of work which is 'of itself'.

Notes

1 Collins dictionary definition
2 Imogen Hogg, MArch student reflecting on the project
3 From 2006-8 MArch (Design) Course Handbook, University of Edinburgh
4 SMLXL (1995) 'Whatever Happened to Urbanism?'
5 Cádiz was a centre of Phonecian salt trade, a Roman and Moorish city, and a key gateway for the Americas. The city has a significant history of military contest/siege/trade. The dense fabric of the old town dates primarily from the seventeenth century, the newer town was based on La Ciudad Lineal, both creating sheltered microclimates in an extremely exposed situation. The city has a reputation for political activism, being the site of the signing of the first Spanish constitution, and where Franco first entered Spain before seizing power. *Gaditanos* see themselves as outward looking *mestizos*. Today, the porous coast of Southern Spain raises issues of immigration and transculturation. At a macro scale the area is a biological crossroads of flows between Mediterranean and Atlantic waters. The port of Cádiz and other industries are still active in a Mediterranean/ North African network. Regional issues of limited water supply and protecting the ecology of the coast are pertinent, and relate to debates arising from the urbanisation of the Spanish Mediterranean coast.
6 "The space of design continues to be defined by layers of photographs, models, Xeroxes,

posters, designs, sketches, magazines, mottos, books, advertisements, fabrics, and so on, which act as fetishistic substitutes for what exists outside the studio: other places, other times, other architects, other schools and other disciplines. These tokens bring all of these issues "into" design. The designer is seen as detached from the physical space of the studio and set adrift among the conceptual space of these representations….They construct and maintain a space for architecture that is neither inside nor outside the university". Wigley, M 'Prosthetic Theory: The Disciplining of Architecture' *Assemblage* No, 15 (Aug 1991) (1991) p20

7 Key texts which were discussed in the studio included Mark Wigley, 'Prosthetic Theory: The Disciplining of Architecture' (ibid. 1991) p 6-29, James Corner, 'Eidetic Operations and New Landscapes' Chapter 10 pp 153-169 in *Recovering Landscape: Essays in Contemporary Landscape Theory* (Princeton, 1999), Carol Burns & Andrea Kahn, *Why Site Matters*. Design Concepts, Histories and Strategies, Routledge, London, New York, 2004.

8 The George Simpson Professor is an annual post supporting Architectural Education at the University of Edinburgh. Ben Nicholson participated in teaching with a number of year groups in Edinburgh at the start of Semester January 2007. In the past this role has often taken the form of critical reviews of individual studio work, but this year we decided to work on a project based experiment. The idea of working on a short project was agreed in advance, although the project was actually conceived and constructed in detail through intensive discussion with the course leader and Ben Nicholson when he arrived in Edinburgh.

9 Andrew Brooks, MArch student reflecting on the project

10 Xiaoxi Song, MSc student reflecting on the project

11 Emma Bush, MArch student reflecting on the project

12 *Performative* (Collins dictionary) "denoting an utterance that itself constitutes the act described by the verb." Neil Leach refers to Judith Butler's distinction between performance and performative in 'On Belonging', pp170-202 in Camouflage (MIT Press, Cambs, Mass. London, 2006) "Performativity achieves its aims not through a singular performance…but through the accumulative iteration of certain practices." p172. Leach follows the consequences of performativity, where action and behaviour form identity, in relation to the politics of mimicry, and space and place.

13 Jessica Ji, MArch student

14 Tao Wang, MArch student

15 Nassia Spyridaki, MSc student

16 Sarah Castle, MArch student

17 Emma Bush, MArch student

18 Euan Cockburn, MArch student

19 Annabel Cremer, MSc student

20 Imogen Hogg, MArch student

21 Boyin Yang, MArch student

22 Marianna Kotilea, MSc student

23 Zhitong Wu, MArch student

24 Craig Hutchison, MArch student

25 Xiaoyan Hou, MSc student

26 Emma Bush, MArch student

27 Galofaro, L Digital Eisenmann: an office of the electronic era (Italy, Birkhauser, 1999)

Maria Vrontissi

(Re)Discovering Architectural Design of Lightweight Structures

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Lightweight structures: a unique design paradigm

Design of lightweight structures has traditionally been a field of experimentation.

Both in practice and education, designing and teaching lightweight structures have been closely related with innovative investigations [Fig. 1]. Projects carried out by professional practices, research groups and educational units have gone one step ahead of their times, resulting in a set of works of the highest standards within the gamut of 20th century architecture (from F. Candela to F. Otto, B. Fuller to Diller+Scofidio, C.and R. Eames to R. Piano, N. Grimshaw or Future Systems). The results of their work have been usually documented in eminent relative literature (such as IL series) and celebrated in Exhibitions and World Fairs.

Likewise, the notion of experimentation has been for long associated with the term of lightweight structures, every experimental structure being considered a lightweight one.

But what actually constitutes a lightweight structure?

The term lightweight structures has been associated with modular systems with articulated parts, deployable or demountable structures and ephemeral/ reversible architecture, therefore immediately linked to specific architectural typologies. And then, deprived from the context and design parameters, the term lightweight structures has been used to describe certain typologies instead of structures produced with a certain design and making process.

According to B.Fuller's classical question, 'Do you know how much your building weighs?', the consideration of lightness in building construction should be of primary importance in every architectural design. In this sense, every architectural structure could be considered as a lightweight one, the issue of weight being one of the main concerns that every building design scheme has to deal with. Moving from the notion of the absolute weight to this of relative weight and then towards the concept of the optimum weight, finally the question comes down to the minimum weight to loading capacity ratio, therefore associating the notion of a lightweight structure with that of a structurally efficient one. Immediately issues of structure, materials, technologies and processes arise.

Taken aside the issue of weight, the obvious synergy of all these parameters in the design and making process of lightweight structures is a unique paradigm of special interest and this is what makes lightweight structures so modern again today.

And while in architecture the complex character of lightweight structures is yet to (re)discover, in engineering fields the concept of lightness is more composite and recalls its initial characteristics related to forms as well as materials and processes.

In 'Lightness - The inevitable renaissance of minimum energy structures' , aerospace engineer A. Beukers points out[1]: "[The book's most important angle] is the trinity of material, shape and process, since the balance between them becomes more delicate, proportional to the lightness required for the resulting structure. Making things lighter is not just a matter of choosing lighter materials, for every material entails its own properties in terms of shape and manufacturing techniques."

Fig. 1
Lightweight structures – Dance Pavilion in Cologne, Germany by F. Otto, Los Manantiales Restaurant in Mexico by F. Candela

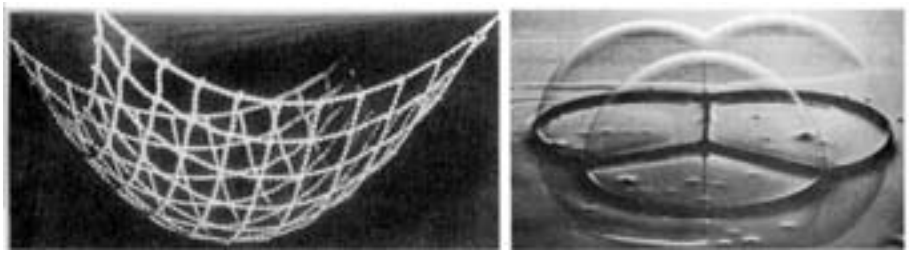

Fig. 2
Studies on lightweight structures design principles – ILEK, Institut for Lightweight Structures, Stuttgart, Germany

What are these characteristics, inherent to the design of lightweight structures?

Weight being a primary consideration, issues of materials and structure become critical. Structural efficiency and material performance are of key importance when giving shape and form of simple or more elaborate geometry, restricting though the degree of formal freedom that non-standard, free-form architecture has. Structural engineer A. Palmer comments[2]: "In designing structural systems it is essential to be aware of the relationship between structure and form: either the structure follows certain physical characteristics such as the shape of the hanging chain or a minimal surface [Fig. 2], or it is a system that relies primarily on bending as the load-carrying mechanism."

Furthermore, precedents of lightweight structures from the vernacular (adapting to changing environmental conditions) or nature formations (withstanding significant water and air forces) usually bring questions of adaptability, sustainability and environmental economics to the design table.

The design process is object oriented, the design basis being the 3D model (physical, digital, 1:1 scale mock-up). In the making process, manufacturing techniques are vastly explored, while a construction approach is considered for detail customization. Prefabrication systems are applied towards mass production.

Crucial to the design process from their very first steps, digital technologies have gradually become a necessary tool to the design and making process of lightweight structures, though always accompanied by traditional methods. Advanced simulation techniques have been used to all their extent as a powerful design tool for form queries to load analysis studies and material properties investigation.

Lightweight structures design has always had a multi-disciplinary character. Most of projects have been the outcome of the effort of an inter-disciplinary team including designers, architects, engineers, structural engineers, manufactures, contractors and material specialists, while many designers whose name has been associated with these architectural typologies, haven't always had an architectural background (E. Torroja, P.L. Nervi, P. Rice, E. Happold).

These fruitful collaborations, yet always application oriented, have created a long pushing-to-the-limits research tradition in this field and have developed an experimental character based on the always reliable trial-and-error path, where in a rather scientific approach, theory is always complemented by experimentation with conventional or digital tools.

Lightweight structures (re)discovered: resolving a misconception

In a teaching framework though, features inherent in the educational approach often contradict the above mentioned design characteristics, thus contributing to a misconception of lightweight structures.

The usually segregated character of architecture education (necessary for methodological reasons) and the lack of integration of related fields in the design process is creating or reproducing a design environment with limited to none inter-disciplinarity, where either the designer has limited control of the project focusing primarily on formal investigations, either the project is of limited scale (installations) in order for the designer to keep control of all aspects. Form becomes the primary concern and issues of structure, materials and processes remain secondary and are rarely investigated as form generators. Tools are explored in this direction, competences are developed accordingly and digital technology is seldom used to all its extent.

In a design and teaching environment of this kind, lightweight structures, deprived from their inherent design characteristics, are looked at like caricatures of a certain typology and have lost their appeal, teaching and experimenting in this field becoming obsolete.

Recent technological advances have influenced the practice, as well as the teaching of architectural design, but they have also radically affected fields closely related to architecture. Evolving material properties, structural morphology, manufacturing technology and construction processes shape a new reality directly linked to the creation of architectural form.

"Digital technology and CAD/ CAM applications have triggered a proliferation of complexly shaped building designs including the free forms we call 'blobs'. […] With current discourse focusing on the underlying shaping principles of 'digital architecture', architects often overlook the fact that the formal complexity of the blob is achieved through conventional constructional and structural means – skeletons assembled from linear and curvilinear members that support secondary members and non-structural building skins. These systems rely heavily on bending stresses – the least efficient of the basic load-carrying methods [Fig. 3]. The visible surface of the freeform shape is structurally functionless."[3]

Fig. 3
Digitally possible complexly shaped building designs relying on bending stresses – Guggenheim Museum in Bilbao, Spain by F. Gehry

As the discourse is moving over from theoretical formal investigations to built applications of digitally generated free forms, questions of structure, materials and 1:1 scale manufacturing techniques are brought in to surface.

New, but differentiated, interest in tectonic culture, in materiality, in manufacturing processes and mass or custom production systems is developing and lightweight structures are again in the foreground, not so much in terms of form, but especially for their design parameters (interrelation of form/ shape, material, processes).

Lightweight structures: precedents with significant educational value

Teaching architectural design of lightweight structures is dealing with the new reality created by recent technological advances, in a range of cases. The course objective is to enrich the design vocabulary and explore design principles and tools towards a meaningful study and creative implementation of innovative architecture. Lightweight structures are a precedent of significant educational value in order to understand complex interrelations among design parameters and enable a resourceful collaboration between design specialists.

Educational tools have an important, yet not dominant, digital technology component. Design assignments address questions of form, materials, structure, construction and/ or manufacturing technologies exploring different degrees of digital technology applications.

The sometimes limited tools and means, while application oriented, form a teaching approach towards exploring methods and developing strategies and criteria instead of investigating tools or training for specific skills and competences.

In the *design of advanced technology systems* dealing with long span, large scale structures addresses the issue of *diversity* of architectural languages and related tools, techniques and processes [Fig. 4]. The issue of *buildability* is apparent [Fig. 5]; the principles of 'organic' architecture are questioned by digitally possible free-forms

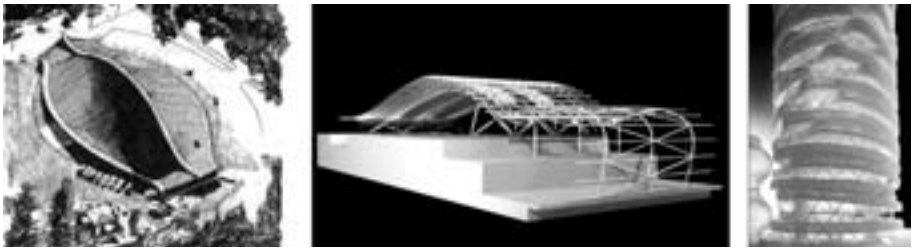

Fig. 4
Diversity of architectural languages in long span, large scale architecture – Yale Hockey Ring in New Jersey, US by E. Saarinen, Kansai Airport in Osaka, Japan by R. Piano, Experimental Tower by P. Testa

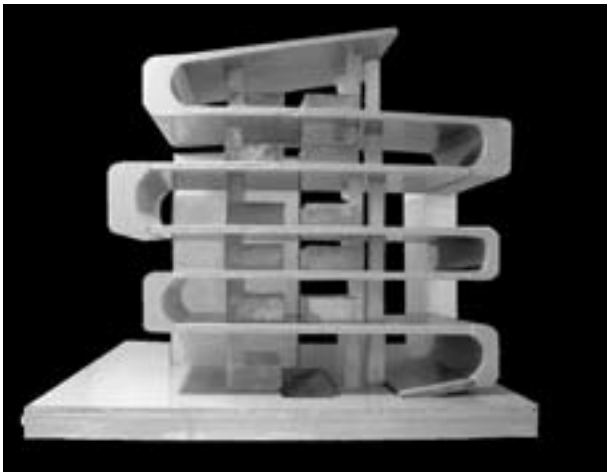

Fig. 5
Studies on tectonics – E.Boubari, A.Togrouzidou, C.Vassis

and even more challenged by structural hybrid forms generated by powerful computational tools.

A series of projects is discussed ranging from concrete structures with minimal structural surfaces (F.Candela, H.Isler), timber and steel structures with organic articulated forms and discrete pin-connected structural parts (N.Grimshaw, R.Piano), free-forms with a skeletal approach basically relying on bending stresses (F.Gehry), hybrid forms with emergent structural morphology (P.Testa).

Digital tools are used for digital representations (representation vs simulation) of structure formations and connection details in order to enable understanding of different systems, while digital databases develop structural and constructional awareness substituting for a limited field experience.

In the *design of tensile structures* the substantial use of digital technology (yet always next to traditional methods) in a broader and more profound way than in other architectural typologies, has produced a particular professional environment (*multi-disciplinary approach*), a singular working process (*object oriented design*) and a differentiated product (*highly customized manufactured architectural product with an enhanced information component*).[4]

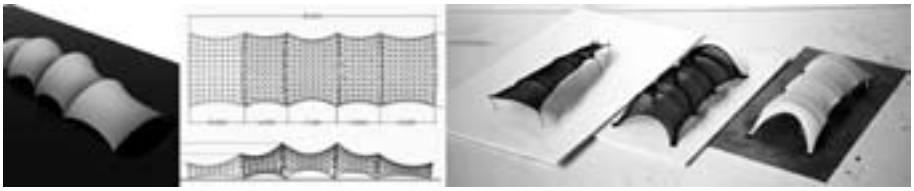

Fig. 6
Studies on tensile membranes – E. Kiourtsoglou, A. Tsioli, Chronaki

Fig. 7
Studies on prefabrication and industrial systems – E. Nazlidou, N. Patsopoulos

Shapes, geometries, structure and materials are interrelated, form BEING the structure. Internal forces and material properties interact with the design as well as the manufacturing process in a differentiated design and making approach.

The whole process is directly based on the 3D model [Fig. 6] (traditionally physical, now digital) containing all information about form, forces, material properties and cutting patterns, therefore being a crucial tool in formfinding, engineering analysis and manufacturing production.

Trial-and-error process, once performed with accurate physical models, is now carried out using advanced simulation techniques (simulation vs representation) to give immediate feedback, digital technology becoming a reliable design tool, when used to all its extent.

Teaching tensile structures is a unique opportunity to introduce the 3D model based design, to develop awareness of the importance of structural and material performance as form generators, to present the interaction between design and manufacturing process.

Digital tools open a new perspective in this field, by offering new possibilities of analyzing structural behavior and material performance, if more elaborate simulation tools are to be used.

The *design of portable/ demountable structures* introduces issues about prefabrication, industrial systems, scale and sustainability [Fig. 7]. The question of *constructability* is apparent; the notion of parametric design is introduced. Choices of materials and manufacturing systems made available by the new digital technology have dramatically increased, but so is the need for input by the designer. Management and evaluation skills are required in order to deal with this new reality.

Assignments dealing with material properties introduce the concept of *material design*. *'Custom' materials* with properties tailored to specific functional, aesthetic

and structural needs can be designed or ordered by a multi-disciplinary design team, changing the design approach. A new process, of choosing a detail, designing a material and reconfiguring the design output, is challenging the traditional approach of creating a form, designing a detail and choosing a material, therefore opening a new perspective, where materiality becomes a powerful design parameter.

Furthermore, the traditional concept of a fixed, static, 2-dimensional building envelope is confronted by the emerging idea of a dynamic, interactive, responsive, intelligent *building skin* [Fig. 8]. The classic notion of boundary is challenged.

Digital technology can be resourcefully explored for research purposes in material science within a creative design scope using advanced simulation techniques to explore material performance in a macroscopic level or investigate molecular structure in a microscopic level.

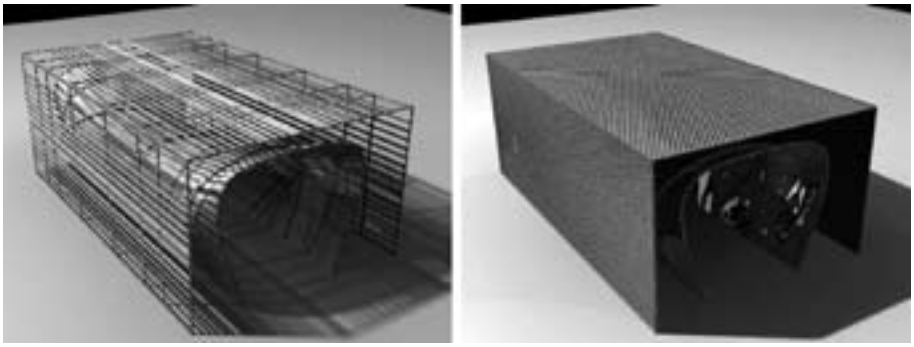

Fig. 8
Studies on material design and dynamic building skins – A. Bezes, D. Machairidou

Finally, the case of a *design-built workshop* testifies the use of digital technology in an environment habitually dominated by traditional methods and design approach.

The workshop theme (tensegrity structures [Fig. 9]) led towards an object oriented design directly based on the 3D model. The geometric complexity, the exceptionally 3D character and the intrinsic characteristics of tensegrity structures proved the traditional methods (paper based design) and representation tools (sketches, 2D drawings,...) to be inadequate, therefore the 3D model being the only and interactive basis for design studies. The 3D model in several versions [Fig. 10]: data sheets to describe coordinates and calculate mathematical relationships between parts, digital model to define geometric forms, physical models to understand force distribution, and, ultimately, 1:1 scale mock-ups, when dealing with complex 3D details and construction sequence issues.

The need to test the theoretical output of these studies, led to an immediate *trial-and-error approach*, looking for a reliable experimentation tool. While the digital model contains no information about materials and forces and physical models are inefficient for scale or accuracy reasons, the 1:1 scale mock-up remains of key importance as a testing tool to understand the physical character and the material

Fig. 9
Tensegrities Workshop, Department of Architecture, University of Thessaly, Volos, March 2007, Professor: M. Vrontissi

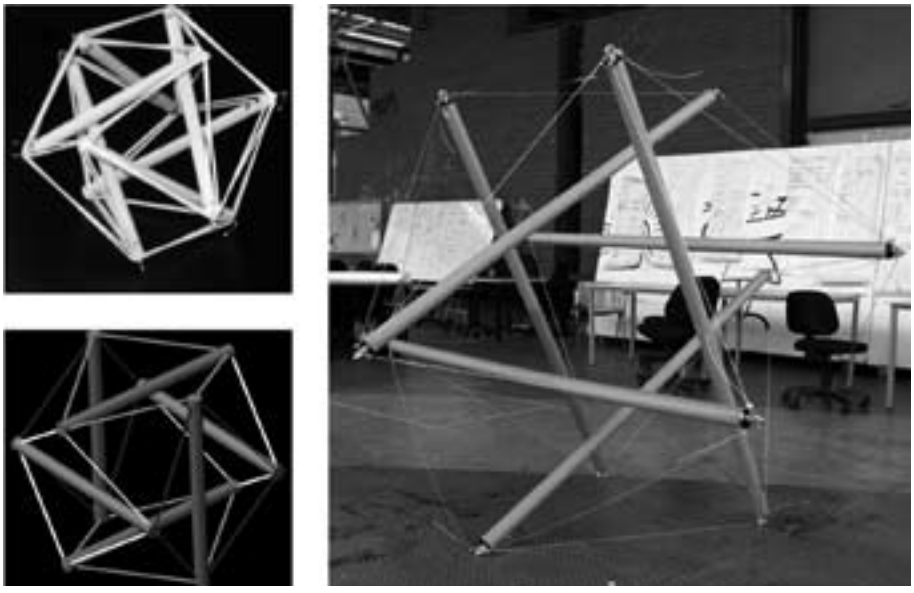

Fig. 10
Tensegrity Icosahedron: digital, physical and 1:1 scale 3D models

properties of the architectural form [Fig. 11]. Failures resulting from lack of advanced simulation tools to test structural behavior and material performance underlined the sometimes misleading role of digital modeling, emphasizing though the power of and, therefore, need for simulation techniques if used in all their magnitude and not only for the formfinding process.

Though sometimes inadequate if dealing only with formal investigations without testing material or structural properties, digital tools proved to be unexpectedly helpful in complex construction issues, like efficiently setting up the 2D layout diagrams [Fig. 12] or resourcefully outlining the formwork needed, successfully substituting for the lack of classic mathematical and geometric analysis tools.

From another perspective, the use of information technology and digital tools was evident for communication, collaboration, recording and presentation purposes. Besides, especially when dealing with a rather unusual design field, internet resources can be particularly helpful to substitute for limited bibliographical references, to instigate interest in new forms and technologies, to present principles and precedents, to develop tools and techniques by sharing knowledge with research groups with similar focus.

Fig. 11
Tensegrity Needle Tower: experimenting with the 1:1 scale mock-up

Fig. 12
Tensegrity Needle Tower: 2D layout diagram and final 3D structure – S. Bagiartaki, P. Doudesis, E. Kostopoulou, N. Theodoulou

Towards a process and teaching (re)design: multi-disciplinarity and interactivity

New developments in material science, advanced structural engineering and manufacturing techniques possible through advances in computational technology, set the bases for an all inclusive process redesign.

Shifting paradigms are about process and teaching redesign; shifting from a task oriented to an object oriented 3D based design, from a construction to a customizable manufacturing technology approach and processes, from a static building envelope to a dynamic and responsive building skin, from an organic to a hybrid structural morphology, from a commercially available to the 'custom' designed material.

While the complex nature of design is (re)discovered, the *multi-disciplinary character* of the design process is revealed and so is the need for a shifting of role for the architectural designer. Next to creativity and knowledge, differentiated kind of input and skills is anticipated by the designer in order to maintain control of the design process and the final design product. Digital technology skills can not be limited to the use of digital technology (digital modeling and programming in architecture and structural engineering), but should be closely related to *management and evaluation skills,* along with decision making abilities.

Digital technology applications need to be explored to all their extent, not simply as communication and collaboration tools, not only for (re)presentation of architectural forms, nor for just providing elaborate, yet sterile, substitutes for the architectural concept.

Digital technology offers a new design approach through the *interactive 3D model* [Fig. 13], now digital with an enhanced information component, being essential to

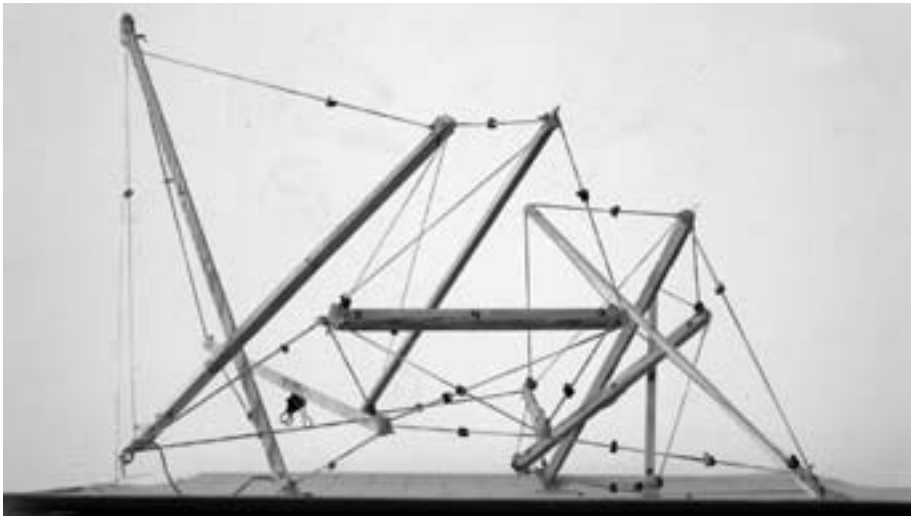

Fig. 13
Tensegrity Sculpture: 3D working model – M. Salehi, K. Tsakiris

the design, engineering and manufacturing process. Advanced *simulation techniques* can be used as design investigation tools providing significant feedback related with structural behavior and material performance.

Digitally enabled *parametric design* [Fig. 14] allows for a new manufacturing approach, towards mass customization rather than mass production, addressing the needs of differentiated target groups, creating a more sophisticated user, while demanding a designer with differentiated skills (programming skills) and competences (analytical thinking).

And while *digital databases* [Fig. 15] constitute an important tool in managing information flow about systems and materials, information management skills next to evaluation skills are necessary towards a resourceful development and creative use of such tools.

Fig. 14
New materials and new technologies: studies on parametric design – S. Koutlaki, C. Tsimourdagkas

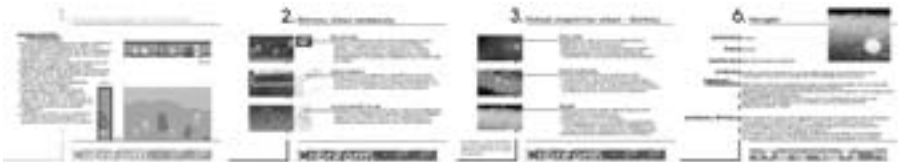

Fig. 15
New materials and new technologies: studies on databases – Papagianni, F. Stefanakaki

Digital technology has given a whole new meaning to the notion of *interactivity*, while the new term of *performativity* has been introduced, associated with the new interactive 3D model, with new intelligent materials and structures, with responsive building skins, with new ways to create a design concept, with the new participatory role of the user, with the new active role of the student.

But what can be more of a performative character than the actual act of building, the actual construction process?

Putting together a design-built workshop, where the final product is the built project, is like setting up a performance. And while project management is like directing a play by organizing time schedules, allocating people, materials, tools and means, preparing design schemes and solving construction issues, construction management IS the actual performance.

Digital technology can assist in creating possible scenarios or recording the play, but the actual play, the construction process, can be rarely compared with virtual

reality… (the materials, the tools, the forces, the people, the team, the interaction, the disappointment when the connections do not fit into place, the joy when the project is set up, the trial, the error, the path,…).

Trial-and-error approach is the basis for every experimentation [Fig. 16]; an interactive method where feedback (re)defines the next step. In this sense, designing and building a project is definitely a play, but furthermore it is an improvisation act, an experiment by definition. Similarly, in the project of teaching, the teacher is there as director and actor in the same time, acting as sensor and actuator – to be the first one to feel possible ways to go and activate students to try them out in an open process, their participation, commitment and feedback being crucial to the success of the project as well as to the renewing of the process…

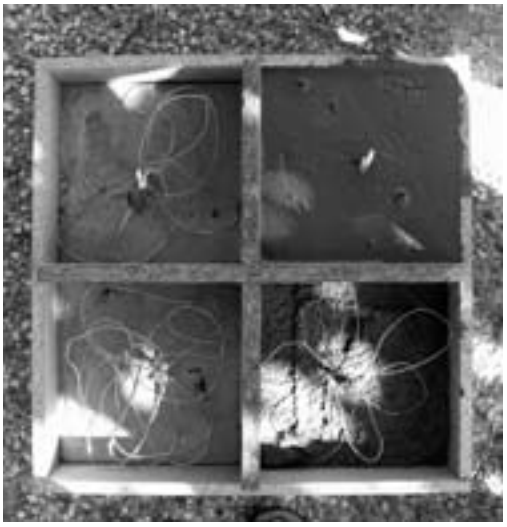

Fig. 16
Tensegrity Structures: setting up and trying out the formwork for the foundations

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Danny Windmolders
Michel Preuveneers

a Critical – Spatial – Design Studio
a concept of architectural education supported by communication technologies

Provinciale Hogeschool Limburg
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The Concept of a Critical _Spatial_Design Studio

If you don't learn while teaching, don't teach.
Ancient Arab proverb

In education it is not only important to look ahead and confront the future with an open mind, but also to consciously review what is behind us with a critical attitude. Education is not as much about giving the right answers, as it is about asking the right questions over and over again. Thinking fundamentally about architectural education, is impossible without questioning architecture: what is the meaning of architecture, how is architecture experience and what is the impact of architecture on the life of individuals as well as society as a whole? Only by continuously questioning the meaning of architecture can useful viewing points concerning architectural education become apparent.

This paper wants to review the concept of critical-spatial designing in the design studio of the second bachelor year of the department of architecture of the Hasselt University College PHL. It puts forward the considerations and experiences that have prompted us to implement this pedagogical concept in the design studio. While our primary aim is presenting and sharing the general premises, experiences, specific educational activities and results of the design studio, this paper also provides us with an opportunity to evaluate the initial expectations and goals.

Architecture is never 'innocent'

Within society at large, architecture takes on an important position. Architecture is everywhere and due to its size, its durable and functional character as well as its visual, artistic and cultural dimension, architecture pervades every pore of our daily live. On the one hand, architecture is the result of our daily lives, but on the other hand, architecture conditions to a great extent the way we live together.

By definition then, architecture is all-encompassing because it has to do with human being in general and with the emotional, physical, individual and collective dimension of human settlement more specifically. As a comprehensive discipline, architecture comprises of a vast number of domains ranging from a purely theoretical and reflective level of architecture to the pragmatic production of a building. Moreover, architecture manifests itself at all scale levels. Through architectural thinking, complex urban models as well as small scale objects are created. This results in a need for a broad range of knowledge and insights and a very specific position of architecture as a discipline within the large spectrum of knowledge and science. More than anything architecture requires an ability to transcend disciplinary boundaries and to bring together differing expectations and viewing points in a meaningful synthesis.

Following these considerations, the design studio of the second bachelor year at the school of architecture of the Hasselt University College PHL, works with a specific pedagogical concept called *critical-spatial-designing*.

The concept of a *critical-spatial-design studio* has come into being to address the re-occurring fact that students project architectural solutions in a complete arbitrary

manner, reduce a spatial problem to a stacking of two-dimensional solutions, or don't relate to designing considering a synthetic activity, and focus on either a beautiful building, a functional building, constructional clarity, the integration in an urban concept, or their design as a cultural manifest. In terms of critical spatial designing, architecture wants to be a proper, sensitive and integral synthesis of all considerations throughout the design process. This is the primary aim of architectural education.

Critical spatial designing obviously encompasses three pillars: spatiality, a critical attitude, and designing as a basic activity of synthesis.

Spatiality

The first pillar and central notion in the concept is spatiality. The true subject matter of architecture is the development and manipulation of space on all scale-levels. Therefore the educational process starts with heightening the student's consciousness of space – experiencing space, then gaining insight in this space -understanding space- and finally working with space –modelling space.

However, space doesn't exist in itself. It only exists because of the claims and considerations put on it. Mutually influencing each other, these considerations transform space as a whole. Students have to acknowledge and consider four of these dimensions in the design process. The first dimension is the physical, structural dimension of space as an organic whole. Here, the emphasis is placed on the architectural object undergoing the influence of physical laws, thereby inevitably shaping its appearance. Secondly, the visual-spatial dimension addresses the formal aspects on all scale-levels and the visual interactions, within the architectural object on the one hand and with in its spatial context on the other. The functional dimension is the third dimension to be considered, covering as well the socio-economic requirements as the fulfilment of human needs and the stimulation of activities and events. Finally, the cultural dimension considers architecture as the physical result and tangible witness of a culture, as it is manifested in time.

These four dimensions introduce a broadened definition of the notion 'context'. This is fundamental in this pedagogic concept. As these four dimensions show, 'context' originates within a broad frame of reference that is more complex than the obvious design conditions alone such as the design brief, urban conditions and obvious constructional logic and constraints.

As architecture is an essential part of a culture, then this culture, in the widest sense of the word, is where architecture should originate from. Architecture contributes to this culture by defining, enriching and externalising cultural values. In this sense, architecture not only has a territorial position, but also has a position in time. As such, because of its presence, architecture can visualise the 'zeitgeist', hold the recollection of important moments of civilisation and represents cultural (dis-)continuities.

The total body of preconditions, considerations, design requirements… present in the design process, is the framework from which a design can originate in a meaningful way. This information can be implicit or explicit, time-related or timeless, local or global, and material or immaterial. Making architecture in a meaningful way, requires

searching for relevant contextual information with a sufficiently critical attitude to be able to integrate this information in the design process in a consequent manner and to make it an outset for design.

A critical attitude

> *We must be systematic but we should keep our systems open.*
> A.M. Whitehead

The second pillar of designing we want to address with this concept is a fundamentally critical attitude as the backbone of the design process. Well-considered and proper decisions within the design process can only be taken on the basis of extensive knowledge and collected insights. A critical attitude entails a methodological approach of the design process, from observation and documentation through analysis, to interpretation. Students must therefore learn about:

- general and specific research methodologies (theoretical, socio-cultural, technological...)
- knowledge as a indispensable ground for design decisions
- the critical assessment of decisions in relation to their own projects as well as other's
- developing communicative skills (verbal & visual) for conveying their critical insights

Methodologically, this is accomplished through preliminary studies, extensive readers and documentation, study-trips, typological studies... But criticality does not stop after the preliminary research. It is important that all information is exchanged between the students participating in the design studio using a permanent, dynamic and continually updated communication system. Firstly, this is done very explicit by organising group presentations. Secondly and more implicit this is done by bringing together all study-results on the internal network server. This network is used as a permanent and dynamic (continuously updated) information system. All information is immediately centralised and permanently at the disposal of each individual.

Designing

The third pillar of the critical-spatial-design concept considers the act of designing as an activity of synthesis. Designing is the act of bringing together different claims, viewing points and affinities in an integral and coherent whole that gives a new dimension to all separate considerations in the design process. Designing is unmistakably a creative process, but creativity is not to be mistaken with the invention of completely new things. Creativity will essentially be grounded in a wide and general education of social-cultural knowledge and insights. In making new combinations, students take on personal emotional-rational tests. In this regard a specific focus of the design studio is put on the materiality of architecture.

Architecture has many faces. It can be a virtual universe of pure intellectual considerations or a theoretical framework, but in its richest form architecture has a real and material form of appearance. Architecture is physically present. It really exists.

By focussing on the materialisation and the appearance of the architectural projects in the design studio, emphasis is put on the way the materialisation of architecture is part of transforming the world.

Material is more than the resources or building products of which a building is made. Of course it has to do with logical solutions for problems of a physical nature such as stability, insulation or waterproofing, but is also more than that. Architectures materiality plays an important role in the way architecture is experienced and articulates the emotional life of individuals and society as a whole. The choice of material is not only determined by rational arguments but also by emotional ones.

Integrating ICT-Tools and classic working instruments into the design studio

As a consequence of the pedagogic concept as it is organised in our architectural design studio, it is absolutely necessary to make use of the broad range of communication and information tools available through ICT. They allow the team of teachers and students to work intensively together in an atmosphere of constant communication, criticism and information. These are the necessary conditions to make the concept of "critical-spatial-design" function.

In the latest evolution of architectural education it is almost inconceivable to let the design studio function with the same dynamic and communicative intensity, without the new ICT- tools. The use of more recent and rather sophisticated technologies became more and more important.

However, architecture developed in a digital world always has a virtual dimension. It has no scale, escapes gravity and is in this sense intangible. Therefore, it is obvious that in the design process the classic tools and equipments, such as, drawing tables, scale models facilities, libraries, photo studio's, etc., continue to play a significant role.

Basic Excercices 06-07

The main topic in the second bachelor year design studio is "DWELLING", in different forms of cohabitation, scale levels and degrees of contextual complexity.

The different assignments in the design studio are part of a whole and complementary series of exercises concerning this topic. As such students have to deal with questions concerning the architectural object as well as urban integration, the virtual dimension of architecture as well as specific material technologies and purely individual or composite forms of dwelling as well as a typical family dwelling is part of the programme.

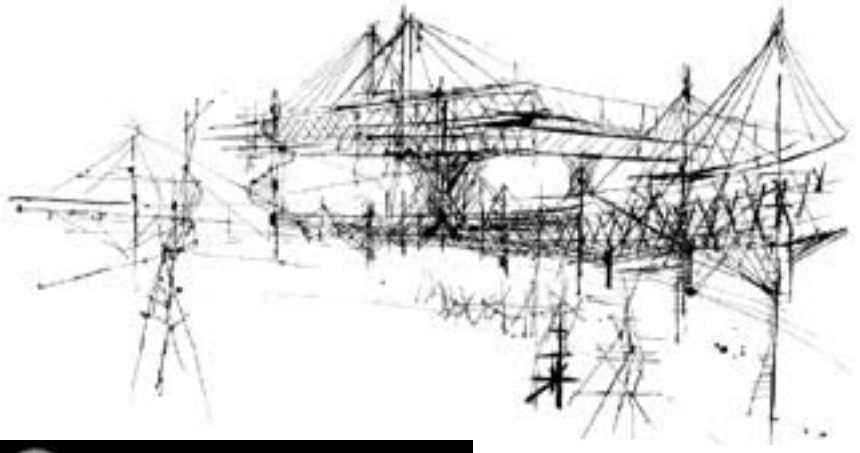
Architectural Essay

The challenge in this exercise is to question '*living' as a phenomenon* in a preliminary study, starting from an unconventional and therefore challenging context and design brief and then translating the insights gained into an architectural solution. As the first exercise of the second year, this assignment is a group-exercise with an experi-

mental approach. It wants to introduce students to the specific approach of the second year bachelor design studio and also allow them to get to know the teachers.

During the academic year 2006-2007, students had to focus on 'Living in Utopia'. Students are given a concise theoretical information package before the introduction of the design assignment. In this case students had the choice to start working from either the utopian work of Constant, and more specific his most architectural work: New Babylon or from the work of contemporary authors theorizing "The fragmented city".

Further information on the two subjects of utopian city's is gathered by small groups of students and presented to all the participants of the design studio. In this way all students can get more and precise information about the ideas of the different thinkers presented to them in the information package. They must be able to make a well-considered choice for one of the approaches as inspiration for their design projects. Finally, design proposals, developed in small groups, are presented to all participants of the design studio as a subject for an open debate about dwelling.



sketch Constant

a student's interpretation

Housing on a site with inclined profile

A second exercise comprises of conceiving *an individual house* in combination with *a community space* on a site with *a strong inclination*. The introduction provides students with extensive information about the context, site, programme and social

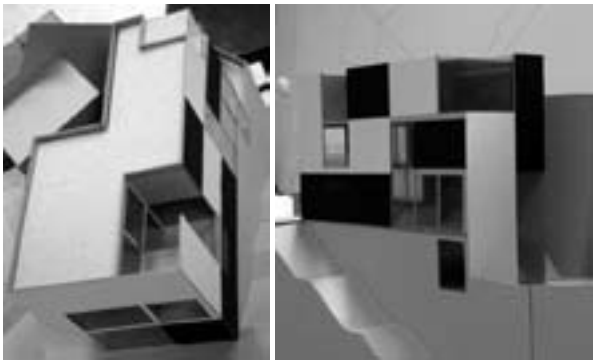
life, in combination with a visit to the real site. Topics of research are defined and extensive information about timing, expected results, models and presentations is given to them.

The first phase of the exercise requires students to research topics significant within the context of the exercise: transitions between public and private, how to deal with inclined sites and how to integrate a mixed programme in an urban context and scenery.

Following this phase students develop individual proposals, which are presented to a jury in presence of a small group of other students to generate an extended dialogue.

The third phase of the project focuses on technical elaboration regarding the materialisation of the projects. Hereby students are required to focus on specific elements to elaborate upon. Finally, correct results are reintroduced in the different projects as a necessary feed-back towards the students. This technical elaboration must be further developed in the next exercise.

the neighbourhood



students' project

Dwelling in a complex urban situation

In this exercise the assessment is to conceive *a group of houses* combined with *urban facilities,* located in a rather *complex urban environment.*

Like the second exercise, the introductory phase provides students with extensive information about the context, site, programme and social life, in combination with a visit to the real site. Topics of research are defined and extensive information about timing, expected results, models and presentations is given to them. A new element is given by introducing the methodology of urban analysis.

In the research phase, students focus completely on urban analysis and proposals for reconstruction of the declined urban fragments with regards to the designated site. All the proposals, elaborated in small groups, are presented to all participants in the design studio to be critically evaluated. Afterwards, the teachers select, correct and complete a few proposals which will serve as 'models' of possible restructuring from which students can choose from and constitute in this way the design conditions for the individual projects. These projects are presented to a large jury with external members. The exercise is considered to be the synthesis of all competences the student is required to possess at this very moment in the curriculum.

This extended jury, combined with the presentation of the "PROJECT/TRAJECT", is the final evaluation of the student.

context

proposal urban development

students' project

Project/traject

Every student will present a personal portfolio for final evaluation. In this document, the student's trajectory throughout the second year design studio is presented. It is on the basis of this document that the student work will be judged. Of each project, all required graphical documents, such as plans, sections, perspective drawings,... must be included as well as an extensive documentation of all study and presentation models. Apart from this typical information about a design, an extensive and personal documentation about the design process, study trips, integrated activities, research, feedback-moments... must also be included.

This portfolio, covering as well projects as trajectories must allow the jury to make a well- considered judgement concerning the extent to which a student has met the educational goals. A fundamental part of the assessment is the attitude of the student as a critical –spatial designer. As such contextual tactics, the sense of reality, the ability to specify and materialise abstract ideas, the expression of cultural notions and socio-cultural reflection, the relevance and coherence of verbal and visual communication are the essential elements. They must be brought together with an

artistic sensibility that takes the separate rational processes and preconditions to a meaningful and integral synthesis.

Assessments

During several intermediary phases, the students are informed about the quality of the presented work. Through individual guidance the students will be given feedback about their strengths and weaknesses and if necessary, are presented with supplementary assignments to train their weak spots.

The final evaluation is made on the basis of a document in which the students present a complete overview of all projects of the academic year. The jury will critically and extensively discuss the results of the students' presentation during a 30 minute session for each student.

During this final evaluation, the entire body of work the student has presented during the second bachelor year design studio is taken in consideration. Not only the final product is important, but also the design process and a coherent and well-considered presentation and communication.

Criteria for assessment

The evaluation of the student's results focuses on three criteria: spatial quality, abilities to synthesize and several specific competences. Student's work must be of substantial quality concerning the first two criteria to be able to pass for the whole design studio work.

Spatial quality is the primary criterion in the assessment. If the student fails to demonstrate sufficient spatial quality, he or she will obviously not pass. Students therefore have to demonstrate that they have sufficient insight of spatial problems: how does the student project deal with the existing context, the design brief, scale, specific spatial articulations… Students must show maturity in composition: the way they deal with internal relationships, the way they use light and material in the composition of space and forms.

As a second criterion which must be met to pass, students must demonstrate their ability for synthesis in their projects in the well-considered use of the specific characteristics of the design problem within a global vision and concept. A sensitive and coherent whole must be achieved while respecting the logics of each aspect of the design problem.

The third criterion puts emphasis on some other competences students must possess in this stage of the curriculum concerning constructive, functional and critical reasoning within the context of their projects and the way they are able to communicate about architecture in general and their own projects in particular. Concerning their ability for constructive reasoning, the student must grasp the nature of the constructive problem, must be able to relate the problem to the physical phenomena behind the problem which are thought in theory courses (building physics, statics…) and demonstrate basic knowledge of constructive solutions and how the student uses this in a positive way in the architectural composition.

Apart from this, students have to show that they are able to translate either a

predetermined or a self-defined functional programme into an architectural concept and also to re-interpret a predefined programme and transcend its limitations in the architectural projects in a functional-spatial way. Apart form this, students must be able to create and present a valuable and adequate programme. The critical dimension of their approach is shown through the relevance of the research questions posed in the preliminary studies on the one hand and the way they deal with the knowledge gained in these studies, in an open and self-critical way in their projects on the other hand. Students must be able to relate their specific design problems to a much broader cultural context. Finally, with regards to communication skills, students must be able to present architectural topics in general and their projects more specifically in a correct, clear and coherent manner. Special attention is given to the sensibility of verbal and visual communication, the relevant use of presentation tools and the value of the communication proposal in itself.

Conclusion

Students must learn to experience space, how to gain insights into space, how to model and manipulate space, how to materialise these spaces and how to communicate their experiences, insights and concepts. This is of course, not an exact representation of the chronology of the overall design process, which is not a static given. Therefore the design studio setting provides us with an opportunity to follow a critical-spatial approach towards design education. A tool that proves to be very appropriate for this is the intensive use of ICT.

Tiago Andrade Santos

Has Anyone Seen Alice?

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"Wow. After I jumped it occurred to me: life is perfect. Life is the best, full of magic, beauty, opportunity, and TELEVISION..."[1]

Everyone has one. Television started out as a reflection of reality, a mirror of society. With technology came the ability to change that reality, and with that ability we were able to change our reflection. TV no longer reflects reality, instead, it creates one for us. The computer screen has taken that new reality a bit further.

Two Sides to a Screen

Our relation with the screen has become very intense and personal. We share with it things we wouldn't share with anyone. It keeps us company while we work, while we communicate, while we shop. We can do almost anything. So Microsoft® asked us, "where do you want to go today?"

Technology is all over. It spreads quicker than any disease and it is changing our lives in ways that we have difficulty in keeping up. We have welcomed it into our streets, our homes, our studios, our pockets. It replaced the fireplace, paper, pencils, letters, books, ..., romance. It became a source of instant information, of instant culture, of instant money, of instant pleasure and instant love.

Picture 01
Reflection, Tiago Andrade Santos

The screen is like a mirror, when turned off. When on, it opens up a passage and we can answer Microsoft 's® question. I go through and on the other side I am still myself, "I see myself there where I am not, (...) [in a] virtual space that opens up behind the surface; I am over there, there where I am not, a sort of shadow that gives my own visibility to myself, that enables me to see myself there where I am absent "[2].

We meet our image in a space that extends beyond the surface that limits it. Reality isn't enough. This new self has been called "online identity"[3]. Where are we when we meet people online?

Picture 02
Alice, John Tenniel

I'd like you to remember a story of a little girl named Alice. She saw the mirror as a window and thought about how life was on the other side. She went "through the looking glass"[4] and found a different world, *a fantasy world*. She talked with chess figures, with flowers. She became a queen.

Something is definitely different. I see windows covered with antennas valuing the glass of the screen over the window view. I see the screen/mirror as a frontier. Not between reality and the virtual, but between two realities. A surface where we are able to control the reflection. Like Narcissus, we have fallen in love with our reflection. Technology has given us the chance to decide on which side of the frontier we want to live. We are spending more and more time in digital environments. We have become our own heterotopy, living

Picture 03
Antenna, Tiago Andrade Santos

inside the mirror in a kind of "consensual hallucination"[5]. Reality has become a dream.

So, has anyone seen Alice?

We live connected to the other side of the screen. We are inhabited by technology as much as we inhabit it. We have a self that lives digitally, as data, through technology. We are no longer complete without it. It flows in our blood, through our hearts (pace maker), enters us through the eyes (head mounted display) or fingers (data glove). It's under our skin (microchips), sometimes is our skin (data suite).

It also inhabits architecture. It's, on the ceilings, under the floor, in the walls, sometimes is the walls. Architecture is beginning to inhabit it as well.

Looking through the Glass

Picture 04
We are family, Patricia Piccinini

Some interesting art works question the relationship between humans and technology, and how it is infecting us. They aim to understand how we are changing, what we have become or can become. We are now a hybrid of skin and wires, eyes and screens, cells and bytes, blood and data. We have arrived at a point where we need technology to communicate, to understand, to have fun, pleasure, to feel close to someone, to make money or use it. We have changed as people. We have taken a new step in the evolution ladder.

We are now able to communicate in real time with others, to be always at reach, to work anywhere, to be present everywhere while being nowhere. Technology has changed how we communicate, how we relate to each other. It changed how we work, how we do business, how we consume, but did it change how we teach?

Communication is now mainly based on the eyes and the ability to read images. We buy things through images, we sell images and the relation to those images. Architects use powerful images to sell their projects and ideas. We do it based on experience and instinct, not on knowledge. Communicating with images is not part of the architect formation but in a world of images it's easy to learn.

Our bedroom has become a doorway to any virtual space of our choice and

Picture 03
Antenna, Tiago Andrade Santos

analogue architecture is rapidly loosing inhabitants to digital environments. Game spaces, Second Life world, chat rooms, etc, have millions of inhabitants at any time, more than many cities. These second spaces are rarely designed by architects. As Heidegger told us "the real plight in dwelling lies in this, that mortals ever search anew for the nature of dwelling, that they must ever learn to dwell."[6] Still mortals, we are learning to dwell in the digital. We dwell in these digital worlds and can even teleport ourselves around it. Who is designing these digital spaces? Some are designed by common people but most are designed by programmers and designers. It seems to me that architects would be more qualified to do so, if only they where prepared to do so.

Many architects, teachers and schools are still in denial that technology is rooting itself on every aspect of our lives, including our practice. This denial is denying students the information they will need to succeed in their practice in the near future.

Picture 05
Final Flight of the Osiris, Animatrix

If we use technology as an augmentation of our communication capabilities, of our memory, of our work production, of our geographical orientation, of our sexual fantasies, of our love, so too we use it as an augmentation of our reality, of our space. I would argue that we are learning to inhabit the digital space, and many of us are doing it frequently. Meanwhile, architecture's denial defines this space as false, not real, not architecture.

It's clear that "if man understands that technology is at his reach he realises it, like it's damn near instinctive."[7] We should acknowledge that the computer is not a machine to use as a pencil or ruler, but a machine to think with. As the notebook and pencil were (and may still be) our partners in thinking and designing, our hardware and software should also be viewed as partners. There is a kind of technological instinct that will be necessary to survive in the future and students should be oriented to develop it.

Francis Ford Coppola has said: "technology is always an element of creativity, it is never its source."[8] So, if we have taught how to use the brush and paint, we should also teach how to use the mouse, how to think with the computer, how to

use software to our advantage.

Architecture is still taught as it was many years ago. But in reality it is done differently than it was. We now have computers in our office. Every year, new software updates are released, more powerful computers are available. Soon, “the rate of change will be so hight that for humans to be qualified in a single discipline (...) will be as outdated as quill and parchment. Knowledge will be changing to fast for that. We will need to reskill ourselves constantly every decade just to keep a job”[9] This certainly applies to architects and students, it should also apply to schools and teachers. It seems Darwin is still right that "In the struggle for survival, the fittest win out at the expense of their rivals because they succeed in adapting themselves best to their environment."[10] So, those that will survive, will be the ones who best adapt. Are schools teaching students to adapt? Are schools adapting? How about teachers?

The technological instinct should be oriented and taught. Schools should help students understand and explore the digital instead of denying it. We should embrace technology and understand that it is a means, not an end in it self. It seems we are still in denial and waiting for the day when electricity is no more.

Picture 06
My avatar friends, s4th kidd

If one agrees with Heidegger that “we don’t dwell because we build, but we build and have built because we dwell, this is, because we are dwellers”[11] it makes sense that digital space is also possible to build. Building is a means do dwell[12]. “Only if we are capable of dwelling, only then can we build”[13]. We dwell in digital space, so we can build inside it. So digital architecture is architecture because it creates a site to dwell in, even if it is as data.

The views that architecture is a “question of building and that forms generated on screen are only utopic fantasies that don’t confront with the requisits tectonic of the real world”[14] are obsolete. Real world? Who defines what is real? Who defines what is architecture?

The arts were not always as they are now. Photography wasn’t always an art, it had to struggle and find its place in the art world. It is respected now. These changes

modify not only the way we represent things, but also the way we look at them. Digital architecture is also on the same battle. Digital architects are struggling for the respect of their piers as did the impressionist painters and other artists. Yes, I consider it as much art as any other.

There are new ways of designing, new methods of building, new ways of moulding materials, new ways of sharing information, new ways of inhabiting, but from what I know, very few schools have the knowledge to teach all the new advances.

Philip Bromberg argues that "our ways of describing “good parenting” must shift from an emphasis on confirming the child as a “core self” and on to helping a child develop the capacity to negotiate fluid transitions between “self stages”"[15]. Schools should be aware of the differences in how people live now, and adapt their way of communicating to contemporary reality. We, as Alice, need to search for a way to negotiate between our lives on each other side of the screen.

Alice stepped into a metaphysical world. For us, technology is a way of realizing the metaphysical of achieving and identity away from physical restraints.

So “when speed reaches a certain point, time and space collapse and distance seems to disappear. The very conditions of spaciotemporal experience are radically transformed. At this point, does architecture finally become immaterial?”[16] Can architecture be metaphysical?

I believe there can be a metaphysical architecture on the other side of the screen. A met@rchitecture, with its own rules or lack of them. A place where we, as data can dwell in data with other data.

On the other Side

With this in mind I started to investigate and experiment on the other side of the screen. If I can dwell digitally and relate to other digital selves, I can build a place for us to interact, a place where I can mix people and information and build a hybrid space.

Picture 07
Skin test, Tiago Andrade Santos

Using the available data as material I can use anyone that inhabits the space to build it, and if I use a person to create a space, I can relate to space as I do to a person. So, how could I build an architectural space that I could relate as I do to some person?

Picture 08
Fur test, Tiago Andrade Santos

Picture 09
Lumpsite (entrance view), Tiago Andrade Santos

Picture 10
Lumpsite (back view), Tiago Andrade Santos

I started to try and find the human essence. What makes us relate to each other as people? I discarded the soul because I couldn't prove its existence. I also avoided the eyes because all animals have eyes. The human skin remained.

I begun to search for data to build the human skin. I needed it to behave as skin: to wrinkle, to reflect light and to be translucid in the thin areas. I needed it to connect with the inhabitant in a strong way, to lead people to come closer or to repel them according to the strength of the design.

The first skin I was able to "build" was unprotected. Bare skin. Something was missing. Hair started to grow out of it. At the same space, a space was created. The result was a space that was supposed to be a website where you could dwell around it.

These investigations have been useful for me in the exploration on the digital environment as inhabitable and in questioning what we can build on the other side of the screen. It was also interesting to search for a human relation to something that is not human, not even matters. Unfortunately most of the 3d digital spaces available online are a mere reflection of the physical world. We go to SecondLife and we have islands, water, sun, trees. Cyberspace should not be a mere

duplication of physical space. This "imitation" of the physical world may be a result of the lack of questioning of the possibilities of the digital realm. Do we really need to imitate a tree to feel it? It's time to be free. If we are now beginning to build somewhere that is nowhere, it shouldn't just imitate anywhere that is somewhere. Let's be free. Let's get rid of the every little rule that has controlled the design of space and build our *fantasy world*, with no palm trees please!

"One day the day will come, when the day will not come."[17] Untill then, "architects of all dimensions, there is an immense amount of work to be done!"[18]

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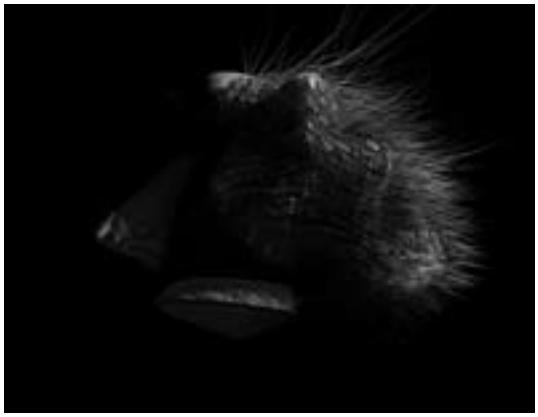
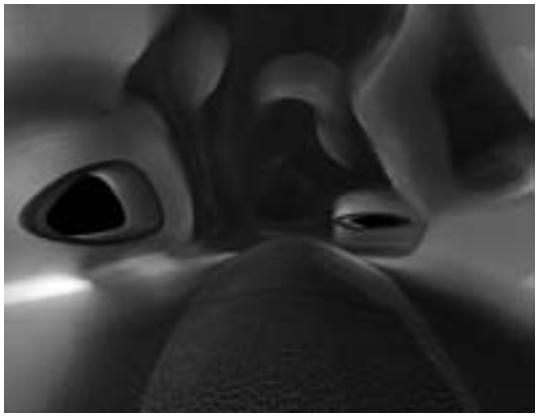


Picture 11
Lumpsite (side view), Tiago Andrade Santos

Picture 12
Lumpsite (side view), Tiago Andrade Santos



Picture 13
Lumpsite (interior view), Tiago Andrade Santos

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Rivka Oxman

New Media – New Didactic
Experimental Teaching in the Digital Design Studio

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New media and digital techniques are now beginning to impact processes of design thinking and exploration. It enhances certain methodologies of formation, generation and performance-based design that were never before available in conventional, paper-based methods. Theories and methods of digital design can no longer be conceptualized as the *merging* of computational tools with conventional formulations of design. A new orientation to understanding the impact of digital media on "digital design thinking and pedagogy is presented discussed and demonstrated.

Introduction

Theories and methods of digital design can no longer be conceptualized as the *merging* of computational tools with conventional formulations of design. There is the need to pioneer a new understanding of the *nature of designing* in relation to *digital design media*. If the very nature of design is radically changing, how then can we accommodate and recognize emerging theories of design as the basis for a new pedagogy? It has now become important to consider the significance of terms such as *"digital design thinking"* and what they might imply with respect to new approaches of design education. If digital design thinking constitutes a new conceptualization, including concepts as the meaning of form, the nature of functional and formal knowledge in design, and generative processes, then there is a need for a new pedagogy. Furthermore, the evolution of digital design theory, the theoretical discourse and the representational capabilities of the new digital media are introducing today new body of relevant knowledge and new concepts related to complex geometry, form, space, structure and material. As the result, new forms of architectural design and architectural production bring educators to re-think traditional didactics, and encourage them to be experimental, test new pedagogical ideas and formulate new ways of teaching.

The conventional educational model in the design studio generally employs a simulation of praxis as a didactic model. That is, the didactic stages are driven by a theoretical interpretation of program, site and conditions carried through stages of conceptualization, schematic design and design development. Furthermore, most studios still employ well accepted knowledge-bases and typologies as well as traditional paper-based sketches as media of what was referred to as a conceptual and explorative medium. Schön's classic characterization of visual representation in the design as a "dialogue with the (drawing) *materials* of the problem" and the process of "backtalk" from visual images (Schön, 1988) are still the dominant model for teaching in the design studio. However, as we attempt to reevaluate the logic of the Schön model, we find the need to re-define the concept of *representation* and to understand the impact of digital design in design thinking.

However, if indeed, contemporary phenomena of "digital design thinking" are different from traditional models, than there is emerging pressure to pioneer new teaching paradigms (Kvan et. al., 2004). Within the framework of this orientation to a critical formulation of new educational agenda, the following issues are considered:

- Are we encountering new paradigms of design, or are we essentially encountering the same cognitive phenomena of known processes of design thinking in the new digital media?

- Is digital design so different from traditional paper-based design that many of our root concepts must be reformulated? If this is the case, how then, can we begin to conceptualize and formulate "digital design thinking"?
- Furthermore, if conventional teaching approaches are obsolete, what are we teaching when we teach about the design media? Are we, in fact, teaching novel design paradigms?

In the context of an experimental design studio we explore and identify these issues, evaluate findings, suggest and test appropriate new didactic principles. The objectives of our initial experimental studio are to take first steps through a process rethinking many of the root assumptions of current computational conventions. We determine the relevance of these findings for conceptualizing new pedagogy in the design studio, and carried out and evaluated these approaches in a series of experimental studios.

A basic finding is that we are, in fact, facing new cognitive terrain in design thinking and that there is a need to formulate a new cognitive basis and rationale for digital design didactics. Therefore, teaching digital design demands new teaching approach from those applied in the traditional design studio. This new rationale demands, among other things, a theoretical basis and a new conceptual vocabulary. It is this change of conceptual structure that is so demanding an intellectual challenge. In the following sections we present and illustrate our experiments in relation to these issues as they have emerged through our experimental research and teaching in the studio.

Theoretical Basis of the New Rationale

The evolution of digital design as a unique field of design endeavor, motivated by its own body of theoretical sources, and a culture of discourse, is beginning to evolve unique ideology, methodologies and formal content (Oxman, 2006; Liu, 2005; Kolarevic, 2003). Given the growing amplitude of issues and subjects in digital design as witnessed by practice, research and education, we need to formulate a theoretical framework that is suitable to the formation of design educational theory.

Some indicators of the emergence of a new ideology

The awareness of change induced by conceptual conflicts between traditional and digital design are stimulating the need for a conceptualization of digital design foundations. Among these conceptual conflicts are encounters between certain root assumptions of modernist design and the contradictions that have emerged with digital design. Among these are the following.

- Digital design thinking is more than simply a set of formal preferences. It is the *abandonment of the modernist design ontology* that is predicated upon formal and typological knowledge (e.g. formal languages, typological classes and generic design, etc.) It is non-typological and non-deterministic in supporting and preferring the differentiated over the discrete and the typological.
- There is emerging a *new symbiosis* between the digital product of design and the way it is conceived, generated and produced in digital media. These stages are

fundamentally different from those of modernist design. It is the understanding and formulation of this procedural symbiotic relationship between conception, generation, production and the product itself that appears to be of high priority today.

- Digital technologies appear to have *freed the image from traditional concepts of representation*. We no longer represent discrete shapes in the conventional paper-based sense. This condition has enhanced the denial of classical notions of representational conventions such as static space, and has introduced new concepts of dynamic and responsive space and form that are producing new classes of designs.
- In many cases approaches to form generation exploit *emergence-based transformational processes* in which digital media are the enabling environment. This in many ways is *replacing the experimental visual nature of the paper-based sketching process*.
- Context in the modernist sense may possess iconic, stylistic, or configurative content that can implicate design through visual or formal content. Context in digital design is considered *a performative shaping force* acting upon shape and form.

Paradigmatic classes of digital design models

These indications of conceptual change have emerged the formulation of design models, the conceptual content and vocabulary of digital design. A formulation through the identification of relevant early models of design has been developed by the author (Oxman, 2006). The classification of paradigmatic models include: CAD models, formation models, generative models, performance models and integrated compound models. This classification enables the definition of underlying current digital design models.

1. CAD: Early CAD models marked an attempt to depart from paper-based media. They had little qualitative effect on design in comparison to conventional paper-based models. In traditional CAD the interaction with formal representations supports the a *posteriori* automation of design drawings and visual models. First CAD systems were mainly descriptive, employing various geometrical modeling / rendering software.
2. Formation: In digital design the centrality of traditional concepts of paper-based representation are no longer valid conceptions for explicating the thinking and processes associated with digital design. Furthermore, in certain *formation* processes of digital design the formal implications of the concept of representation are negative and unproductive. Emerging design theory has transformed the concept of form into the concept of *formation* associated with *topological, parametric and animation*. *Topological design* is based on the exploitation of topology and non-Euclidean geometry. *Parametric design* is based on principles of generative components (Burry, 1997). Animation, morphing and other range of motion and time-based modeling techniques are based on the propagation of multiple discrete instantiations in a dynamic continuum.
3. Generation: generative models of digital design are characterized by the provi-

sion of computational mechanisms for formalized generation processes. Here, as compared to formation models, shapes and forms are considered to be a result of pre-formulated generative processes. Currently there is a rich theoretical body of research-related applications of generative models. Two main distinct current sub-approaches are shape grammars (Stiny, 1980; Knight and Stiny, 2001) and evolutionary models (Frazer, 2002).

4. Performance: performance-based models are driven by performance and potentially integrated with formation and generative processes. Forces in a given context are fundamental to form-making in digital design. External forces may be considered as environmental forces including structural loads, acoustics, transportation, site, program etc. Information itself is also considered as an external "force" that can manipulate the design.

From Conceptual Content to Didactic Principles

We have attempted to build educational content by explicating the new conceptual structure of digital design. In reality, the integration and interaction of technological content with that of conceptual content is obviously part of the formative process of learning to design with media. However, the exploitation and experimentation with new concepts can prove to be an articulate environment for design learning (Oxman, 2003) in which learning by making is transfigured by its conceptual, rather than computational, content. Given that a rigorous formulation of such emerging concepts does not yet exist, any work based upon an as yet unformulated body of theory must by necessity be in itself experimental. A logical first step to such exploratory work is to begin to sketch the outlines and principles of a theoretical order.

Beyond formal representational design

The first stage of such a conceptual mapping is predicated upon the prevailing models of design at the level of their own conceptual structures. The prevailing model of modernist design is a formalist model in the profound sense of what we might term *design ontology*. Modernist design is formulated about the sequential development of symbolic representations of the design. It traditionally begins with considerations of space, with the major emphasis being upon the manipulation of visualizations of the design object –the design of form – through the stages of conceptual design, schematics, design development and materialization. The formal foundations of modern art and design have been theoretically defined and the evolutionary process of formal-graphical evolution in design representation has been well-formulated by various theoreticians.

We are now moving beyond this formal syndrome. The parametric, topological, geometric and generative characteristics of current digital design (Lynn, 1999) are in profound theoretical contradiction to shape production in the formalist models. Irrespective of how unique that shape may be, it is still the process of shape production as the production of a static form. Digital design characterized by generative processes related to movement and time is neither formalistic nor static. Form

generation, beyond formalism, produces conditions of pliancy and continuity in both the conception and geometry of form.

Formation; Generation; and Performance: pedagogical implications

Formation, generation and performance are the motivating forces in the new design. They, as concepts and processes, begin to condition new design procedures that are uniquely conceptual. To some extent, these conceptual stages - in the establishment of an appropriate *morphology* for the design- are also non-contextual. *Shreds, Strands, Bleps, Flowers* and *Folds* are among Lynn's (1999) interpretations of the morphologies of digital form.

First material, then generative procedure, and then performance appear to be the *methodological sequence of digital design*. It is this methodological sequence of procedures that supports the preference for time-related transformational states in place of the representation of static design representations.

This characterization of the digital design model is completely contradictory to models of design such as Schön's "reflective practitioner" in which the visual representation of the design is manipulated by visual reasoning through a succession of stages generally in the medium of sketching. This interpretation of sketching as design thinking through iterative stages of visual discovery is the antithesis of the digital model. Digital design brings new design ontology beyond the visual interpretation of form.

The digital medium and design process

A prime pedagogical goal is to define and explore the new understanding related to the impact of digital media through this concept of digital medium. One of a major aim in the studio was to demonstrate the methodological relevance of the concept of digital medium in relation to digital design processes.

Furthermore, in the studio the need for the integration of both the digital model and the physical model were found to be extremely meaningful for the conceptualization of *digital material*. Since current descriptive geometrical modeling lacks material and structural logic, the physical model provide a complementary medium. The physical model is still very useful for feel and touch in exploring principles of form, morphology and structure. Physical studies can then be translated into digital models for transformation and versioning.

Some conceptual principles for re-thinking digital design didactics

In the following section a didactic approach in guiding three different paradigmatic projects is presented and illustrated. Each project was developed by exploiting digital concepts and techniques that suited the theoretical and conceptual content of the project. Each conceptual basis presented the designer with a medium for the development of the material concept through its parametric and morphological evolution. In each of the following selected projects a conceptualization of digital material and a unique digital process appropriate to the material concept and to the type of media is presented.

Our didactic process consists of the following four basic tasks: the first task is to conceptualize and test a generic type of digital material. The second task is to define a unique responsive strategy for modification. The third task is to select a generative model. The fourth task is to select a context that can best demonstrate the behavior and applicability of the design material in relation to task specifications. In the following sections we demonstrate and illustrate these didactic steps in a series of selected projects.

Experimenting with digital forms: a boundary wall

The first project is termed "topological boundary wall". The specific context is related to a design program dealing with site conditions, programmatic aspects and constraints which vary along the length of a boundary line. The design medium in this project attempts to apply topology that maintains the same relations along the boarder line. It accommodates the new complexity of a certain topology (Emmer, 2005), departing from the more static and typologically deterministic logic and design methodologies of the previous generation (see figure 1). The changing requirements found along the boundary create a constantly changing condition of context and program along the otherwise continuous design of the boundary. Together, the performance-based technique and the definition of parameters produce differentiation and heterogeneity in the design rather than the instantiation of a particular style, or standardized, modular structure as is currently routinely applied irrespective of complex changes of program and conditions.

Figure 1
Topological Design of a Dynamic Boundary
(by Farah Farah- Technion)

Parametric design: an Urban Square

The next project is termed a "parametric urban structure". The digital medium is defined as a structural and morphological system of parametric modules (see figure 2). The design process resulted in the production of parametric differentiation of the continuous material morphology.

Generative principles: 'Texlight' MECHANISM

The third project was termed "texlight mechanism". The conceptualization of the digital material is based on morphological principles of woven textiles. This woven

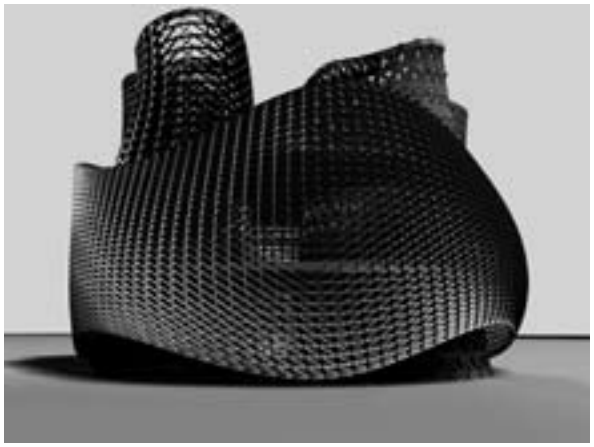

Figure 2
Parametric Design
(by Shoham Ben Ari- Technion)

Figure 3
Weaving Techniques
(by Alex Eitan and Tal Kasten - Technion)

material created an indeterminate range of heterogeneous folded profiles that were versions of folding and weaving principles. These profiles evolved to enable spatial, structural and environmental envelope functions within the woven matrix (see figure 3). The design transformations are defined by a set of syntactic rules (see figure 3). A Marina along the sea shore was selected as a context to inform the development of a continuously evolving structure.

Performance-based Design

This experiment involved the design of *responsive building skins* (see figure 4) that might protect a building from excessive wind loads, solar penetration and acoustical contextual problems such as urban noise. The responsive wall is a project that integrates a constructive skeleton that supports a dynamic surface structure. The skeleton has built-in sensors that can inform and simulate the dynamic motion of the skin which is designed as a system of scales.

The skin design itself has been generated by a performative simulation of wind force and light penetration. These forces produce dynamic effects on the skin. Ani-

mated techniques were employed to produce these dynamic simulations and performative effects. The objective in this model is that the formation of the skin/structure assembly will be generated by multiple performative conditions, all of which are dynamic. This condition of design models, that support multiple performative analyses in their componentized assembly, is highly representative of complex wall assemblies. In this case, the design objective is to support the dynamic behaviour in the various components in response to the dynamic nature of the wind and light loadings of the building surface. Animation studies were employed to model the formation process in which form generation was controlled according to types of simulations.

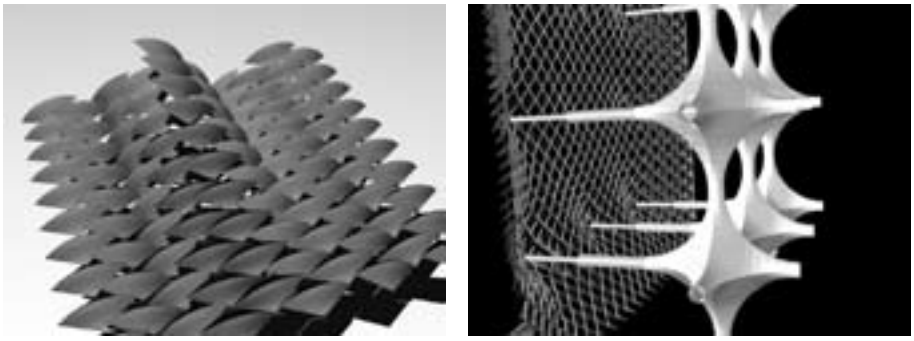

Figure 4
Performance-based Design
(by Shoham Ben Ari and Roey Hammer – Technion)

Summary and conclusions

Our experimental teaching is based on the integration of a theoretical module and an experimental module, both carried out in the framework of an experimental digital design studio.

The theoretical module emphasizes the departure from paper-based design concepts and sketch-based design that is based on visual representation and modification of images in design. We define the decline and transformation of root concepts in design theory such as *representation, precedent-based design, typologies*, and other principles of the *visual literacy* school of design pedagogy. New body of concepts such as hyper-continuities; connectivity and differentiation; morphogenesis, generative and performance-based design; materialization and production; etc. are introduced as a new theoretical basis. These are defined as a set of concepts deriving from the synergy of the digital technologies and the new theoretical discourse.

The second module is an experimental studio that is conceived of as the exploration of design research in digital design. It emphasizes digital design as a form of integrating a theoretical architectural content and a design method. The designation of the studio as an "experimental design studio" serves to free the student from expectations related to conventional processes involving functional programs, the conventionalized design sequence from concept, to space, to project representation, etc.

The process is not "project-oriented" in the conventional understanding of the term.

No program or specific site is presented at the inception of design. So this is not a conventional model of design from problem to solution. Once a generic system or a formal structure has been developed for research (see figures below), there is a need to demonstrate the functional potential and applicability of this system/formal structure.

The exploitation of models and their transformative potential becomes a focus of the search for a dynamic design medium. Rather than a conventional programmatic orientation of the studio, the experimentation is based upon the search for a structural mechanism-frequently a morphological, cellular, or a spatial, structural mechanism- that supports a potential for differentiation in response to performance requirements. The structural qualities of repetitive assemblies are experimented and their ability to react and respond to local forces through deformations and geometric transformations is explored. For example, such "natural responses" are view as attributes of the structure.

Given that the orientation is towards exploration and research rather than the production of a final product in the form of a one-off finished design, each student can be assigned a research task appropriate to his own interests and aptitudes. All work is in the form of multiple short design experiments which are finally produced by each student as a research report.

Acknowledgement

This chapter presents the work of the DDGR experimental group at the Faculty of Architecture and T.P. at the Technion, Israel. My students, Farah Farah; Tal Kesten, Alex Eitan, Shoham Ben Ari and Roey Hamer are acknowledged for their contributions.

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Joanna Crotch
Robert Mantho

Media, Technology and Teaching

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With the growing reliance on technology and other visual media to explore architectural ideas, has architectural pedagogy realigned itself with the evolving possibilities of the new technological age?

Second year students are balanced on a threshold where skills' learning morphs toward the creation of buildings, and further again toward the making of architecture. Our ideas centred on each student's acquisition of both a personal visual language and an individual intellectual framework, while connecting them to a historical culture and demonstrating the possibilities opened through experimental working method.

How can one engage students in the creation of a deep and broad body of knowledge and combine the possibilities of the new technologies available and also draw on a sound historical framework to deepen knowledge?

Using the existing stage two teaching frameworks – a traditional, well tried and tested series of programmes with a weighting on manually made drawings, as our context, we devised a new series of programmes which would encourage students to be more explorative in their investigations; while embedding these pieces in a series of 'events' with which the student would become intimately involved. All this aligned with the possibilities that technology can now offer.

"There is no architecture without action, no architecture without event, no architecture without programme. Actions qualify spaces as much as spaces qualify actions; that space and action are inseparable and that no proper interpretation of architecture, drawing, or notation can refuse to consider this fact"

Bernard Tschumi

Through this postulation a series of four programmes emerged that would run consecutively, each one informing the next, with the broadening knowledge base being cumulative. The premise for the programmes is that architecture is embodied and experimental, and activity that the building hosts is more relevant to the creation of that Architecture than the form given to the containers for activity.

The new programmes were timetabled to run from week three of term one through to the end of term two. It was proposed that the programme would consist of two strands. The first would concern itself with research, the acquisition of a visual language, and required the students to engage with three different mediums which we titled – Cubist space, Film Space and Digital Space. Each investigation would take between 2 – 3 weeks, with tutorials and reviews occurring regularly throughout the programmes. The second strand was the implementation of the acquired knowledge base, where the students were asked to design a building inspired and developed through their investigations. This element would last the full 10 weeks of term and encompass site visits and analysis, design development and completion, detailed design investigations; with structure and construction being addressed; and include tutorials, formal group discussions, peer reviews, interim and final and reviews.

The series of programmes began with the students being asked to select an activity. We were as non prescriptive as possible, and encouraged the selection to be on a subject that they were interested in, even if they were not currently active participants. The 'rules' for selection were that the activity should involve physical movement of the participants, should involve a group of around 10 people, and be available to be

viewed locally. As with any area of choice given to students, deliberation is lengthy, and we encouraged selection with the timetabling of a tutorial when the activity would be presented, discussed and approved. The student's selection was diverse, ranging from Chinese Dragon Dancing to Salsa to Tug of War and Skipping. We hoped that a broad range of activities would enrich the discussions and the outcomes of the exercises that we had planned. In retrospect we should have been more rigorous in our sanctioning of activities. Activities such as deep sea diving were not encouraged as we foresaw issues when the design of buildings came on stream. Other activities such as basketball and nursery play were allowed, but did present issues of scale and building typology that were not anticipated when we were writing the briefs.

The students were then required to observe, draw, diagram, photograph, and film the activity …… to become very familiar, intimate, with it. This involved firstly visiting the venues and observing. We encouraged to students to make multiple visits and record their observations in many modes. Revisits were also required during all three phases of the research programme. Meeting with the participants and discussing other aspects of the activity in terms of sensory response, rituals, traditions and other aspects embedded in the activity that were perhaps not initially evident to the observer. Students were also briefed to research the historical, physical, visual and sensual components, and at all times being aware of mood and movement over time.

The next task was to produce a 'narrative cubist' drawing of the activity paying particular attention to how the activity unfolds over time, and how the passage of time, movement and mood is depicted in the drawing. Initially through briefing and subsequent research, the students became more familiar with the principles and theory behind the Cubist movement, and hence used its principals to generate a 'narrative cubist piece' of their own, to represent their activity. The results were broad ranging in both the application of the cubist principles but also in the medium used. Curiosity regarding each other's work spurred discussion and debate, this was further fuelled by students out with the year group whose curiosity and interest in the programme was informed through an exhibition of the work that the students organised in the Schools own public gallery.

As with each task, the students were also asked to construct a series of plans and sections, in the first instance using their cubist drawing as the source - these drawings were not definitive – but speculative – design proposals. The making of these drawings caused much consternation amongst the group, as they grappled to demonstrate, what they perceived as conventional orthographic techniques being used to communicate information of a multiple image, where the space that they were being asked to reveal in part only appeared in their imaginations. Many of these constructs revealed fascinating spatial relationships between the moving bodies, which would not perhaps have been seen, let alone perceived without this exercise.

The first example illustrates the activity of Fencing through a Cubist construct. The student carefully observed and recorded the activity using sketches, photography and note taking. Using the sketches made during that process, the cubist image was created. The final cubist image (fig.1) represents several pairs of fencers in combat,

being overlooked by a referee, who can be seen at the bottom right of the image. The time frame represented is short, with limb and foil movement symbolized via the use of multiple images and colour. The student expressed motion and the precision of the activity through repeated use of geometric form and controlled line. The student's next step was to digitise the cubist drawing and extrude it into the third dimension. The scale and direction of the extrusion was driven by the duration and intensity of the movement as directly observed during the activity. Figure 2 illustrates the outcome of this step.

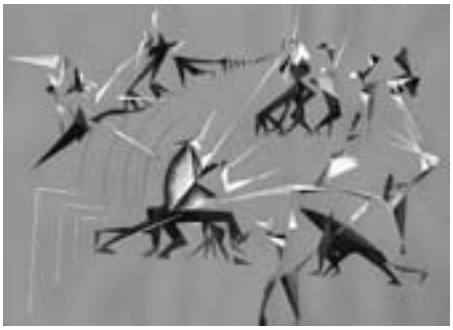

Fig. 1
Max Klaentschi, 2007

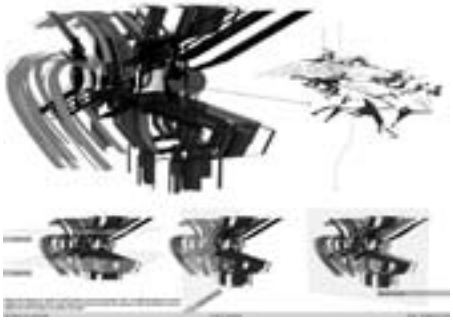

Fig. 2
Max Klaentschi, 2007

Cuts were then made through the digital model to generate plans and sections; an example of each is illustrated in figure 3 (plan), and figure 4 (section).

Fig. 3
Max Klaentschi, 2007

Fig. 4
Max Klaentschi, 2007

The plans and sections generated from the Cubist painting, via 3d digital transposition, have created complex and fascinating spatial constructs, where the intriguing spaces formed have been directly produced from the activity and are representative of both the physical and qualitative aspects of the event observed.

The second task involved the moving image, perceived as a comfortable and familiar medium of communication in modern society. The majority of students are of the

'MTV' generation, where all 'essential' information is perceived to be communicated via the TV/computer.

The students were required to revisit their chosen activity and carefully study the specific movements and spatial relationships created by the movement, and considering their previous work and the new understandings derived from it. The students were then required to construct a filmic document based on their observations and new insights. Any mode of recording was deemed acceptable, and editing and design of the piece was required. As students became more familiar with the movie making and editing programmes the filmic information became more controlled and edited, with a number film produced of a very high level, with layering of information and sound/music enhancing the record of the activity, thus contributing to and deepening the visual language.

As with the previous exercise, the students were required to construct a series of plans and sections through the created 'movie'. This component although relying on their previous knowledge of the conventions of plan and section, required a lateral approach as to how one constructs a perceived static construct to represent a moving image. Again consternation reigned. As with the cubist work, the students were encouraged to establish a set of rules to aid the construction of these drawings. With these rules in place, students became less anxious. As their confidence grew and they became more comfortable with the task, curious and provocative spatial relationships began to emerge.

The Film Space example represents one student's movie and the plans and sections that were generated from his Film Space. The student's chosen activity was 'Museum Going' and the film took the observer on a journey around Kelvingrove Art Gallery in Glasgow. Continued observations of the activity were made, firmly grounded in the cubist study. The route was carefully planed so as to move both horizontally and vertically and to capture special moments during the visit.

An SLR camera on rapid shoot mode was used, and then timing was adapted through power point to one shot/sec. The result was a rapid fly through this beautiful late Victorian Glasgow Institution. The student then had the challenge of representing this moving image in a static form and also generating plan and section from the film.

Figure 5 and 6 illustrate the final outcome. Static images from the movie were selected. The particular shots were selected on the basis of significant moments in the film i.e. change in direction, specific views etc., and spacing of these was dictated by actual time within the movie.

The 'journey line' is an abstraction of the journey taken, and represents the route in a linear format; recording vertical movement and change in direction. The physical dimension on plan determined the scale of the line.

Fig. 5
Michael Fedak, 2007

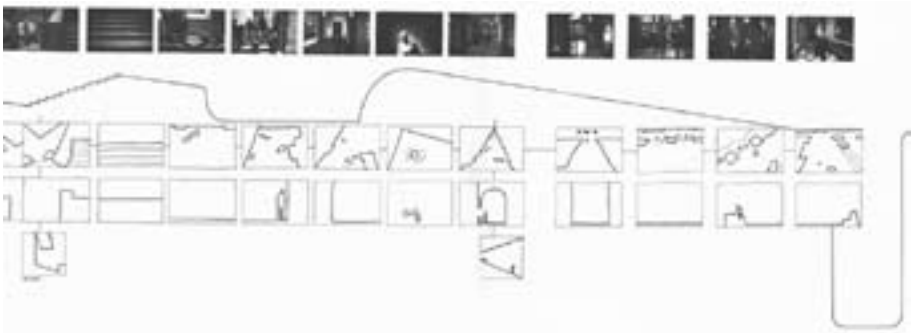

Fig. 6
Michael Fedak, 2007

The plans and sections were directly generated from the movie with the application of a set of rules enforced by the student. Each static image selected created a plan; actual depth was replaced by visual depth and form within the static images, and sections were then derived from the generated plan, with vertical dimensions taken from the observed dimensions of the museum.

The result is a series of distorted spaces, absorbing and speculative with an accompanying journey line that elegantly and holds the spatial exploration together.

The third task required the use of digital technologies to continue the student's ongoing research and investigation of their activity. The programme was explicit in its approach to the use of the computer as a tool to allow further, deeper visual exploration, where the digital media directly relates to the activity. Form and space are not being derived in isolation, but are anchored in the activity.

The students were encouraged to use the RHINO drawing package, which the entire student group had been introduced to, and subsequently used in the first year. This programme allows complex 3d geometries to be drawn with relative ease. We ran refresher courses to get less able students 'up to speed' and to help alleviate the technology hindering their creative processes. The results were various, with some very literal interpretation of the activity being studied, despite regular encouragement to experiment, in order to communicate movement across time in a static image. Experimentation into the possibilities that the computer offered was also encouraged, and some abstract representation emerged that in some cases visually communicated the more metaphysical qualities of the activities.

As in the previous 2 exercises, plans and section were required to be constructed of the digital model. The students were asked to consider carefully relationships between the participants, the physical container, light, sound and the sensual qualities of the activity all through the creation of a 3D computer generated model.

Taking all this into account the selection of the cut line was important and as the technology allowed for testing, in a way that had not been available with the manually produced constructs, with students encouraged to critique their work based on their stated intentions.

The example we have selected to illustrate the Digital Space component of the programme follows a student through the process, and is illustrated in figures 7-9.

The activity being studied is Salsa Dancing. The first stage was the generation of plans for the Film space (fig.7 & 8) where the space between a couple dancing was recorded with a series of lines. This exercise was then repeated with each couple and the spaces captured were linked. The time frame for these recordings was 10seconds. The development of these plans into three-dimensional constructs and finally into a digital model took a further three stages. Firstly the plan was taken into the third dimension by projecting a height on to the lines made; the static images taken from the movie were utilised to allow the correct elevation to be applied. The next stage was to translate the lines in to extruded forms. The last stage was to apply colours to each separate movement recorded. The colours selected were abstractions of the sensual and poetic nature of the activity.

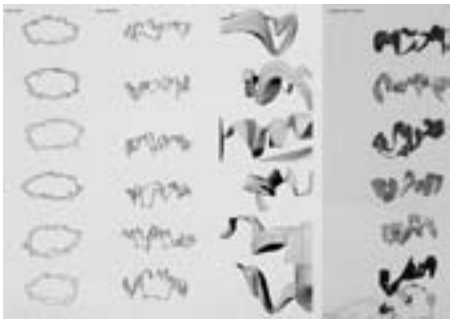

Fig. 7
Ed Eastham, 2007

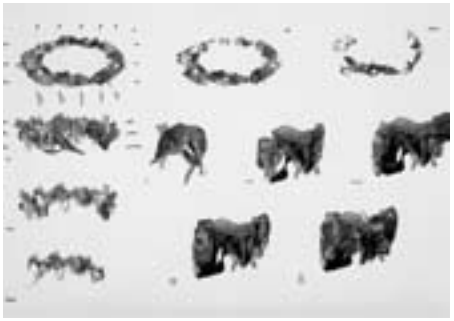

Fig. 8
Ed Eastham, 2007

Figure 9 illustrates all of these elements enmeshed, lit from within the form and overlaid on a context; in this instance a still image from the movie was layered in as the background. The fourth figure represents a further study carried out by the student. This intriguing and evocative expression of the activity was generated from the digital model, where six of the sections and plans that were created are layered upon one another.

Fig. 9
Ed Eastham, 2007

Fig. 10
Ed Eastham, 2007

The three programmes required the delivery of tutoring to be reconsidered, with the 'group tutorial' emerging as a successful learning and teaching tool, this allowed a dis-

cursive event with cross fertilization of ideas and an efficient delivery of the more factual information that the students requested. Reviewing, again had to be readdressed, with a year group of 96, and limited space and staff resources, a tightly timetabled and well managed series of events took place. Despite the formality of these occasions, the students were active in their critique of their peers work, as they all 'grappled' for clarity in their own work. We were aware that as the students' knowledge of their activity grew, and they became the 'experts', their confidence also grew, and with this new found confidence came a more discursive attitude, where the tutor was no longer the 'expert', but they were, resulting in a more democratic review environment.

The second strand, and the fourth and concluding part of the new programme was the design of a building in which to house their activity. Now, with the benefit of an individual intellectual framework and a personally developed visual language, the students were required to generate their own brief around a given generic framework, and a given site and context. Our expectation and belief was that the architecture that would emerge would be derived from a more informed and deeply investigated background. Spatial relationships, movement and mood captured in the previous programmes would manifest themselves in a proposal, where the activity and the investigations of it would form the core of the architectural endeavour.

The first stage was to meet the context. This was carefully examined in both the micro and the macro. It is often disappointing how students make site analysis, and hold on to it during the development of their idea. Despite a group programme, which included historical research, computer modelling and dimensional site recording, the sense of engagement with the site was disappointing. Perhaps this was due to the emphasis of the activity as the generator for the design – and students literally designing their buildings from the inside out. This is, to a certain extent what we had both envisaged and hoped that they would do – to draw on the depth of knowledge, and take reference from the exercises carried out to create and inform their architecture. The program development will pursue methods which more explicitly ties the activity to the context.

As the students developed their proposals, there were encouraged to revisit the work produced in term one, with sections and plans containing their spatial investigations. Students were also encouraged to explicit their newly developed skill sets and understandings.

Figures 11-12 illustrate the architecture that was generated following on from the research and investigations surrounding the activity. It is obviously impossible to say what might have developed if a more conventional design process had been adopted; but the language used and the spirit of space appears to have a direct correlation with the digital study, and hence grounding the building with its intended use.

Another challenge for this group of students is how they translate their investigations in to a paper format, as currently the A1 folio submission is demanded at the end of Stage Two, and it remains the format with which the summative assessment of the years work is made. Each of the three research components presents its own issues to be resolved by the students. With the Cubist piece, scale and medium for many of the students required thought in how they can comfortably place this work in the folio without losing the quality of original work, which in some cases, is significantly bigger than A1.

Fig. 11
Brendan Higgins, 2007

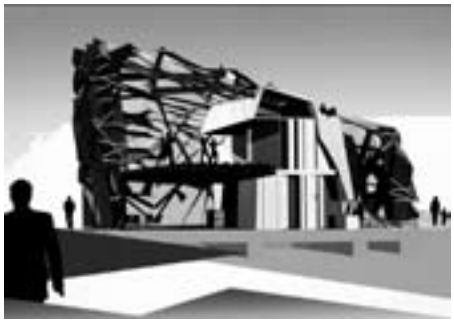

Fig. 12
Ed Eastham, 2007

With the Film Space, the students have to design how they represent their movie in static images and how their constructs can relate to these images. Again, scale is an issue as A1 become very restrictive a format for this 'freer' presentation.

The Digital Space programme is less problematic, in this programme control and editing is essential in order to represent the work appropriately. As a School we are questioning the appropriateness of such a restrictive submission format, and as Technology become the mainstay of the students work, digital submissions will have to be trialled.

Our perception of success of the programme is, of course anecdotal, and it is obviously impossible to assess what the results might have been if a more traditional design process had been taken. What is evident is that the use of the computer to generate drawings, particularly 3d images is more common place than in previous years. The students have been introduced to an alternative design process that they can draw on in the future, they have made investigations and revealed spatial relationships quite different to any previously encountered. In addition to this, they have engaged with, and become relatively competent with computer technology and used it as a design tool and not just a hi-tech pencil. Future development of the program will require students to move away from simple formal associations to the studied activity and help students carry the spatial discoveries and strategic thinking achieved during the research portion of the program into their design proposals.

Debate on the papers of Session 2

Chair:

Johannes Käferstein

School of Architecture
University of Applied Sciences, Vaduz
Liechtenstein

Johannes Käferstein, Vaduz, Liechtenstein
Let us begin our discussion.

Dimitris Papalexopoulos, Athens, Greece
It is a huge question and I am not going to attempt to answer it now. I just wanted to say that all the interventions were really excellent. And it seems, that finally, after a number of years, the Mackintosh School of Architecture and your surprises have come to join us. My question is almost a rhetorical one, but it could perhaps be answered in one or two words: do we intend to move towards a critical position at this time, even concerning our own work? How do you judge, in two words, your own work? Is everything OK? Are there any question marks concerning your own approach (not the surrounding reactions, money, etc. The question is how do we judge our own work, how do we judge our own teaching of work?

Robert Mantho, Glasgow, United Kingdom
Do you want me to answer that? Should I try?

Dimitris Papalexopoulos, Athens, Greece
Yes, in two words.

Robert Mantho, Glasgow, United Kingdom
In two words: very carefully.

Rivka Oxman, Haifa, Israel
I would answer also that you have to be very committed. You have to be dedicated and believe in what you do. It is like an experiment: it may be successful or it may be unsuccessful, but whatever findings you come up with will have value. But like anything else, you have to be committed and believe in what you do, but leave others to do as well. I said two words, so that is it.

Robert Mantho, Glasgow, United Kingdom
There is a joke in my family that we never make any decisions that are not spirally achieved. I do not know the answer to your question, and if knew I would not be here, I would be doing something else. My point is that we are on a journey, and I see our journey as just as important as the students' journey. They give us stuff, we give them stuff; the point is the discussion, the kind of dialogue that happens in the studio, which is sometimes accidental and sometimes very deliberate. We are going to go back and we are going to redesign this programme and we are going to find things that did not work this time that we can make work better next time, and we are going to find things that did work this time but will not work next time. In a sense, I think the whole teaching thing is involved with unknowing. If it was about knowing, it would not really be teaching, it would be some other knowledge transfer method that I do not understand. I do not know if that is much of an answer, but it is the best one I can give today. I think the very notion of how you assess needs to evolve and change.

Darren Dean, Kingston, United Kingdom
Because you are working in a traditional environment, do you have to work with pre-existing assessment criteria and trying to evolve those criteria into something that is acceptable to what you are doing? It basically relates to the last question: how do you judge? Do you have to take an existing body of criteria and change those, and if so how are you doing that?

Robert Mantho, Glasgow, United Kingdom
Yes, we do that, but we also exploit the cracks. There is a bit of using the criteria that we are given as a way of finding out some things about the criteria, if you see what I mean. We are forced to use a set of established criteria, but those are evolving and changing.

Joanna Crotch, Glasgow, United Kingdom
We are lucky, I guess, in that the people who wrote the Learning Act wrote the criteria so loosely that all we have to do is to interpret them in the way that we wish, which does give us that freedom.

Robert Mantho, Glasgow, United Kingdom
But it is also important to note that as much as it is traditional and there is a kind of resistance to change, there is also a real desire to change, but it is a desire that is founded on not wanting to lose things that people hold dear. So there is a glacial change; the learning outcomes are being redefined and will continue to be redefined in a very openhearted kind of way, but sometimes with a big "Whoa", if you know what I mean.

Rivka Oxman, Haifa, Israel
In my opinion, what is happening is that, first of all, the students are fought over, and what is interesting is that students are choosing their architects, choosing their offices. They have a direction and they know who they want; they have this kind of mission, and also of course they are accepted in the best schools to continue their research. And that probably means something, you know. It is out of the local context because it is referred to the global context. Frank Gehry believes in what he does. It may not be right for us, but he believes in what he does.

Johannes Käferstein, Vaduz, Liechtenstein
I would like to ask an open question, which I will ask again – I think – at the end of this conference. I do not think that there is time to answer it at the moment, but I would just like to put it before you. In the two sessions we have had, yesterday and today, there were excellent contributions and a lot of experimenting, and the theme of this conference is experimenting with architectural design. I refer also to the comment Nino and Per Olaf made yesterday, relating to changes in pedagogy and advances in technology. I have seen a lot of experimentation with the tool itself, a lot of experimentation with line and surface; but right now, and maybe someone will respond to this later, I think in our experimentation with the meaning of the line and the meaning of the surface, the construction, in my view it is possible also to

experiment in a different scale; and we have seen certain scales today and yesterday, experimentation with materiality and real experimentation with space. We have seen lots of models of communication, how to communicate, how to make pedagogy evolve and make it better, make it different; but somehow, and I do not know if you agree with me, for my part I would like to touch the material and right now I cannot really do that yet. So we will see in the next sessions, and I would really like an answer and your opinion on that matter.

Keynote Lecture

George Legendre

Design Technologies - Ten Years After

AA School of Architecture
London
United Kingdom

***George L. Legendre** has been unit Master of Diploma Unit 5 since 2002. He graduated from Harvard Graduate School of Design in 1994 and served as assistant Professor of Architecture at the GSD in 1995-2000. He was visiting Professor at ETH Zurich (2001) and Princeton University (2003-05). He is the author of IJP: The Book of Surfaces, Bodyline, as well as The Inversion Principle (2003-06, all AA Publications). His London-based office, IJP, explores the integration of space, mathematics and computation. IJP is presently building a 1000-foot long bridge in Singapore and doing competitions worldwide.*

Part I

I will do my best to address the brief of this particular venue: advances in technology, changes in pedagogy. My own title is a little misleading because I won't be discussing design technologies per se. What I am in interested in is how the recent leaps in technology re-actualize the key sources of individual creativity. So, granted, the advances in technology produce changes in pedagogy, especially in the last 10 years, but my own broad thesis is that we somehow have to move forward as well as backward, and often at the same time. I will try to make this clearer as we go.

I am in private practice, but I began my career as a full-time academic, first at the Harvard GSD and Princeton School of Architecture (1996-2003) and at the Architectural Association in London, where I have been leading Diploma Unit 5 since 2002. I am basically teaching 4th and 5th year undergraduate studio, as well as reading a theory seminar.

10-odd years of teaching is a long time, or long enough anyway to outline a broad and clear line of development for the work presented; but is that really so?

This is what my students were doing at the GSD back in 1996. It's a recreational centre. The brief was given; it was still lingering around from the days of Rafael Moneo's tenure as chair, though at the time it was nicely coordinated by Preston Scott Cohen.

Believe it or not, this is a first year, second semester architectural core studio. And this here is what my students are doing now in Diploma Unit 5, an undergraduate architecture studio, in fifth year. So what happened? There are no doors, no windows, no walls or roofs, nothing remotely recognizable as such. Has something been lost? I like to think that this act of disappearance may have something to do with the theme of this workshop, but I may be wrong.

As architects we are willing new things into being and in this sense we must come to grips with a rather fundamental issue: the transition from nothing to something. The variable 3D surface, which I am using as subject matter and vehicle of exploration in my writing, teaching and practice, is basically a pretext, and not just any pretext, but the worst pretext I could get hold of. I chose it precisely because it is seemingly unsuitable for architectural speculation. Unless you consider it purely aesthetically, the variable 3D surface is a messy business. It is very abstract, can be extremely technical and is resistant to ordinary means of analysis and representation. It is indifferent to materiality and programme: its structure says nothing about potential physicality. Building it requires extensive material reinterpretation, and so on.

And yet, if the emergence of materiality is what we are after, these fundamental constraints are not necessarily counterproductive. In fact they can even be of great help.

As a teacher, I like the computed surface BECAUSE IT offers us practical and theoretical challenges analogous to the challenges of a traditional architectural discourse, with the difference that the focus on materiality, iconicity, instrumentality and performance is SENSIBLY shifted: thinking about the surface is thinking about architecture by analogy, and the analogy is productive because it frees us from making direct and automatic assumptions. We don't have to worry, for instance, about

what things look like; or what they are supposed to look like; it is enough to focus on what they actually do.

For the past four years, Diploma Unit 5, my studio here at the AA, explored the twin paradigms of (1) descriptive notation the points and lines of projective geometry, on the RIGHT and (2) analytic geometry, the surface of modern mathematics and computation, on the LEFT. The distinction is purely historical and goes back to the time when algebraic symbolism broke free from the figures of geometry. Though personally I like to think of it at a more fundamental level, i.e. as the essential distinction between symbols and figures, between text and the image.

So you see, year in year out, the AA project review pages of Dip 5 are evenly split between the descriptive, and the analytical. I do not have time to elaborate on this key distinction, but the essence is that we do never draw or model form; instead we just write it.

The descriptive surface served Dip 5 well! This being an undergraduate studio, we approached the problem in narrative and playful terms, taking the human body as site. For about 3 years, we did short projects that took the body as site but never took directly from it, looking instead for surfaces modeled on the body's external envelope, its measurements and dimensions. In 2003 that material was collected in Bodyline.

Bodyline opens with the rather figurative meshes of contemporary computer gaming, and descends very quickly into abstraction. In descriptive terms it moves on to micro-narratives of pattern and garment in which the body is already all but unrecognizable. This one is about growth as a form of decay, a metaphoric look at the uncontrolled multiplication of cancer cells and the lethal distortions it visits on the sick body.

Bodyline closes with the work of our third and final year, in which the students drew stereotomic self-portraits using the projective networks of Mongean geometry, a mode of notation invented more than two hundred years ago. The briefs were very abstract; this one is about reciprocity, geometric inversion, or the act of collecting.

Technically speaking, this final chapter took us back to the ancient techniques of the eighteenth century, but, paradoxically, in its merciless abstraction, it also produces the most contemporary result: the human body disappears, and the subject itself emerges only through registration and technique, as is the case in the work of, say Pollock or De Kooning. So you see, our latest virtual visions can be art-historically backward, since in terms of gestalt, it is actually possible to move in two opposite directions at once.

Bodyline presents this contradiction in the form of an art-historical spoof, treating the software Maya and Character Studio as Ancestors, and Mongean geometry as 'contemporary'.

The question of course is whether this is of any use for architectural design. We did try to use it, starting from the obvious fact that it is a lot more difficult to draw a jacket than it is to draw a building. This is because pattern grading uses one plane, whereas architectural drawing uses at least two, and that extra difficulty is in itself very inviting. So we tried to extend building with the same techniques that you use to jump sizes in clothing, but the final result was a bit generic. The descriptive tech-

niques do not produce static drawings or models ; most of the time, if it is to make any sense, the project has to be performed, leading to demos that sound a bit like cookery demonstrations on breakfast TV (I don't have any videos of it with me).

There is, however, one project that I think did something with this in the end. The projective plane of descriptive geometry features a missing quadrant if you like, which does not exist in the sense that the 3 remaining three quadrants do. It is there only as a concession to the continuity of paper as a material support, and mathematically it is simply treated as the negative portion of the upper quadrant. But since it IS there we figured we might just draw on it and generally behave like it's an ordinary projective quadrant. So my student Hoi-Chi Ng rushed into this tear in the material fabric space and populated it with his own weird creations, leading to the development of an analogical Tokyo ward, as part of a studio experiment titled learning Japanese (2004). After this I chose to discontinue the line of pedagogical inquiry for two reasons. The first is that too many people simply saw all this as some kind of collage, and I don't blame them because it does look like one. The second reason is that the work was also often referred to as 'folding', a completely meaningless and reductive formulation if there ever was one. By the time we completed learning Japanese, we simply decided to move on to the fastest-growing area of our research, the analytic surface.

Part II

Exploring the surface is for me primarily a problem of notation, and for some time now I have chosen to approach it almost exclusively in writing. By writing I do not mean writing emails, but approaching the subject through symbols and marks, rather than figures and images. That is the nature of the analytic surface.

When it comes to creating new surfaces, writing takes on a different role altogether: it implies a direct recourse to generative symbols and marks. This is about using symbolic equations rather than ordinary surface software commands, or symbols rather than buttons and sliders. Working in this manner requires a Zen-like mindset. In the age of immediacy, super software and smooth person-machine interfaces, working with parametric equations, as I and my students do, means choosing the arid discipline of writing over the futile pleasures of modeling.

As this example clearly shows, the process of parametric generation produces a continuous surface made of lines, or threads. There are two sets of threads, one for i and one for j, and yes, these the symbols mentioned in the title of my book, IJP the Book of Surfaces.

The bottom line is that the surface of contemporary mathematics is just lines, or threads. Hence, the transition to materiality is usually straightforward. If the lines are two-dimensional, we can use them to define centerlines for parallel laser-cut material profiles, as shown on this slide by Asa Nilsson. The tectonic expression of this model emphasizes the reading of the longitudinal threads, which form the full body of the surface itself. The presence of the other range is somewhat obliterated:

only two threads are left to perform an elementary structural role, as you can see in the foreground.

Using the longitudinal indexical threads to dissociate the structural and skin-related functions of the surface makes a lot of sense, but it also comes from –and leads back to- the routine segregation of form and structure. It is difficult to resist the iconicity of the load-bearing spine, and Kun-Min Kim, who made this beautiful sample, must have had many ready-made references in mind.

And yet, in this example by my Princeton student Yusuke Okabayashi, it is clear that such decisions are pure problems of interpretation. If both indicial threads are given equal prominence, as is the case here, the resulting tectonic arrangement functions as a continuous, distributed and polycentric whole that blurs the boundaries between formal and structural functions. For this extraordinary example there is no blueprint, no pre-made reference, and certainly none of the staidness we casually associate with parallelism and flatness (and yet everything here is parallel and flat).

If the indicial threads are not two-dimensional, as shown on this math worksheet, we can use them to print doubly curved members in depth. The threads are effectively laminated from the ground up, as I described earlier.

The structural and morphological questions raised by this model are of course vastly different. This is a peculiar case of degenerate weave: a woven arrangement of indicial threads veering into a disorderly hyperactive pattern (in a seemingly uncontrollable cancerous mode, if you allow me the uneasy metaphor again). Threads that used to be parallel begin to intersect (the intersections are flagged in red) and half the form is becoming potentially self-structural. The other half is then removed (i.e. the transversal threads) and the remainder is laminated into a self-supporting structure that shares the morphological characteristics of half and whole.

In the end such choices may be traced back to basic questions of mathematical modulation: how many indices have you used in your equations? Are the transformations periodic? and so on. There are various machinery-friendly equations if you like, some better suited to sheet cutting, others to lamination.

My point here is that materiality does not ALWAYS begin with matter. The possibility of producing material undercuts, recesses, self-intersections, holes and other telltale signs of formal complexity is linked to the mathematical model's ability to describe variation, and to our own ability –and willingness– to qualify variation conceptually. Consider for instance the rather impressive medium of rapid prototyping: unlike the laser-cutter, its technically inferior counterpart, the one-to-one correspondence RP draws between data model and physical artifact eliminates the need for the kind of tectonic interpretations shown on the screen. Is that good or bad? As you can see, prototyping with tectonics and flat sheet cutting can be a much more intense proposition, so we are entitled to ask: is rapid prototyping primitive? Is laser cutting advanced? Both systems do one thing very well. I love splitting hair about instruments because deep down, and even on the surface, their limitations reflect our own.

Session 3.1

Chair:
Oliver Fritz
Liechtenstein University of Applied Sciences
School of Architecture
Vaduz
Liechtenstein

Pedro Ressano Garcia

Teaching and Experimenting with Architectural Design

Lusófona University
School of Architecture
Lisbon
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Does advance technology help architects think better?
And, does technology improve our skills to design and experiment better?

In this paper I shall not try to answer these questions but instead present a possible structure to analyse the influence of technology in the design process. I would argue that the use of technology does not substitute the moment of invention. But, it contributes for the exploration of solutions that are beyond what one had started at the beginning.

To evaluate if 3D and 4D are helping architects designing better I suggest the identification of two distinctive moments in the creative process: the moment of invention and the moment of discovery. They are both part of the design process, they are complementary and yet distinctive.

Invention is identified here, as one moment, happening at one shot when an idea or a concept appears. Students invent solutions in many different ways using various tools. In general, they cannot fully understand what they are inventing and it becomes necessary to know deeper what is being invented.

Discovery follows the first moment. That is to say, once the invention has taken place the student seek to know and explore the design proposal with 3D models and 4D video. Engaging the process of exploration and discovery, the student has the opportunity to design using the computer as one more tool. It is at this stage that experimenting with computers benefits design.

It is my perception that within this theoretical framework we may question if computers are helping students thinking better in both, the moment of invention and the moment of discovery. Or computers are constrained to help students exclusively at the second moment of discovery?

Frank O'Gehry, defends that it would have been impossible to explore with models what he had imagined without the support of computers. Relevant to say that Ghery has been using cutting edge technology since the late 80s.

Philip Jodidio, an art critic, in his book on new shapes in architecture, states the following "change occurs precisely when computers started to offer new hypothesis of project and clearly emphasized the emergency of a whole new range of architectural solutions that could not have been imagined earlier."

What Jodidio calls new range of architectural solutions, includes the invention and discovery of architecture that emerge from advanced technology. In short, computers are seen not just as one more tool for better development of design and exploration but are influencing architects. In this case, computers are helping students to think better. If this is true, how can we relate to ranges of architectural solutions produced before computers such as Horta, Gaudi, Lloyd Wright, Saarinen and many others?

To illustrate another perception of the invention's moment quote a Team X member responding to the question:
"How do you invent your architecture? The other day, I slept at a hotel. When I woke up, I noticed the pattern of the rug and the plan of the project I was imagining at

that moment. I took pictures. It is enough for my consciousness to be aware and understand (…)"
I would argue that advanced technology contributes to the exploration of unknown environments that ultimately, it is the student who selects them.

It is enough for their consciousness to be aware.

3D models and 4D video do not substitute the inventiveness but influence the design process and present a very powerful tool in the development of the design. Particularly in editing visual images that explore a new range of solutions to quote Jodidio.

In general, mathematicians do not use computers for their researches, and complex demonstrations, as architects do not rely on technology to invent, but take advantage for their design process. Advance technology is a useful tool, it is helping students getting to know better their design proposals and teachers should keep their consciousness awake.

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Kate Baker

Experiencing Space and Collaborative Design

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Preamble

Our students at Portsmouth love digital technology. Much of the time they spend designing is in a virtual world and they are quick to learn how to apply the latest software. This year we set an experimental project to counterbalance the virtual, and to encourage students to work in real time and real space. Architecture and Interior Design students were asked to research their own perception of space working collaboratively with artists, some of whom were disabled. They had two tasks: to create a collaborative performance, 130 second year students participating with the artists, and to make individual visual diaries, recording the process, and their own research. There was no restriction on how they could record and evaluate. Both students and collaborators; artists, dancers and musicians, found it very energising and a very positive experience.

Project: Space Exploration

Investigating the boundaries and sensory experience of space and building through movement and mark making, exploring ways that bodies and architectural space interconnect.

"Every touching experience of architecture is multi-sensory; qualities of matter, space and scale are measured equally by the eye, ear, nose, skin, tongue, skeleton and muscle. Architecture involves seven realms of sensory experience which interact and infuse each other."[1]

History

Last year I was approached to collaborate with disabled artists, to work together and to document a work, Squaring the Circle, as part of a bid to the UK Arts Council for a regional award. The bid was successful. The award ceremony took place within the building that houses the School of Architecture. Part of the ceremony included two site-specific dance performances. One of them was by Signdance Collective who is part of the team involved in the project. In September 2006, at a progress meeting, we were reflecting on how successful the dances had been, and we started to form an idea for collaborating more thoroughly with the students, using dance and exploring space through bodily movement, and recording it through drawing movement of the body in specific spatial contexts. It would provide an interesting platform for discussion both for understanding and perception of space, and of disability issues.

Our educational aims were

- To collaborate with other disciplines and investigate a new relationships with space.
- To explore different perceptions of our surroundings for greater spatial awareness beyond the visual
- To explore ways of embedding an understanding of disability issues through the body in space

- To explore space and its boundaries through gesture and mark
- To explore a series of connected spaces and narrative strategies
- To explore the possibilities of working constructively in peer groups
- To explore architectural and interior design as process

Process

The project took place over two weeks, with three structured days containing a series of workshops, lectures and demonstrations. It culminated in a performance that took place over the entire building and the exterior courtyards. With the guidance of the artists, students were asked to creatively explore their own environment. The purpose was to increase their understanding how our bodies and space interconnect, how this connection can be explored through the performative nature of drawing, and how this exercise can be a precursor to Architectural and Interior Design. Working with disabled artists provided the opportunity for students to re-assess their attitudes toward sensory perception. Their insights were key to the project, for example, one of the dancers is profoundly deaf, has a highly developed sense of space using senses other than hearing. All students kept a sketchbook. This would be a record of the development of the project including their progress within the group, and their own research into disability and experimentation with drawing and recording.

Organisation

To manage the numbers, students were broken down into 4 groups. Each group had a designated 'journey' to investigate, set in and around the School of Architecture. Each journey varied, but had 3 characteristics in common: a large static space to start in with freedom to move around in, followed by a narrower elongated connecting space, and finally, our large atrium. Each group was also allocated an artist and musician. The group was also allocated a 'sense' to research: sight, sound, touch and smell. This provided a 'theme' to their exploration, and allowed discussion over a range of disabilities.

Fig 1
Start of Project

Day 1

Main aim of the day: To introduce students to the scope of project: disability awareness, working collaboratively as a group with the artist, new techniques of working such as dance and movement, drawing as mark-making.

Participants: 2 dancers, 2 musicians, 1 sound artist, 3 visual artists, 1 co-ordinator, 8 tutors, 130 students.

1. Introduction
2. Group exercise, whole year: Icebreaker session - movement
3. Exploration of given spaces/journeys for each of the 4 groups
4. Lecture. Drawing and recording the body in space
5. Group exercise, whole year: Explore 3 movements in relation to space/building horizontal, vertical, circular.
6. Exploring the body in space. Drawing/movement exercise in groups
7. Presentation of initial ideas.

Fig 2
End of Day 1

We deliberately filled day 1 with a full programme. It threw the students into it. They were confused, but even the sceptics became involved by the close of the session.

Signdance Collective started with an icebreaker workshop to help students (and staff) to lose their inhibitions over moving in front of others. We stressed that they were not trying to be dancers, but exploring them through movement and bodily engagement. Day 1 had to be a build up of how the tasks we'd set the students; movement, drawing, performance, are interlinked. A workshop at the end of the day where they presented their initial ideas forced them to make progress. Although many students were still unclear about its relevance to their preconceptions of architectural design education, they produced promising ideas.


Figs 3 - 4
Group drawing - Experimenting with tape

Days 2-3

Students continue their own research. No structured workshops.

Day 4

Main aim of day: Map and choreograph the spatial sequence of the journey. Dancers/musicians to build on Monday's exercises, to develop phrases of movement and expand the students' vocabulary.
Participants: 2 dancers, 3 musicians, 1 sound artist, 1 co-ordinator, 130 students.

1. Warm up. All participants
2. Explore space and movement in space on location.
   Groups work in allocated spaces.
   - Groups continue to explore their spaces through movement, and drawing.
   - Choreography and recording to be completed in draft by the end of the day.
3. Feedback

The day started in a similar way to Monday, but the students had more confidence in their ability to move effectively. With fewer staff, students took greater ownership of their work, and were very involved, and committed to the project. Choreography took priority over drawing with the absence of the visual artists, giving the students more time to work in an area that was new to most of them. De-briefing with staff at the end of the session was again necessary, and adjustments to the following day's schedule made where necessary.

Day 5-9

Students continue their own research. No structured workshops.

Day 10

Main aim of day: to complete choreography/recording. Performance

Work to be brought together for interactive event with intersecting dance and drawing. Drawings and building being used as an integral backdrop to the dance work.

Each group of students/musicians/artists to re-enact their exploration through dance, music, drawing/video

Participants: 3 dancers, 4 musicians, 1 sound artist, 3 visual artists, 1 co-ordinator, 8 tutors, 130 students.

1. Meeting. All participants.
2. Warm up. All participants.
3. Final Choreography and Artwork. Groups. Develop movement to express and explain the journey, finalising drawings/ digital data for use in the performance.
4. Technical session.
5. Performance.

The day started with enthusiasm, with all students arriving in costume. (One colour allocated to each group). By mid-day there was disarray, with fall-out among students, and even some of the artists, over the final presentations. The moment had come when ideas had to be finally shaken out and turned from a series of connected ideas into a coherent performance. Some students argued, and some did nothing, until the pressure was really on. Finally through the guidance of dancers artists and tutors, they coc-operated, and put together an abundance of work that they had been preparing over the last 9 days.

- 3.45pm Each group is positioned in its first location
- 4 pm audience arrives at empty atrium, and divided into 4.
- Each audience group is directed to one of the 4 student groups.
- As they arrive the students and musicians start their performance, through the spaces.
- Audience follows.
- All finally arrive in atrium
- Musicians leave individual groups and form a band
- Students finish their dance accompanied by band
- Band continues
- Performance ends with band accompanying students as they take down the props and atrium reverts to it normal self.

Day 11-13

Work on diaries

Day 14

Hand in Sketch Books

Fig 5
Drawing dance

Fig 6
Start of performance

Fig 7
Performance

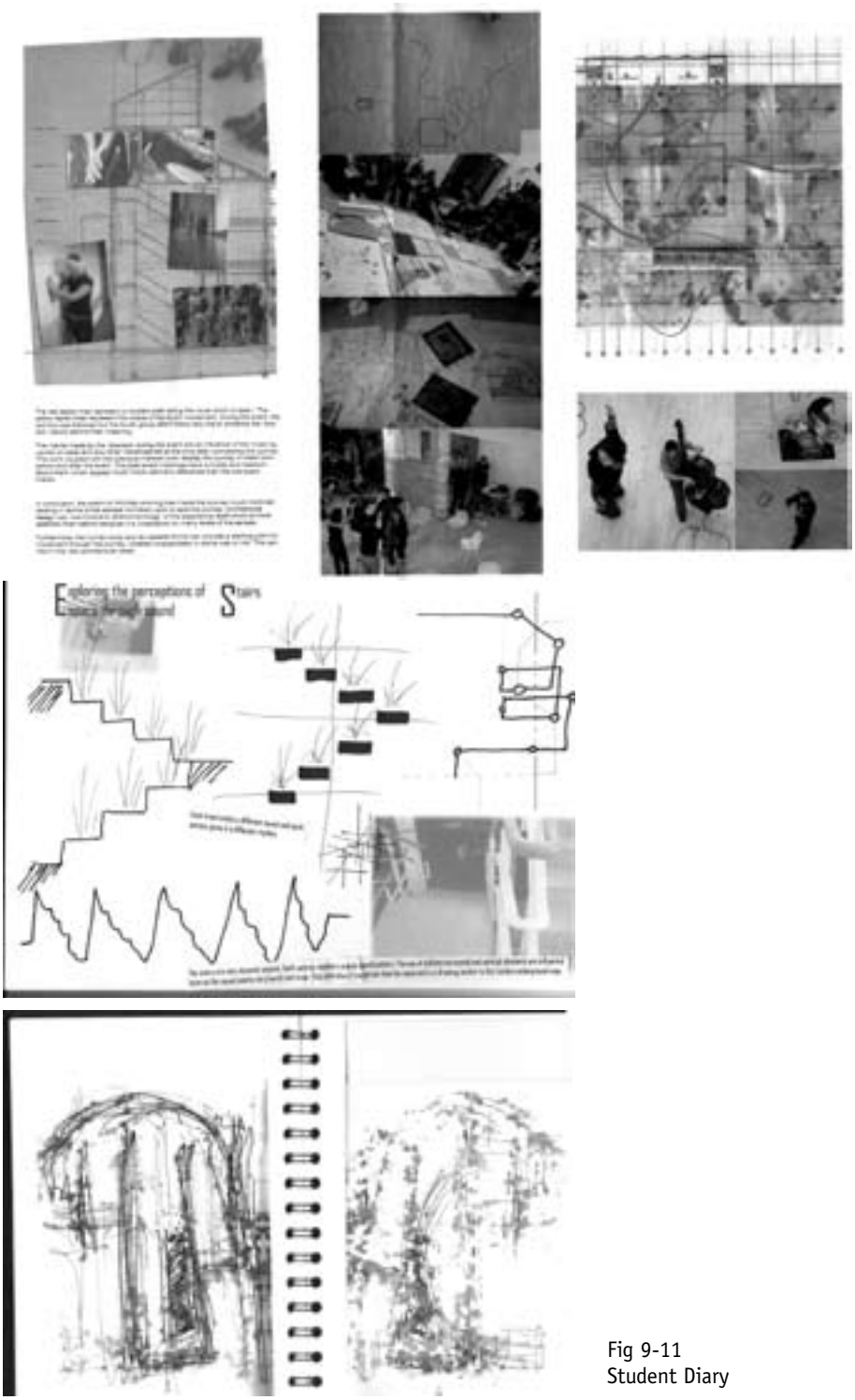

Fig 9-11
Student Diary

Conclusions

Collaboration

- Disability Awareness. The disabled artists demonstrated to the students that they were not 'other people' with problems that had to be dealt with along with other building regulation issues, and taking disability issues seriously can be a creative process in design. It also taught us that a disability to us is not necessarily a disability to the person concerned.
- Perception of space. It helped us understand the complexities of sensory awareness. Although we started off with an emphasis on one sense to investigate in each group, it became apparent just how much our sensory perceptions are linked and interdependent. Exploration through movement and direct physical involvement altered the students' perceptions.
- Dance and music played a major part in the cohesion of the groups.
- Crossover of artistic disciplines during the project stimulated much conversation and debate. This was not always harmonious, and added considerable edge to the project. Having the performance as an end point provided us with a common aim and deadline which gave the work a focus and direction.
- The artists encouraged the students to think beyond conventional drawing to express their ideas, particularly by testing the potential for performative nature of drawing, and experimenting with movement and time.
- Pre-meetings. Over a period of 5 months, a core team met periodically. It was a challenge, as although we had heard of other similar projects such as "Between the Lines"[2] there were few precedents, particularly with involvement of disabled artists. The sessions were very productive. The main challenge was to work our way through the complexity of aims of all concerned.

Student Experience

- Group Work was successful for the following reasons:
  1. Year 2 is a good year for experiment. Students have acquired some basic skills and are not yet focussed on their degrees.
  2. Although we had large numbers, the architecture students were in the studio groups they had been in for the first semester, and were already familiar with each other. Interior students had to be allocated to each, and integrated well.
  3. Empowerment of students. Groups worked autonomously with tutors intervening as advisors only.
  4. Warm up/ice breaker sessions put everyone on a similar footing from the start.
  5. The diversity of the project allowed students with different strengths to flourish, and participate.
- *Working with the artists*. By engaging with artists from a range of disciplines, students were able to explore their own perceptions of space that took them beyond visual understanding which currently dominates in architectural and interior education.

- *Choreography/movement*. All students involved themselves in movement, dance and the idea of choreography, the moving body in relation to building and landscape. The first day was critical for total immersion. After that, enough students felt they owned the project sufficiently to move freely. With guidance from the dancers it allowed them to reflect on how we fill the spaces we design.
- *The performance* was important as an end point. It gave the students a goal to reach, but more importantly it provided them with the opportunity to be part of an event that was itself a creative piece. The immediacy of this was in stark contrast to the usual models, drawing and virtual reality of the output for standard design projects that can only ever be *representative* of the artefact.
- *Recording* Students recorded their work at every stage. This enabled them to see that their work was emerging out of the process, and the process itself was important. In many cases their diaries became small artworks of investigation, with a mixture of experimental image making, and research into other artists, disability, anthropometrics etc. Drawings and images that had emerged were created and used in the final performance.
- *Impact as a preamble to architectural design*. Although the performance and diaries are about this particular project, we hope that the experience will act as a point of departure for the students' next project, and inform a continuing design process.

Notes

1 Juhani Pallasmaa from his essay *An Architecture of the Seven Senses Questions of Perception* Steven Holl, Juhani Pallasmaa, Alberto Perez-Gomez Chapter-. ISBN 4-900211-48-C3052P3000E

2 Rachel Sara, Alice Sarah from their paper *Between the Lines: Experiencing Space Through Dance*, CEBE Transactions, Vol 3, Issue 1, April 2006, pp 95-105 (11) ISBN 1745-0322

Invited Artists

Artists: Belinda Mitchell, Trish Bould Kathy Oldridge, Mitchell Bould Artists, Jon Adams
Dancers: Isolte Avala, David Bower Charlie, Signdance Collective
Musicians: Luke Barlow, Mark, Alex, Leron, Luke Barlow Band

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Images

1 Start of project Kathy Old ridge
2 End of Day Author
3 Group Drawings Author
4 Experimenting with tape Trish Bould
5 Drawing dance Simon Drayson
6 Performance Author
7 Performance Author
8 Performance
9 Diary Paul Cahsin
10 Diary Stephen Dryburg
11 Diary Simon Roscoe

Appendix

Drawing and Recording

Group 1 Library Sound and text
Students were made aware of how hearing sound affects all the other senses, and our perception is interconnected. Students started with quite conventional plans. Using words as well, they manipulated drawings that become expressive of their experience of moving in a space that has a very specific purpose and shape. Manipulation of words contributed to their ability to describe the feeling of the space.

Group 2 Upper Terrace Sight
As with touch, the students started off by blindfolding themselves. It is so taken for granted that we use our eyes to see and understand the world. A more productive exercise was to have one person in the middle of a group who guided him; He could see but was not in control of his contact with the space around him. This progressed to exploring the potential of the space for movement, and their relationship with 'bounded space' and the 'space beyond'.

Group 3 Liongate Courtyard. Taste
Taste was the most difficult. The link with the canteen was tenuous, and the group concentrated on breathing and inhaling. This could be translated into body movement and freedom to dance

within the space. Dance. Inhaling, reaching up, building up energy before moving around and reaching out to the edges. This was contrasted to contact with the ground, and the ground plane. Drawing interacted here with the body where tape was used instead of paper and pencil as a way of drawing stasis and connectedness of the body.

Group 4 Architecture Studio Touch
The students started off by blindfolding themselves, and soon realised that all it was doing was to prevent them from seeing and not helping them understand touch. Touch is interconnected with the whole, and as soon as the students started to explore through movement and with each other they made progress, and could start to record the process. Involving themselves bodily with the work also gave rise to expressing our tactile relationship with the space. Making use of the everyday use of the space was another way in.

Student Self Evaluation

"I felt I have learnt an unexpected amount from the dance and drawing workshops. Prior to this project my comprehension of disabled access was limited as a list of regulations set out in the 'Architect's Pocket book', ramps and widened corridors. However in reality, disabled access is an opportunity for a building to truly improve the experience fro the 8% of the population registered disabled.
I have redressed the tendency to stereotype the disabled, as a group of people with a weakness, for this is more often than not, widely off the mark. In fact David and Isolte taught me that in most cases a disabled person would not choose to trade for a fully abled body, instead a disability can define a person and make them stronger. Watching David, who is totally deaf, in perfect harmony with the music, dissolved any thought of his disability being a 'weakness'. So next time, and every time I am designing a building, I will think of Isolte moving so gracefully in the face of her acute arthritis, of David and the others with their finely homed senses and ask myself what my design can offer them."

Elzbieta Trocka-Leszczynska
Boguslaw Wowrzeczka

Collaborative Design in Architectural Education – Design Experiment

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Introduction

A selected design exercice uses the experiment for presenting colaborative methods of teaching architectural design at the Faculty of Architecture of Wroclaw University of Technology.

The main objective of this exercise was to show students the complexity of colaborative design: how to organize it, how to be creative in colaborative process of design and how to comunnicate to accelerate process of design.

Specialists in colaborative design define it as: "to work toether with a shared goal' (T. Kvan). Folowing Maver and Petric, " In collaborative design, the participants are not strictly bound to solve assigned partial problems (like it is in cooperetive design), but are encouraged to engagge in solving design problems from other participants as well or to contribute to their design work".

Collaborative design is described as process "...of stimulating each other to contribute to the design task. Participants act towards mutual understanding and maximizing outcomes that satisfy not only their respectivegoals, but also those of other participants" (H.H. Achten).

Specific stages and components of collaborative design process can be descibed as follows:

- organizing of the group, the group integration
- problem identification, formulating ideas and ideology
- establshing common communication environment and methods of presentation i.e. language, methods of reporting the process, CAD programs, tools etc.
- formulating rules of stimulating and finding conseunsus
- decomposition of design problem into smaller tasks, schedule
- implementation of the process: finding solutions – students acting their proffesional role in multidicyplinary team
- presentation and promotion project
- recapitulation, evalution, improvments and conclusions.

Using different forms of communication participants have to develop their own working environment on solving design problem: design software, documents storage, data exchange platform, forms of process records and reviews etc.

As part of curriculum of MSc in Architecture, second year course of architectural design has been taught using methods of collaborative design. The course is obligatory for all students of the Architecture and Town Planning specialisation. Its study load is 60 hours and the students receive a credit of 8 study points.

Regulary the course consists of two design tasks related to "the complexity of multidisciplinary design process and compexity of collaborating in different context"(Jos van Leeuwen,Frans van Gassel, Ad den Otter). For this presentation one of them was selected: "Fastfood reality – home".

Generally speaking the course consists of several characteristics of colalaborative design, i.e.:

- teams working on design,
- all students can manipulate the design,
- there is estabished communication environment supporting the process of design and enabling sharing information.

Experimental design task

Design task title: "Fastfood reality – home"

The goal of the exercise is to design and build a residential object :

- which will occupy minimum area of a generic type and wil be constructed of materials and structures which do not require employing specialized building techniques
- integrating all elements of the collaborative design process
- establishing common communication environment as design methods
- creating and experiencing the real space

The experimental exercise was carired out by a group of students comprising 10 people. Students described ideological aspects of the design task on essay:

Chosen parts of this essay are quoted below:

Goal

We want to prove how much the world, we, ourselves, are influenced by brand philosophy and consumption culture. We are trying to figure out whether modern society accepts the world, with its perfectly created brands which suggest a certain life style, the world, where fast food forces out home cooking and where Coca Cola replaces home-made stewed fruit..

We try to find an answer to one question: How does an individual, a potential consumer feel about this, where does he find his place.

Material

We've decided that it has to be easily accessible, belonging to the consumption culture. One, that would enable us to create a functional, high quality area, a material satisfying the consumer's needs. We chose boxes, Coca Cola bottles are stored in and McDonalds wrappings.

The Consumer

He is fastidious and frequently changes his likes and dislikes, continuously demanding something new, better, more efficient, cheaper, something which would satisfy all his desires. Although he's constantly striving to achieve a higher level of approaching his needs, he will never be fully satisfied. The consumer's hunger can be eased only temporarily.

The space he lives in, has to satisfy his basic needs, it has to be of HIGH QUALITY, it has to attract attention, it has to be quite cheap and what's most important- it has to be mobile. That means flexible, adjusting itself according to the circumstances, the consumer's needs, wishes, giving him a feeling that he's mastering the situation-that he is the one making the most essential decisions, at least that's what he believes. He wants to sleep-he unfolds a bed, he wants to take a bath - he pulls out a shower, he's hungry-he orders McDonald's food, he's thirsty-he orders Coca Cola

via Internet. Designing a house for a consumer we have to adapt the given space to the consumer's mentality in a most complex way. We have to create a space no consumer will resist."

Collaborative design method

The exercise consists in designing and building an object in real size (1:1) with consideration of all stages of building process: the concept, the design and construction of the object.

Collaborative design process of the project consist of the following stages:

- stage I : organizing of the group, the group integration – working togather, ideas, the ideology, field work, the seek of the sponsor
- stage II: decopmposition of design problem, team formation, partition assigments: project management plan, project vision, project design, the temporary schedule, the realization of chosen ideas
- stage III: small schock, the dazzle, the learning from errors, the rising of the final ideology
- stage IV: introduction with material, the contact with the box, the spatial exercise with boxes, the precious expierience. Rejecting the stereotypes of perceiving the construction material. The design of new building and constructon materials was intended to drive students' atenntion away from typical solutions, which employ traditional materials. Invention in the use of new materials is one of the basic conditions for creating new architecture which satsfies the needs of the contemporary man and his lifestyle
- stage V: organizing of the construction, the manual work, material realizing of the project. Students tested their knowledge in 1:1 building engineering. This allowed the verification of previously learned architectural and construction rules in the application of new material in real object. Students also verified traditional concept of the parts of building components:
  - foundation – "Euro" pallets (12 pieces)
  - walls-honeycomb and solid, made of coca-cola containers (400 boxes) isolated with air-bubble film (60 m²)
  - ceilling-honeycombed, "densely boxed" with the span of 3mx4m
  - door-air bubble film filled with air
  - floor-chipboards covered with mosaic (8,5m²)
  - roof-air bubble film and regular film – two layers, with the roof pitch on external walls
- stage VI: preparation to the exibition in the Museum of Architecture in Wroclaw: improvements, the promotion, the manual work. The experiment was repeated – Museum of Architecture, in order to improve it and remove flaws discovered previously
- stage VII: recapitulation, conclusions, evalution, plans for the future

Colaborative design requires establishing communication platform and other elements of working environments. In this project the main elements of working space conists of:

- Communication platform. For the improvement of the communication with persons leading one founded the account the e-mail adress and internet page. On Internet site every day they appeared the report which informed about progresses of the group. The report into the well ordered manner show stages of the creative process – determine their own kind the records.
- CAD workspace. Process of design was based on Autocad programme – educational packages. Using this platform students could manipulate and tacle all the design problems and echange information by internal connections as well as by inertnet links. They worked in different places: at homes and in faculty computer laboratory fully equiped in design programs and other audio-video media.
- Students monitored, recorded and stored each stage of design process in different forms: reports, design data, sketches, drawings, etc. All data were accesible through a website. Students prepared six weekly reports, video film, posters, and several drawings reflected the design process.The documentation of whole design and building process allowed the analysis of the whole experiment after its completion and was a basis for conclusions. Active participation of students in all stages of experiment resulted in fact that collaborative design were naturally memorized by participants
- Students materialized their design in real space, 1:1 scale. Process of real building allowed them learnt and expierienced the necessity of management and collaboration and learnt from difficulties how to solve the conflict situation beetwen participants. Students created timetable showing the organization of building process.

Evaluation and conclusion

Individual, formal evaluation of students in solving experimental design task was, in fact, impossible - all students were equally engaged in a collaborative process of design.

Structured evaluation, based on opinion of participating students, evaluated that a good elaborative design process depends on:

- Understanding of mutual goals
- Communication environment and good technical support
- Understanding each other intention and conflict indentification

The conculsions are:

- Students worked in collaboration as an interactive teams
- They generetad ideas and theory for this task during the interactive dissscusion
- They were creative through interactive disscusion, they monitored all process of design and building
- They involved ordinary people (students- observed and monitored how users behave in this space) as an partner in collaborative design

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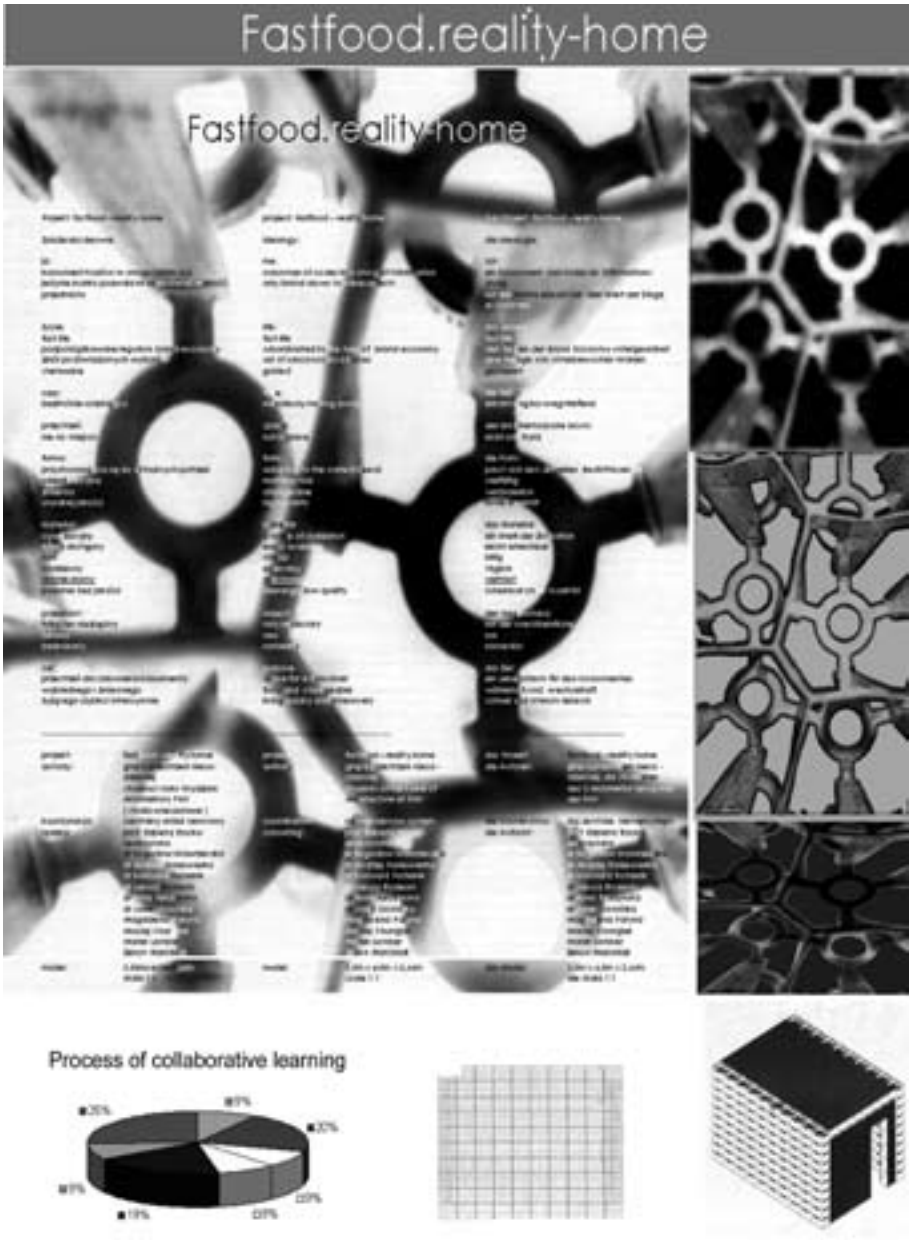
3. Our group is coordinated by known young Wrocław architects, working at Wrocław University of Technology.
   Maciej Chorazak
   Magdalena Paryna
   Prof. Dr hab. inz. arch. Elzbieta Trocka - Leszczynska
   Dr inz. arch. Bogusław Wowrzeczka
   Dr inz. arch. Janusz Frydecki
   Dr inz. arch. Ilona Tarczynska



THE STAGE I – organizing of the group, the group-integration , ideas, the ideology, field-work, the seek of the sponsor
THE STAGE II – partition of assignments (exercises), the temporary schedule , the realization of chosen ideas
THE STAGE III – small shock, the dazzle, the learning from errors, the activity: the rising of the final ideology
THE STAGE IV – introduction with the material, the contact with the box , the spatial exercise, the precious experience
THE STAGE V – organizing of the construction (build), the manual work, material realizing of the project
THE STAGE VI – recapitulation, the learning process , conclusions... , plans for future

WROCLAW UNIVERSITY OF TECHNOLOGY FACULTY OF ARCHITECTURE-POLAND


Fastfood.reality-home

Vasco Pinheiro

Reflections Towards a new Project Design Pedagogy

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It may be considered as a fact that Computer Aided Design and the new systematisation of the work method provided by digital technology was the main revolution in architectural practices of the end of the last century.

Overriding the ancient practice of drawing, the integration of new digital technologies provided a different manipulation of the architectural images projected, as well as the introduction of new dynamics into project practice.

However, the implementation of digital technologies in work practices and environments is not exclusively the case of architecture. The main instrument in digital technology – *the computer* – is, today, an indispensable tool in any professional environment assuming itself, within the panorama of contemporary western society, as a first-class need.

Although its use by students is normally not prevented, in academics, avoiding the use of computers and softwares is absurd and an almost impossible task.

Given this scenario, project subjects are those where resistance to applying computer instruments may be greatest and also those where the worst results and examples of incorrect use may be found.

On the one hand, the variety of software available and, on the other, easy access to it and the natural aptitude that students demonstrate in its handling, are factors that, inevitably, have an impact on the resolution of the project exercises and may be seen as obstacles to sedimenting work methods. As a result of growing availability, choices are many times undistinguished or subject to certain types of graphic possibilities provided and, in conjunction with the lack of operative training lead, invariably, to results that pay attention, in the first place, to visual effects and appearance, disregarding the individual, and necessary, reflection that results from manual drawing.

However, given their incorporation into the architectural professional environment and into the environment surrounding it, accepting the use and the usefulness of these work tools is inevitable. It has become urgent to evaluate, given a yet unclear pedagogical experience within this scope, how computers may, or should, constitute a valid means of education and preparation of future architects.

As central theme of this problem are two aspects that are understood as the main difficulties and/or obstacles for the use of new computer technologies. The first one has to do with the interposition of the machine in the intimate relationship between the individual and the physical drawing. The second one concerns the ease in manipulating the images influenced by the laws of the new "society of information" and the consequent effects of the globalization phenomenon.

In this sense, in the case of architecture teaching and project practice we have to question how these difficulties can be minimised.

I am convicted that the consolidation of the new teaching methodologies shall be sustained and make use of the new technological tools. However, the poetry and spirituality that should command the gestures of the architect should not be obscured by the lights of technology. The instruments provided by new technologies should submit themselves to the condition of useful tools that are part of the method but which should not condition it.

In a summarised and elementary manner, we will firstly enumerate some aspects

considered to be problematic, so that we may afterwards conclude with some lines of orientation, allowing us to consolidate the basis of a pedagogical transformation, which is needed now more than ever.

Without forgetting the humanistic condition of architecture – its method and experimentation – the following 8 points may be defined as emerging problems in the traditional pedagogic system:

1. In general, cultural imagery and in particular, architectural imagery are presently haunted by the possibilities offered by new technologies, which allow us to travel in time and space in a digital universe where imagery and its relationship with technology constitute an accentuated expression of dominant consumption, which finds in an emotional appeal, its principal criterion of acceptance.
2. New design technologies are competing for the consolidation of an architectural culture dominated by image. But this is not only a problem of architecture. In the academic environment, it may be dangerous to allow the easy handling of images once their construction may lead to the emptying of contents, to the absence of rigour, geometry and composition criteria, leading to the configuration of objects whose efficacy does not surpass the value of appearance.
3. The diversity in tools made available by new technologies and the great variety of contrasting *software* present specific and equally contrasting characteristics, which introduce in the act of drawing, physical and operational limitations that impede the subject in the act of projecting without constraints.
4. The natural and intimate relationship between the subject and the graphic expression of his thoughts – the drawing – is interposed by an artificial system – the computer – which operates in accordance with specific *software*, conditioning the spontaneity of the act, while subverting its emotional, sensitive and cathartic character.
5. The experimentation of solutions by drawing or design as a research method is conditioned by the need to introduce rigour in the registration process – the great majority of drawing software functions with the help of the Cartesian system, which requires precision in the determination of the geometrical location of points, lines and planes. It is important to note that mistakes and crossing over errors are equally fundamental in the act of preparing projects. First and foremost, a project's drawing communicates with the subject who's realising it, as he relies on critical thinking while awaiting permanent correction.
6. The drawn object assumes its value in accordance with the totality of the represented figures and the necessary relation between its parts and their respective relation to the whole. For this reason, the dimension of the monitor's field of view constitutes a clear limitation, demanding the use of specific commands such as, for example, *zoom* and *pan*, which interpose themselves between the visual relationship of the subject and the drawing, fragmenting the object and concentrating the subject's attention on its parts, consequently making it difficult to concentrate on the whole.
7. The professional use of *software* encourages the rapid and easy handling of graphical elements, which are part of the project and appear in the form of blocks, libraries and preconfigured solution models (whole and partial). Their use in the

practical component of the project leads to the frequent incomprehension of their meaning, and overall, to a lack of "to know how to do", misrepresentation and the weakening of a student's critical capacity, as he incorrectly may accepts these solutions as given.

8. Due to its complex nature, the architectural drawing constitutes a repertory of signs and symbols, whose reading and comprehension relies on mental rigour and the quality of its graphic expression, where each line and each stroke should assume a value and an intention. The transposition of this process to digital has found great obstacles due to the simplification of the process, as it relies on one machine to digitalize, another to draw and a third one to print.
9. In the same way that a designer is not necessarily an architect, it's equally important to note that a computer operator is not an architect. In both situations, drawing practice constitutes the consequence of know-how, specific knowledge and determined intention.

Generally, it is accepted that new technologies have brought important benefits to project drawing. However, these benefits cannot be associated either to the simplification of the drawing or its *modus operandi*, which is, by definition complex.

The teaching of architecture and particularly, of project design, should be able to deal with these and other problems which are part of a student's learning process, even when ill informed and many times, ill prepared.

For these reasons, it is increasingly important to know how to deal with new technologies as a basis for the establishment of new instrumental and operational tools, which may contribute to the success of project development rather than frequently contributing to the realisation of hybrid solutions, which are empty of meaning and subject to superficial appreciation, as they never surpass the dimension of appearance.

Since they are fundamental, whether in day to day life or in future professional practice, which is why they should be included in academic preparation, the tools offered by new technologies should, first and foremost be evaluated in order to determine how they could be integrated in the learning process. This has also to do with some curricula of architecture courses.

For this reason, it would be a mistake to begin from the principle that computer assisted design systems, the modelling of solids, image handling programs and others constitute a given fact of the problem, as first and foremost, a criterion should be defined as well as a method for its use.

The sketch as a place of converging thoughts, intentions, dreams, ambitions; the stage of confrontation between the possible and the impossible, the real and the imaginary – the draft as a symbolic structure – cannot be diminished or devalued.

Both the draft and the drawing show themselves as fundamental structures for the development of architectural thought and they should be assumed in the learning process as a means of exercising and comprehending the conceptual dynamic of the project.

Curiously, I believe that these are fundamental aspects required in the successful use of the machine and its possibilities.

With respect to subjects related to project design, it would be important to evaluate with the students the possibilities of actual new software programs, keeping in mind not necessarily the increase in design and project productivity, but most importantly, an improvement in the intrinsic qualities of the solutions.

For this reason, the subject project or project design should encompass, during its introductory phase, the use and practice of the draft or manual drawing, as a means necessary in the construction of the method. During a secondary phase, the new technologies would be introduced as a means of configuring formal solutions which in turn configure objects.

Similarly, the selection of computer tools should be made after knowledge of the conception process's different stages. New technologies should encourage rather than substitute the powers of imagination – transformation of thought into image – which occurs, in the first moments, in the complex levels of the subject's mind.

The understanding of a drawing as the expression of a thought should remain constantly present. New technologies are also the direct result of human thought, and they do not operate freely without precise instructions or without resorting to the functional commands which dominate the new architectural vocabulary – *draw, trim, extend, offset, copy, paste,* etc.

Behind these designations, lies the existence of concepts, since they are not lacking in meaning. In their technological condition, they are coated in pragmatism, which in certain ways contradicts the abstraction that characterises the genesis of an architectural image. It becomes fundamental to insist on the importance of these concepts and the drawing's true meaning as well as its intentional and human nature.

The new technologies should therefore be assumed as the architect's design hostages, instead of the product of his imagination that should never be conditioned by their natural limitations.

Julian Keppl

Information and Communication Technologies in Architecture and Urban Design

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It is quite obvious in a contemporary creative work in architecture and town planning, that a design office can be remote from an actual building site several thousands of kilometers and information highway substitutes the necessity to move in space and time. Sophisticated IT can replace direct sensual perception or compensate its imperfection in many cases. It's possible to obtain photos of the building site from satellites, precious maps elaborated by digital technologies, computer 3D models of terrain and adjacent surroundings. Thanks to those technological achievements there is low probability to repeat the case of the American town San Francisco, famous of creating roads with precipitous gradient, the consequence of adopting a checkerboard layout of American cities not taking into account hilly topography of the site. To avoid repeating this mistake we prepare our students to obtain appropriate information from the Internet, to evaluate and use the information and to communicate with clients, partners or contractors in remote areas. For this purpose we have introduced the virtual design studios and common projects with partner schools from abroad. Some examples are described in this paper.

The Virtual Design Studio

The virtual studio enables long distance cooperation and consultation during the studio work. It does not matter where the student is at the moment. If the project details are digitally adjusted and accessible through Internet for pedagogical process, students and professors can virtualy communicate and consult their work on the various stages of elaboration, present it online via videoconferencing tools and data transfer. The virtual design studio focuses on facilitating collaborative work for geographically distributed design teams, using CAD and electronic communication technologies, in particular the Internet. Remote collaborative work using the virtual design studio analogue has been carried out in co-operation with partners at three other European architecture schools: the Faculty of Architecture at the University of Technology, Bratislava, Slovakia, the Faculty of Architecture at the University of Technology Graz, Austria, and the Faculty of Architecture at the University of Technology, Vienna, Austria.

The core notion of the virtual design studio analogue is that of remote design collaboration facilitated by Internet communication technologies. Students at four European universities participated in the projects described here. The work presented is in its essence collaborative, and was co-ordinated by the following members of academic staff at the participating institutions:

Igor Kosco and Juraj Furdik – University of Technology, Bratislava,
Wolfgang Dokonal and Annegrete Hohmann – University of Technology, Graz,
Adrian Dobson – University of Luton, Bob Martens – University of Technology, Vienna

Project BRAGRALU (BRAtislava, GRAz, LUton) – Baily Hill Water Tower Conversion, Luton, 1995

The initial prototype project linked students at the University of Technology, Bratislava, the University of Technology, Graz, and the University of Luton. The project

was modest in terms of architectural design complexity, and involved only a small number of students. It focussed on the conversion of a disused historic water tower in Luton (fig. 1).

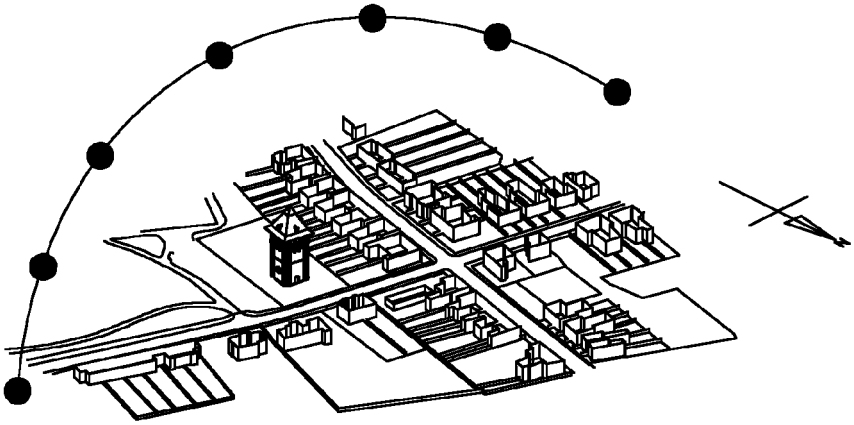

Fig. 1
Bailey Hill water tower, Luton – digital site model

The brief required the development of proposals for the conversion of the building into an office for a graphic design company, with domestic residential accommodation for the husband and wife partners. Design information was exchanged in various electronic media formats, predominantly text and CAD files, using a variety of Internet file exchange methods, such as email and file transfer protocol (FTP). In order to maintain compatibility of information, it was decided that a standard CAD software package, *AutoCAD*, should be selected. In the early stages, information was exchanged freely with no formal mechanisms for the management of data. Not surprisingly, this proved to be too relaxed a management regime, and led to confusion. Initially there was no systematic convention for the naming of files. It quickly became obvious that a file naming system was essential for the management of the network.

The initial prototype project was successful in achieving completed design proposals. The students at Bratislava and Graz enjoyed working on a project on a site located at a different geographical and cultural centre, and all the students benefited from seeing design proposals produced by students outside their normal year group in their own school of architecture.

A key pedagogic benefit of the first project was the opportunity for the students at Bratislava and Graz to carry out design work in a new context, with local information being provided by the Luton participants. This contextual theme was enhanced by the decision to use the conversion of an existing building as the vehicle for the project. In educational terms the project was beneficial in developing the awareness of the students of issues connected with collaborative working, differing architectural cultures and the potential of electronic communication in architectural design.

Project BRAGRALUWI (BRAtislava, GRAz, LUton, WIen)

For the second collaborative virtual studio project, carried out during the second semester of the 1995-96 academic year, a group of students from the Faculty of Architecture at the University of Technology, Vienna joined the network. The re-use of four nineteenth century brick gasometers in Vienna (fig. 2) was selected as the vehicle for the project. Small groups of four to five students were formed, every group having at least one participant at each of the other institutions in the network. The aim in this project was to develop team solutions, by collaboration between students at different centres, rather than individual solutions being produced at each centre.

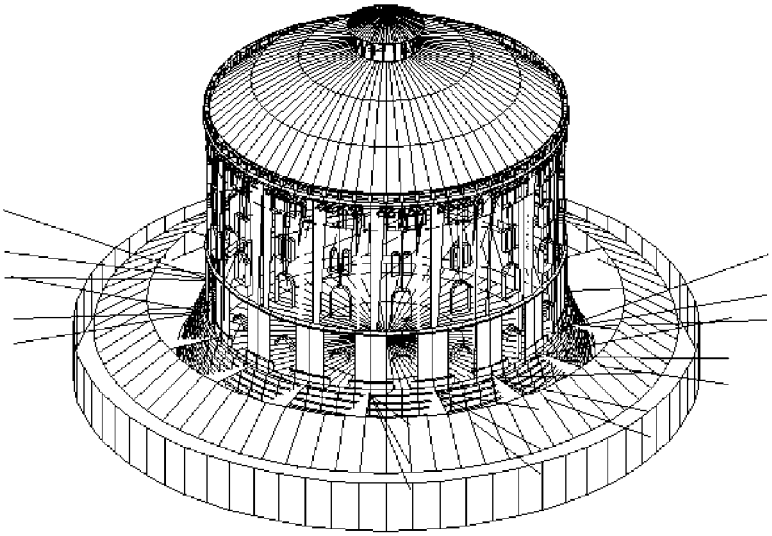

Fig. 2
Digital model of existing gasometer

Students had free access to the necessary electronic communication software, including email, FTP (file transfer protocol) and web browsers. As well as working on their own solutions, exchanging information between themselves, each team was required to post "work in progress" onto a web site acting as a virtual notice board, located on a server at the University of Technology, Vienna. Contextual information about the buildings was posted on the virtual notice board, and students in Vienna produced a digital model of the gasometers, which could be downloaded from the Vienna server.

For this project desktop video conferencing[1] and electronic whiteboard technologies were introduced. The intention was to explore shared concurrent access to digital design models, and to enhance the social interaction necessary to the to success of the project. File naming conventions were introduced. Information was generally exchanged in asynchronous modes. It had originally been thought that the desktop video conferencing and electronic whiteboard facilities would help to facilitate this. Thus e-mail and on-line chat may be more appropriate in many instances than more sophisticated video-conferencing and electronic whiteboard technologies.

Danube Docklands Zone in Bratislava, 1999-2001

The further project in this sequence of experimental virtual design studios focussed on the development of proposals for the urban regeneration of the historic Danube river docks in Bratislava. Contextual information, including photographs, maps, local authority development plans, transport infrastructure plans and historical data was collated by students at the University of Technology, Bratislava, and made available on a project web site (fig. 3, fig. 3a). The students at the University of Technology, Bratislava, also worked together to produce a detailed 3D digital model of the whole docklands urban zone, and this was incorporated as a series of downloadable Auto-CAD files on the web site. Following our experiences on the previous virtual studio project, it was decided to adopt a simpler project structure, with just two teams of four designers, and only two participating institutions. By extending the project over a whole academic year, it was intended to establish more permanent social working relationships, and provide the necessary timescale to achieve a stable and predictable technical and organisational infrastructure. In order to try and overcome some of the management and communication difficulties, telephone connections were used for the first time as a regular means of communication. As part of an enhanced project management structure, a series of key dates for interim review of design proposals was established. At each of these design reviews a video-conference was held, at which all the students and tutors could exchange views on the work. A more robust video-conferencing system based upon multiple ISDN lines was utilised for this project. This offered reliable audio and visual links, and the capability to display computer-based data in real-time.

Although part of the purpose of the project was to provide students with experience in the use of CAD modelling and digital visualisation techniques for architectural and urban design, the principal aim was for them to explore the use of Internet and telecommunications technologies for design collaboration, in accordance with the virtual design studio analogue.

Fig 3 (Fig. 3a)
International studio project works – website with basic information

The students were encouraged to work in a range of media, including manually produced graphics and physical modelling as well as digital techniques (fig. 4, fig. 5, fig. 6). The more sophisticated video-conferencing techniques available for this project meant that remote discussion using a range of representational techniques, beyond the purely digital, could be facilitated relatively easily.

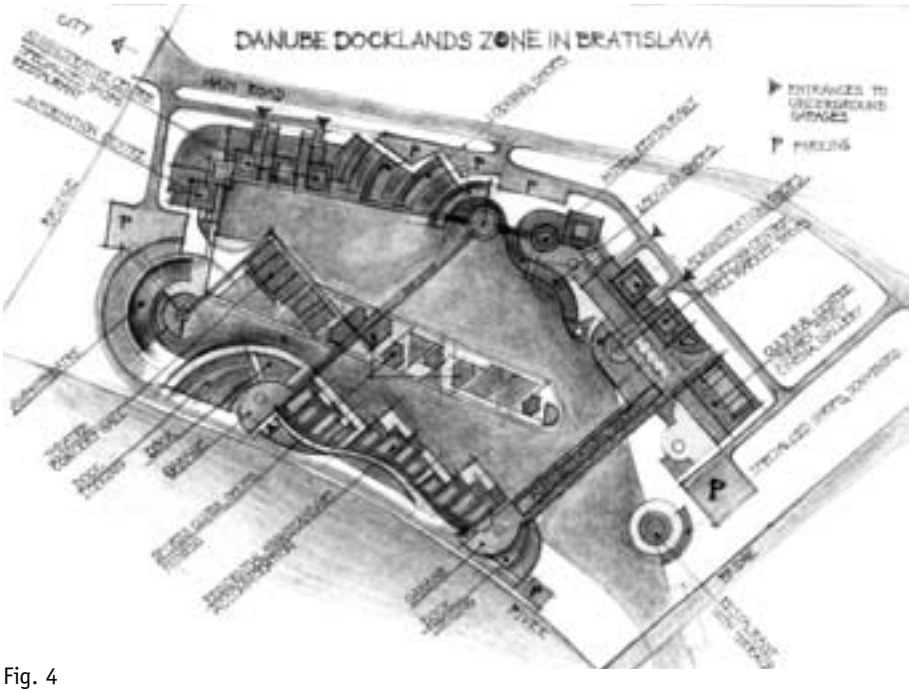

Fig. 4
The reflective stage – beginning of creative process, first sketches

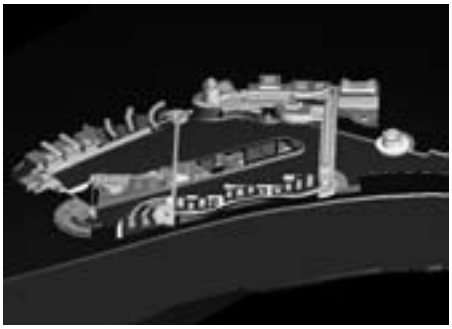

Fig. 5
Adjusting, preliminary design, digital model

Fig. 6
Presentation of the final proposal

The Street of 21st Century, 2002

This study was ellaborated in the scope of an international student competition in which the European Center for Architecture & Information Technologies - International

Academy of Architecture in the cooperation with Bratislava City Council and the Faculty of Architecture specified the street (or better the whole zone) to be designed for the 21st century requirements. The project was a continuing of the previous Bratislava docklands project. The core aim was to support the cooperation of talented students at European universities and gather new, modern ideas for the participant cities redevelopment (fig. 7).

Fig. 7
Website of the international student competition Street of 21st Century

Centre of Czech Architecture in Prague, 2005-2006

This project is an actual pedagogical experience with virtual collaboration between foreign students from Socrates–Erasmus mobility scheme, pursuing their study at Faculty of architecture in Bratislava (FA STU), professors of FA STU and Visiting Professor Lizon from University of Tenneessee, USA. He lives and works in the US and majority of his teaching at the FA STU is via e-teaching. The topic of the studio was the refurbishment and enlargement of the Centre of Czech Architecture in Prague. Combined face-to-face and long distance education has been used during the two terms studio works (fig. 8).

Fig. 8
Centre of Czech Architecture - preliminary design and photomontage, student Isaa Assad from Spain, tutor professor Lizon

The unique distant learning consisted from the initial, continuous and final intensive workshops at the FA STU and subsequent videoconferencing sessions and electronic communication between students in Bratislava and the teacher in the USA. Graphic files of students design have been critiqued through computer nets. For the long distance synchronous communication the systems of VRVS (Virtual Room Videocinferencing System) and Skype were tested (fig. 9).

Skype videoconference system provided good sound and video transfer and was easy to manage. However, it did not allow us the multipoint sessions an online

Fig. 9
Videoconference consultations with professor Lizon via VRVS system

digital data presentation. Final jury review has been realized successfully at the FA STU.

Such form of long distance learning will continue at the FA STU. Experience from the first applications must therefore lead to improvement of the teaching and technology facilities. Emphasis lay in the appropriate technology equipment for the long distance defence of students' projects with more sophisticated audio-video devices.

Conclusion

All presented studies had common methodological features. Basic information about the project, specific data entries, building regulation, site references and photos have been available on a server through hypertext organized web pages linked with other important sources. More that final design result we were oriented on design methods influenced by ICT (Information and Communication Technologies). Videoconferencing enables the visual presentation of design in real time. In the architectural education it represents the method for verification of design quality. On the other hand, professors and students have an opportunity to join the design process even if they are on abroad station. By the means of videoconferencing tools the education converges to practice and therefore could represent the important methodology tool in architectural education.

Such form of long distance learning will continue at the FA STU. Experience from the first applications must therefore lead to improvement of the teaching and technology environment. Emphasis lays in the appropriate technology equipment for the long distance defence of student projects; (so as the running with the camera and microphone during the videoconference sessions seemed nearly comic); with more sophisticated audio-video devices, beepers and back-up power supply.

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Note

1 Videoconference is the most sophisticated form of synchronous communication using ICT tools. It supplies the real time communication with the simultaneous projection and sound transfer. Videoconference implemented between two points is called two-point videoconference. Multipoint videoconference connects more than two participant points.

According to the technology of implementation, can be two essential forms of videoconferences:

- videoconferences through ISDN links (Integrated Services Digital Network) – are relatively cost demanding for the basic equipment and for the service (the payments for ISDN call), but are very credible for good sound and image transfer,
- videoconferences through computer nets and Internet (Netmeeting, MSN, Windows Messenger, FirstClass, VRVS, Skype etc.) – require the minimum of technology equipment (web camera, headsets or microphone and loudspeakers), and provide the low cost services (only the payment for nets). The specific time delay of the image and sound transfer, due to the data overload of computer nets, is their disadvantage.

Yordan Radev

IT Means of Simulation to Building Performance in Teaching Architectural Design

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Nowadays digital technology produces a lot of applications and devices changing our way of life. It also gave us a huge possibility to transfer the different types of information by means of digital form that gives advantage to easy and effective transition through the different means of digital technology to students accumulation of knowledge like lectures, course works, team works (limited / local / international) etc. The teaching process is a kind of transfer of accumulated knowledge to the youth. It is most important for Universities to develop these tools in a proper way to make them centers of higher level education and research.

Fig 1
Lecturing by means of IT

Implementation

Nowadays, we can see a lot of digital applications in different fields of life like virtual presentation, conferences, seminars, forums etc, but the architectural education process is still far from the well using and applying of available powerful computer technology and advantages which it realize. The Higher education must master The Mind of students. The IT technology is just right tool for that. There is wide specter of fields in architecture to get use of it.

Fig 2
Urban planning and development

Fig 3
Ambient world

Fig 4
History of architecture

Fig 5
Sunshine and forms

Education in design by research

There was no industrial revolution of the end of 20th century but it's the time for humans to think more about the built environment.

IT simulation in Education

What is the role of digital devices in the process of Education in architecture - how to use the simulation methods in architectural design to get the significant role of sunshine to human being's life? We should look for a new system based on experience, research, experiments and their validation comparison with the practice. Suggested example includes use of a system of teaching by research and the relationships among all of its components with education process in architectural design. Thus the study formulates a prototype for the suggested system that includes all system components and the relationships among them. The point is that dialogue with the machines is still complicated, time consuming and requires lots of related knowledge. Do we need better machines and software then, or new teachers? Are students obliged to learn all the knowledge accumulated or to trust the software given without the base it has been developed on? They definitely trust teachers and acreditated systems of education.

For example: the industry has traditionally been the one with the poorest lighting. Light is not the most important matter for machines but for the people that work with it. The important mater of education is to provoke the desire and knowledge to students how to solve the problem using IT means of modeling working performance in respect of sunshine when design a building.

"Of all the fields, industry has traditionally been the one with the poorest lighting. New Concepts, rather than radically new light sources, are coming up".

J.E.Caminada, Philips

Fig 6
It is not the energy used only by machines but for work performance. The factory is a manmade product

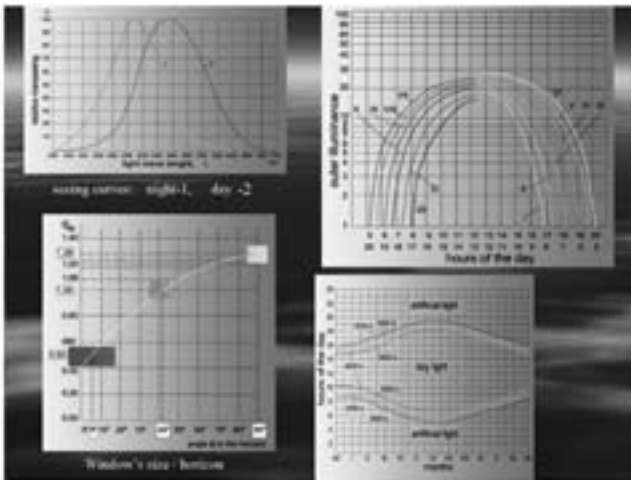

Fig 7
Comparison between using Daylight and its substitutes

The relationship between lighting conditions and productivity has been studied for many years.

This is because of the extent to which lighting enhances work performance and is often used as the financial justification for the amount and quality of lighting provided.

There are three ways whereby lighting conditions can affect work performance:

They are through changes in *visibility*, changes in *mood* and changes in *photobiology*. All we need is a new concept when design a building.

1. Bulgarian State Standard (BDS-1786-84) for Daylight evaluation has been in use since 1984. It is a compulsory tool of designing buildings for industry particularly the size of windows. The process of design is hard and there is no connection with enthalpy and energy consumption.

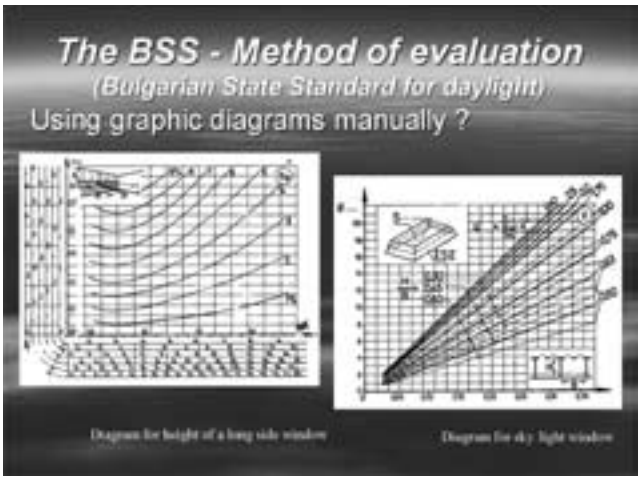

Fig 8
Method of evaluation using the BSS

2. The use of computer simulation as a method of teaching is much better - faster, understandable, attractive and reliable. All you need is a system.

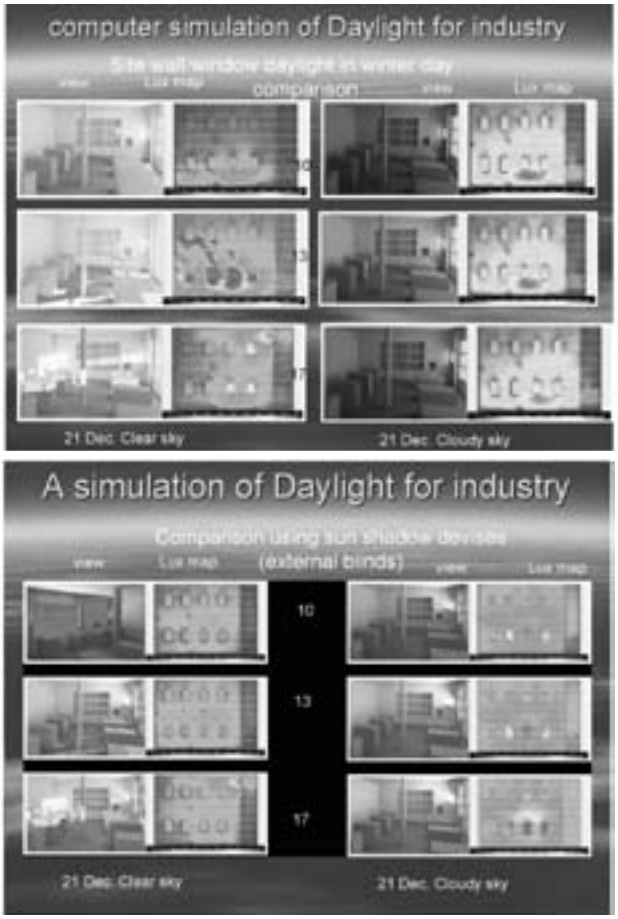

Fig 9-10
Designs by study windows performance in a factory

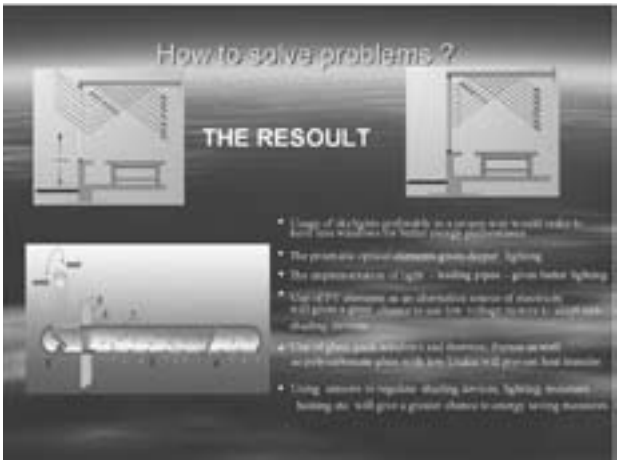

Fig 11
Nowadays technology is in position to improve the use of daylight building during a winter day (by use of "Light-scape" software)

The research we need is to include the degree of realizing the aim of simulation, a decision taken about the research hypothesis, validation of research contribution(s) and some recommendations related to the field of the study.

Session 3.2

Chair:
Dimitris Papalexopoulos
Technical University of Athens
School of Architecture
Athens
Greece

Marko Savic

Competence-based / Studio-driven Curriculum Methodology Case Study / UB-FA

University of Belgrade
Faculty of Architecture
Serbia

Introduction

The curriculum reform process on the Faculty of Architecture in Belgrade has started about five years ago. As a vice dean for academic matters, and the coordinator of the TEMPUS project, I was responsible to manage this process from the beginning until the formal adoption and start of implementation of the reformed curriculum.

At the very beginning, the process was based on the following aspects:

- Forming the EHEA – European Higher Education Area (Bologna Process);
- The nature and structure of the University of Belgrade
- Tradition of teaching architecture in Serbia, and
- Contemporary tendencies in the architectural education promoted within EAAE-ENHSA (European Association of Architectural Education-European Network of Heads of Schools of Architecture)

In more than 160 years, the University of Belgrade has been structured on the different ways, but always with breadth based on Humboldt's principles. Nowadays, faculties have remained with a great part of their autonomy. The Faculty of Architecture was continuously the member of the group of technical faculties, and, its curriculum was based on the tradition of central-European polytechnics.

Irrespective of this, in the last 50 years, the Faculty has been trying to follow the contemporary approaches and teaching methods.

In this period, the studio-based approach was tested in different ways for a few times. The School has organized the different teaching units, subjects and methods which were based on the studio work[1]. The first step was made in 1956. After this, studio work, more less, has remained part of the teaching process. In 1976, the curriculum has got the first modular elements.

After more than ten years of a social, academic crisis, the School has started the reforming process in 2001.

But, with the faculty of 140 teachers, and the old curriculum which hasn't been changed more than ten years, this process was very difficult to manage. The Academic society has shown both of its faces in the same time – a liberal and conservative one, and a dialectic process, actually, was a leading stream to the final solution. Finally, restructuring of the curriculum has been made on a radical level, and the implementation started in 2005.

Case

During the years of work on the reform, one of the members of teaching staff argued that we have to think about the curriculum as the living thing, which should be changed and developed continuously. So, when the new curriculum was settled, and we start with implementation, good and weak points became clear. That's why, now it is necessary to activate the regulatory mechanism, to synchronize the learning outcomes and competences on the whole curriculum level.

This work has a task to present a methodology for the process of harmonizing the learning outcomes and re-thinking the curriculum on the Faculty of Architecture University of Belgrade.

The main aspects of influence in this process are set as follow:
- Bologna Process (forming of EHEA – European Higher Education Area);
- Architecture (as the field of education, research and legislative), and
- Education (or educational psychology, as the key for instructional design).

Bologna, modules, outcomes & competences

The most important principles of the Bologna process, connected with curriculum development, could be presented as follows:
- Study programs in cycles – as gradation;
- ECTS – as the measure for the student's workload;
- Modularity – as the mechanism for optimization;
- Learning outcomes – as the teaching goals, and
- Competences – as the professional measure of reaching the learning outcomes.

Curriculum for any study program consists of MODULES and COURSES, and has its own complex structure.

Different types of connections and levels of coordination between those parts should be reached:
- STRUCTURAL – harmonization between courses in the same module;
- VERTICAL – hierarchy in the fields of study, gradually, through semesters and study cycles;
- HORIZONTAL – synchronization between different modules in the same semester
- DIAGONAL – preparation for the further modules in the different fields of study

Generally, modularity:
- anticipates excessive curricular particularity
- decreases number of exams
- makes the mobility easier

but
- reduces the teacher's autonomy.

That is why, irrespective of advantages, modules are not so popular in contemporary (reformed) study programs.

Each MODULE and COURSE should be defined through:
- SYLLABUS - content, subject matter
- TEACHING METHODOLOGY - the way of teaching
- LEARNING OUTCOMES - final result of the teaching/learning process

Architecture, UIA – UNESCO, EU regulation, EAAE-ENHSA research

Architecture, as a field, integrates the arts, technologies and humanities. Concerning this fact, UIA UNESCO Charter on Architectural Education recognizes three main different types of academic institutions:

- universities,
- polytechnics, and
- art academies,

on which the formal higher architectural education is performed.

It is possible to recognize a few main contemporary approaches to the architectural education:

- General / academic / classical
- Specialized / professional / vocational
- Studio based
- Process driven / design driven / technology driven
- Research based / research driven
- Pragmatic on academic foundation[2]

Studio-based approach has been accepted from a large number of architectural schools as the model for the curriculum development.

EU legislative regulates the architectural profession. Education is part of this regulation. Directive 2005/36/EC defines eleven points of knowledge and skills (competences) which should be acquisitioned.

Contemporary processes of the reform in higher education are based on the generic and professional competences which students should develop during their studies. These competences represent direct or indirect results of reaching the learning outcomes. Curriculum modularization provides opportunities for easier systematization of the learning outcomes.

During the past three years, ENHSA Thematic Network has started research on the competences in architecture, based on the TUNING methodology. An initial list of competences has been formed on the:

- Tuning project experience
- Specificities of architecture as a creative discipline, and
- Existing institutional framework.

After the evaluating, the list was set and defined as the material for the questionnaires for the academics and professionals. First results of this inquiry were presented in Chania in September 2006.

The first step

The first step in this methodological research is to compare competences defined through EU Directive (as formal task), and through ENHSA questionnaires. This matrix has a task to show the points of overlapping and convergence between those two resources. Diversity shown by this matrix underlines the complexity of the learning outcomes which should be defined in the curriculum. Each marked field should be transformed into the learning outcome, and each one should be placed on some place(s) in the curriculum.

The matrix also shows that the most points of convergence are in the fields which are, logically, directly connected with the studio work. This fact should become the approval for choosing the studio-based approach.

GENERIC COMPETENCES

	ability to create architectural designs that satisfy both aesthetic and technical requirements;	adequate knowledge of the history and theories of architecture and the related arts ,technologies and human sciences;	knowledge of the fine arts as an influence on the quality of architectural design;	adequate knowledge of urban design, planning and the skills involved in the planning process;	understanding of the relationship between people and buildings, and between buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale;	understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors;	understanding of the methods of investigation and preparation of the brief for a design project;	understanding of the structural design, constructional and engineering problems associated with building design;	adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate;	the necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations;	adequate knowledge of the industries, organizations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning.
Ability to work in an interdisciplinary team	■			■		■	■	■	■	■	■
Ability to develop a trans-disciplinary understanding	■										
Appreciation of the diversity and multicultural quality of contemporary European society		■				■					
Ability to identify and work towards targets for personal, academic and career development							■				
Awareness of and respect for points of view deriving from other national and cultural backgrounds					■	■					
Ethical commitment	■			■	■	■		■	■	■	■
Capacity to develop an analytical and critical thinking and understanding	■			■	■	■	■				
Capacity to apply knowledge in practice	■	■		■				■	■	■	■
Capacity to apply a spirit of synthesis of ideas and forms	■			■	■	■	■	■	■	■	■
Capacity to generate creatively new ideas and forms	■			■							
Capacity to adapt proactively to changing situations	■			■	■	■	■				
Capacity to evaluate ideas, proposals, forms	■			■	■	■	■				
"Learning to learn" ability		■					■				■
Decision – making skills	■			■						■	■
High level computing skills including the ability to use the Internet critically as a means of communication and a source of information	■		■				■				■
Personal and social skills in expression and communication by speaking, writing and sketching	■		■								■
Ability to receive and respond to a variety of information sources (textual, numerical, verbal and graphical)	■			■			■				■
Basic knowledge of all the professional applications of the discipline	■			■	■	■		■	■	■	■
Responsibility for one's own work and ability to be self-critical in relation to that	■				■		■				
Knowledge of languages		■			■						■

PROFESSIONAL COMPETENCES

	ability to create architectural designs that satisfy both aesthetic and technical requirements;	adequate knowledge of the history and theories of architecture and the related arts ,technologies and human sciences;	knowledge of the fine arts as an influence on the quality of architectural design;	adequate knowledge of urban design, planning and the skills involved in the planning process;	understanding of the relationship between people and buildings, and between buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale;	understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors;	understanding of the methods of investigation and preparation of the brief for a design project;	understanding of the structural design, constructional and engineering problems associated with building design;	adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate;	the necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations;	adequate knowledge of the industries, organizations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning.
Ability to create architectural designs that satisfy both aesthetic and technical requirement											
Adequate knowledge of the history and theories of architecture and related arts, technologies and human sciences											
Awareness of the issues and themes of present day architectural debate											
Ability to recognize and use appropriately architectural theories, concepts, paradigms and principles											
Knowledge of the fine arts as an influence on the quality of architectural design											
Knowledge of contemporary and historical works that have achieved the highest standards in architecture											
Ability to abstract and present key elements and relationships											
Adequate knowledge of urban design, planning and the skills involved in the planning process											
Understanding of the relationship between people and buildings and between buildings and their environments, and of the need to relate buildings and the spaces between them to human needs and scale											
Awareness of the potentials of new technologies											
Understanding of the profession of architecture and the role of architects in society, in particular in preparing briefs that account for social factors											
Critical awareness of the political and financial motivations behind clients' briefs and building regulations so as to develop an ethical framework for decision making within the built environment											
Critical awareness of the relationship between current developments in architecture and the past											
Understanding of the methods of investigation and preparation of the brief for a design project											
Understanding of the structural design, construction and engineering problems associated with building design											
Adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against climate											
Necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations											
Adequate knowledge of the industries, organizations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning.											
Ability to work both with a high degree of autonomy and collaboration											
Ability to engage in self-managed and life-long learning (eg working independently, time management and organization skills)											
Awareness of the need for continuous professional development											
Ability to respond creatively and flexibly to changes in the professional environment											
Ability to communicate appropriately to a variety of audiences in oral, written and graphic forms											

Education, educational psychology, Bloom's taxonomies

A next level of research is focused on the principles of educational psychology.

There are some useful theories / methods / definitions, or tools which can help in the process of the development of the module and course curriculum. I have found out Benjamin Bloom's taxonomies[3] of the cognitive and affective domain appropriate for the field of architecture[4].

In short, taxonomy in cognitive domain has six levels:

- KNOWLEDGE - Recalling important information
- COMPREHENSION - Explaining important information
- APPLICATION - Solving closed-ended problems
- ANALYSIS - Solving open-ended problems
- SYNTHESIS - Creating 'unique' answers to problems, and
- EVALUATION - Making critical judgments

In the revision of Bloom's taxonomy[5], his successors and former cooperates discuss about the position of the last two levels (synthesis and evaluation), so, in this research, we will treat them as on an equal level.

Taxonomy of an affective domain has the following five levels:

- RECEIVING PHENOMENA - Awareness, willingness to hear, selected attention
- RESPONDING TO PHENOMENA - Active participation, willingness to respond, or satisfaction in responding (motivation)
- VALUING - The worth or value a person attaches to a particular object, phenomenon, or behavior
- ORGANIZATION - Comparing, relating, and synthesizing values, and
- INTERNALIZING VALUES - Behavioral characteristic of the learner (personal, social, emotional).

The second step

The second step in this methodological research is to compare the domains of the competences defined in the first matrix. On axis, colors show the domain and level of competence. In matrix fields, colors (blue, red and green) explain the character of the overlapping points. This character should implicate the teaching method through which the learning outcome should be reached. The blue fields imply the focus on education, the red ones on pedagogy, and the green fields imply the complex didactical approach. The type of approach in instruction should be very important for the defining the learning outcomes.

GENERIC COMPETENCES

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Ability to identify and work towards targets for personal, academic and career development											
Awareness of and respect for points of view deriving from other national and cultural backgrounds											
Ethical commitment											
Capacity to develop an analytical and critical thinking and understanding											
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Capacity to apply a spirit of synthesis of ideas and forms											
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Personal and social skills in expression and communication by speaking, writing and sketching											
Ability to receive and respond to a variety of information sources (textual, numerical, verbal and graphical)											
Basic knowledge of all the professional applications of the discipline											
Responsibility for one's own work and ability to be self-critical in relation to that											
Knowledge of languages											

PROFESSIONAL COMPETENCES

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Ability to communicate appropriately to a variety of audiences in oral, written and graphic forms											

The Future step - Case study - Implementation

In the reformed study program, the Design Project (Studio work) modules have been accepted as the integrative element of the whole curriculum. Semester after semester, changing the focus (introduction, architecture, urbanism, technologies), the studio remains the didactical unit preparing the students for the different aspects of solving architectural problems. The studio becomes the unique model for the teaching/learning activities for achieving the learning outcomes in all three partitions. This is of particular interest for the students which, simulating the future professional activities, start to understand architecture as a polyvalent and multidisciplinary field. Also, they are in the position to develop generic and professional competencies concerning the holistic character of architecture.

The Tuning project has developed the methodology which has shown its performances in other educational fields. ENHSA has launched the test phase of the TUNING process in the field of architecture. The Faculty in Belgrade will also participate in the forthcoming TEMPUS SCM regional cooperation program "Recognition of architectural degrees in CARDS countries based on competences and learning outcomes" with the aim to map and harmonize the assumptive competences between different schools. The main goal is to improve the mobility and multilateral recognition of the qualification.

Operationally, steps in this process should be:

- generating learning outcomes from competences matrix
- positioning outcomes in curriculum structure
- analyzing the overlapping and convergence
- modifying the syllabus
- modifying the teaching methods, and finally,
- developing /re-thinking/ the curriculum.

Notes

1 Nikolic V.,Savic M.,Timotijevic M.: *"Studije po evropskim standardima: Univerzitet u Beogradu – Arhitektonski fakultet 2006"*, UB-AF, Belgrade, 2006

2 Doevendans K. & van Bronswijk J.: "Ready to Start a 21st Century of Architectural Higher Education", in Spiridonidis C. & Voyatzaki M. (Ed.): *"Shaping the European Higher Education Area"* EAAE, 2003.

3 - Bloom, B., Englehart, M. Furst, E., Hill, W., & Krathwohl, D.: *"Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain"*, Longmans, Green, New York, Toronto 1956.
- Krathwohl, D. R., Bloom, B. S., & Bertram, B. M.: *"Taxonomy of Educational Objectives, the Classification of Educational Goals. Handbook II: Affective Domain"*. David McKay Co., Inc., New York 1973.

4 with exception of the psychomotor domain, as the third domain in the research of Bloom and associates – authors remark.

5 Anderson, L.W., & Krathwohl (Eds.).: *"A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives"*, Longman, New York, 2001.

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Mariela Cvetic

Four Steps Re-search in Architectural Design Methodology

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Design in Design

Designing has no meaning on its own. It does not exist out of a general architectural context. Furthermore the case of replacing its abstract value with methodology bears in itself the probability of staying out of it. This only means that the question of abstracting from reality has to continuously linger in the air in order to keep universal values above personal.

There is no doubt that the nature of architecture is connected to phenomena and forms in which it appears. The way architecture exists as universal in particular cases or phenomena, designing can also take two forms that do not exclude each other. Although we know that it is not going to help us in the progress of design analysis, keeping architect's position safe can not be replaced by the coincidence of having a successful design outcome. Perhaps it is just about a concept or a chosen perspective, but position of being detached can be very useful, nowadays more for designing than designers.

The problem of universal and specific can not be easily solved. Especially it can not be solved by its own means. If we, for the sake of process of thinking ignore the problem, at least for a moment, we can enable ourselves something more than a moment of aesthetical "pleasure of denial" - a shift in idea development. Being contemporary requires at the same time being specific, unique and authentic, but also does not oppose common principles. Furthermore, stressing the general is a probable form of this situation. Specially for methodology of design, which is of our main interes, this kind of ambivalence enables anticipation, further progress or another *theorethical jurney* (Baudrillard & Nouvel, The Singular Objects of Architecture), common for architecture and architects, ecology, technology, ethics and aesthetics.

Progress in technological sense it is not linked to architecture (alone), but is part of a wider context. Whether it refers to irresistibility or "love of convenience" perhaps has no importance, but architecture and especially architectural education is hard to comprehend out of this symbiosis. For architectural design it is just a new natural environment.

Skill in Knowledge

Architectural design dominates architectural education. This role was given to designing because of its unique ability to, through its process, synthesize all that can be considered relevant for anticipating (architectural) the future. Even though it takes place in the present, designing is primarily relevant to the situations that are about to exist. In the genesis of the word *project* there is a blurred relation between skills and knowledge, that is in designing set parallel to ambiguous relation between how well architect, creator of the processes, is informed and his intuition. Being a well-informed architect in the era of information technologies is a common state. But selection, usefulness and information validity are methodological topics *par excellence*.

If we accept existence of the authenticity of each designing case, then the method selected is both mean and technique, process and result, question and answer. It means that the contemporaneity of architectural form is not just undetachable from

the process of its genesis, but that the form is, in the final outcome of this aspect, the process itself. This jumble of ideas may seem theoretically untrue. Its purpose is not defining, it is understanding, not of the form itself, but the process, especially of the context in which this issue is considered (Le Corbusier, Vers une architecture). The design context or state can also replace the form in which all known content values, meaning or pure artistic qualities of architectural form are refracted.

Changes in architectural education were echoed by changes in architectural practice. In contrast to every-day problems that architects encounter and solve in relatively clearly established social ambient (rules of game) for the priorities in changes of architectural pedagogy that are placed in the awareness of ability and understanding its proofs during the progress in designing. Studding design is not possible in non designing procedure, nor are the both parties excluded from this act. To make this procedure clear, the method has to be adapted to it. In this sense it is possible to set following comparisons: selectivity and criticism, usefulness and morality, confidence and talent. The question of aesthetics is transferred from goal to method, from form to formula (Rowe & Slutzky, Transparency). This does not mean that the form does not exist, on the contrary, it speaks volumes of understanding its architectural strength, independence, purity and transparency (Hill, architecture – the subject is matter).

Unity of Opposites

The nature of designing in education does not differ from designing in general, and still there are things that could not be *a priori* applied to professional reality. Research is an important component of education in the same way the final form of design is an integral part of the process that shapes it. If we see this as a quality and not as a problem, we are enabling the continuation of the process and its creative future (Bergson, L'evolution creatrice), equally based on knowledge as on skill, in other words intellect as much as intuition.

If the role of technology is defined by nature of the way it was brought to our life, than its part in design is natural as well. This is not just about application of computer technologies, although it is the most obvious example of the statement we are discussing about, but about meaning that is assigned to technology or space that is set aside for it. It is easy to present all the advantages of modern technology for designing and building architecture, but the question about the future of this relation stays completely open, not just as an architectural particularity. Although embodied in opposites between imagination and reality, artificial and natural, digital technology is everyday architectural environment. This equally belongs to the existing architecture as much as to the one that is about to vanish or be discovered. That does not mean that architectural design is impossible without it, nor architecture, but certainty in verity of design is diminished, not to mention beauty of such form or its value of use.

In the methodological sense contemporary relation of designing and digital technologies can be defined through two extremes: the means of use and the usage of means. The form of partnership evolves into a specific interconnection among

means – particular architectural case that confirms certain general value. The way things set the question of balance stays open, but in understanding changes that technological progress brings, the thing that is opposed by its genesis technically helps the most. This refers to the analysis of relation between real and analogue vs. virtual and digital. In designing process both exist as a proof of their opposites. Only when formally defined things obtain their autonomous value (Focillon, Vie des formes). Along that line, furthermore, form stops being only what it had been up to each moment of discussion, leaving us the problem to accept, or not, that it is still simply about its life.

Naturalness

The nature of technology is manifested in problem solving, not in its understanding. On the contrary, design could be understood as a process of not only problem-solving but also problem-making. Particularly in architectural education, both can be equally valued. Since architecture that is of our interest does not exist beyond life, even more in the (past and) future than present, certain lies may be considered as predefined for designing. A game or a simulation of real environment in education as well as in design and its potential in methodological de-fragmentation, should bare possibilities for new combinations. Perhaps the most important role of modern technology is the one it has in the phase of design learning. The possibility to borrow a part of technique and overcome the situations when lack of skills is disproportioned with a clear capability to conceptualize architecture.

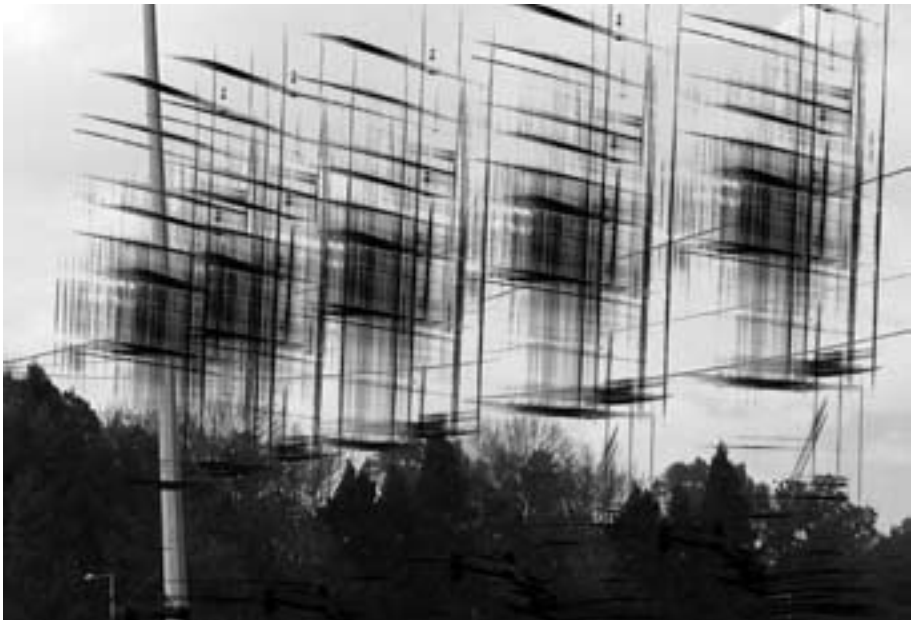

Image 1
Single family housing. Design Studio 1. Marko Marovic

Today, in ongoing cyber culture, much different from the period of more than half century ago, it is possible to equalize real, virtual and illusional. At first glance it seems that we are dealing with evolution, experiment, imagination, intuition, or constant search for answers on questions that are constantly changing form. To the world evolution is presented through a sequence of forms with visible and invisible, small and continuous differences within a type. Experiment also has a limited scope in which it takes place and shows results. Imagination is acknowledged by the power of images, and intuition seeks for a form that would present in the best possible manner vague essence. What does expectantly unexpected actually mean in architectural design? Is predictable necessary any more?

backwards/ back-words[1]

Naturalness. There is always a question about naturalness in the art process that considers believing in romantic notion of instinct and trying out all the options until "the one, the only true one" comes along.

As the direct insight in the matter of things, as the category, historically speaking, *inspiration* was developing from subjective, overwhelming observation (pre – modernism), then acknowledging obvious truth on which rational knowledge is based[2] (modernism), into position of *hypothesis* created by quotation (or montage), and thus became unstable, open and changes prone – to finally (in post-modern) notion of intuition is created by rationality.

In any historical moment, intuition is (was) possible to occur any place: equally in library, in the embrace of and under the awake eye of all theories, as well as the histories, but also on the cracked plaster wall or "wall smudged with various stains" (method followed by apprentices after, perhaps never read, the instruction of Leonardo Da Vinci in his treatise on *painting*, point *69. On ways how to awake and stimulate mind for various discoveries.*).

Always: the one who teaches does not give any advices or recommends no technique that one does not use by oneself.

Unity of opposites (τεχνε – skill, λογος – knowledge). history of new materials in art is history of 20th century: versitale methods that were used to incorporate new materials in artistic work until the technological revolution – are the core of art work of the student studying architectural design (ontogenesys = philogenesys).

Numerous possibilities of technology did not and can not alienate from art itself.

From *xerox* art as the strategy for dematerialisation of the art piece to *vr* as strategy of electronic simulation of image (sound...) and connecting technology with human being.

Ultimetly, technology, by definition, has expiration period: to stay useful it needs to be new, updated. New computer multimedia uses old media as its basic material, while software becomes avantgarde. (*metamedia*, lev manovich)

Skill in knowledge or the skill bears lust for skill. Technology allows sometimes to be left behind in order to become familiar with the need to develop manual skills

– drawing by both hands, (revenge sinister) after all. as well as: drawing in the dark, or: drawing colours by colours. Generating colour in computer and finding it in pigments, or: drawing the invisible, what lays behind, or: moulding simple symmetrical objects on pottery wheel, or: print of a stencil on a paper.

Design in design. There are no exact, definitive instructions for design/in design to be resolved in order to resolve what can and cannot be in the design process – might become an avenue to new discoveries.

On the other hand, it stopped being important if work is the art or design. Furthermore, the critique of media loses its importance because it is possible to design own software that would define its own cultural system.

So, beside architetural design, there is information design as well.

Notes

1 Considering that this text aspires to position the art in overall architectural education, its structure tries to follow the structure of architecture, which, as a discipline, is based on synthesis and interdisciplinary relation between technology and art, so an author tries to create a text as a hybrid text for its praxis of both the teacher and the artist.

2 Gaston Bachelard in *le nouvel esprit scientifique* talks about relation between absolute realism and rationalism and change between "intuitive and direct metaphysics by discoursives and objectively corrected metaphysics."

Vladimir Mako

Architectural Design Research and Aesthetics of Conceptual Ideas

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The aimof the present paper is to explore particular issues in architectural design research and its potential development in education as a process in which aesthetic communication can be established through conceptual ideas. Framework in this process is based on the integration of theoretical and pragmatic research aspects using contemporary understanding of aesthetic as communication on a cultural and social level. In contemporary understanding of a creative process, the designer's intention to develop a complex interaction with parameters of aesthetic communication is crucial. It activates a complex system of individual and cultural principles in creative activity, based on intuition, experience and knowledge. This approach is conditional for developing the complex character of a creative process. In that context design research can be thought as a form of processing the artist's aesthetic intention, guiding in a particular way further development of design activity, and providing variable forms of its expression. In that way design research operates on the primal stage of creative activity, starting with the aesthetic intention and ending with the concept developed on an ideal level.

Investigation of this process is important for several reasons. First, it can provide insight into the basic stage of creative activity, indicating possible aspects in the process of articulating aesthetic intention and conceptual ideas as sensorial expressions; second, it can establish design research as a complex form where design activity and aesthetic activity interact in a most sensitive way. In that context design research can be understood as an active process of transformation and increasing complexity of various design aspects and possibilities, developed on the primal stage of creative activity; third, it can develop a research procedure in interdisciplinary design education, as experimental framework in which former processes can be observed.

In that context architectural design research process can be thought as a form of manifestation of the designer's aesthetic intention providing variable ways of its expression, regarding theoretical and pragmatic aspects guiding the research. However, this process can be developed further and interpreted as an artefact by itself. The meaning of that is that the research process can be evaluated as an outcome, in which case the aesthetic communication of particular conceptual ideas can work autonomously from any pragmatic task in developing architectural thinking. In this context, we can generally differentiate two levels of research processes: one leading towards an artefact as a product, and the other which by its own conditions of development becomes and exists as an artefact.

The first level of building such a complexity in architectural design research reflects particularly on establishing a research procedure in architectural design education. This procedure is, however, more related to a particularly established theoretical framework, which allows flexibility in individual approaches, using preferably developed artistic experience and intuition. However the position of different kind of knowledge, crucial in any educational process, can also be thought as extremely important. Its character is defined by different ways of managing information, using different medias, acknowledging different possibilities of expression, and developing them into architectural concepts.

Knowledge is here more based on possibilities in using intuition and experience, then materialization of the process outcomes. In that context researching as a process of enquiring guided by aesthetic intention logically relates to an activity through

which one can acquire individual experience and knowledge, specific for the discipline, and emphasized in architectural design education. Supporting novelty, innovation and original thinking, architectural design research culminates in the act of creativity. That discourse, as a complex system, conjoins speculative thought and creative force in an active way, and therefore interacts with aesthetic intention.

The level on which research process can develop as an autonomous outcome asks for a particular definition of the term artefact. The meaning of artefact should be established broader and based mainly on ideas defining *imaginative artefacts, performing artefacts,* or even those where they are *evidencing the process*. In that context, the paper will support existing ideas defining *a relatively autonomous "world"* (Diaz-Kommonen) of particular artefacts, developing it further into a state where they are no longer evidencing the research process, but are that process, at the same time embodying the new experience and knowledge reached through the process as a particular concept.

Consequently, if the research process itself becomes an artefact, it should consist of values referring mainly to researcher's personal experience, intuition, development of different kind of knowledge, and in principal divorced from concretely defined functional, material and technological properties, conceptualizing ideas of a different kind. Generally, research process can be thought as a form of processing designer's basic creative intention, guiding in a particular way further development of its activity, and providing variable forms of expression of ideas.

In the context of this paper and regarding the research process on which the discussion is focused, it would be insufficient to define the designer's intention as an aim towards achieving a pragmatic design solution of any kind. It is more an intention for a complex communication of ideas, where solely factual knowledge and practical outcomes are not final means of the activity. It implements largely the intuitive articulation and expression of sensorial values and conceptual possibilities as broader, more abstract reflection on given conditions of a fragment of reality. In that way design research operates on the primal stage of creative activity, starting the process with the affective attention as the primal step of any creative intention, ending with the concept developed on an ideal level.

This kind of design research process, especially if developed for educational purposes, has its autonomous value, even if not finally separated from the one leading towards rational definition of functional and material design properties. However, the main implementation of intuition, imagination, speculative thinking, and subjective and/or unconscious judgment of perceptual values, is placing this research process closer to the field of primal creative experimentation with sensorial values, than to the rational, functional and technological decision making.

According to these conditions, the designer's intention in scope can be better defined as its primal or inner aesthetic intention. Driving out from affective attention, which indicates basic relationships between sensorial values of a fragment of reality, aesthetic intention in this context can be defined more as a process-based activity than as a flash of a creative moment. In that sense, research process and its outcome, which will be discussed in this paper, is also mainly different from a

process of artistic creativity and its interpretation of the world. It means that the research process as an artefact is applicable in the further procedure of the practice of design where it confirms its purpose.

However, accepting the possibility of a presence of aesthetic intention we acknowledge the research process to be a process of aesthetic articulation of ideas which, unavoidably leads towards an aesthetic outcome. As emphasized in contemporary aesthetic theories, existence of aesthetic intention, and we can add of a continuous process of internal evaluation as part of a creative activity, is a sufficient aspect for an outcome to be considered as aesthetical one. Its main characteristics are transformability and search for possibilities in expression of sensorial values.

In that context, the third issue relates to the possibility of defining the nature of research process as an aesthetic artefact, which by its own means should be based on a particularly developed and complex set of conditions. More than that, so defined research process can be understood as a complex form where design activity and aesthetic activity interact in a most sensitive way. In that context research process can be understood as an activity towards transformation of different design potentials and possibilities, which increase complexity of various design aspects and concepts developed on the primal stage of creative activity.

According to all that has been said it appears that the structure of the research process is of particular importance. It is obvious that it can not consist of a fixed matrix of implemented data, rationally prescribed procedure, and based solely on rational knowledge and factual decision making. Through research of the basic creative impulse, intuition and imagination, established procedure should be in accordance with the idea of design as a cognitive tool, implementing a constant process of transformation: data into information, information into design potentials, design potentials into design aspects, and design aspects into design concepts.

However, the nature of this transformation is not mechanical or strictly rationally guided. The process can be better explained as an activity of 'designing' new potentials, aspects and concepts, which, for its own part increases the level of complexity of the design research process, and consequently researcher's experience. Aesthetic intention, evaluation and re-evaluation, in that context, coordinate the steps in the process of transformation and the increase of its complexity.

This kind of design research process, especially if developed for educational purposes, has its autonomous value, even if not finally separated from the one leading towards rational definition of functional and material design properties. However, the main implementation of intuition, imagination, speculative thinking, and subjective and/or unconscious judgment of perceptual values, is placing this research process closer to the field of primal creative experimentation with sensorial values, than to the rational, functional and technological decision making.

Design research as explained is very close to the notion of an aesthetic discourse as the form of 'subjects' mental relation to reality. It develops particular values internal to the process of formulating new experience. In the process of evaluation and constant transformation of sensorial values and belonging emotional reflections, aesthetic discourse provides the primal level in investigation of new design modes. The 'subject' is arguing with its own existing experience of reality using intuition and imagination. In this way, the process of constituting a new reflection on reality is in accordance with the 'subject's' own intention for a design interpretation of that reflec-

tion. It means that permanently increasing experience and intuition implemented by aesthetic intention are in constant active interaction, defining aesthetic discourse as essential aspect of an initial design research process. Existing knowledge, already active within aesthetic discourse, in this context can be defined through experience and its constant development in a design research process. Intuition in that sense can be accepted as an active element of transformation and further development of 'subject's' knowledge. It always initiates process of constituting new values trough affective attention, which defines aesthetic intention and according to that the nature of aesthetic discourse and its outcomes. Based on these premises, design research is focused on modes of thinking and designing activities, defining their primal aesthetic values developed within personal approaches to design and creativity, which is essential for educational purposes.

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Nina Juzwa
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Teaching and Experimenting with Architectural Design *A Case Study from the Silesian School of Architecture*

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One of the important new strategies being implemented in the teaching of architectural design are workshops which have been included in the school's curriculum. The workshops provide a possibility to create space and atmosphere where students are encouraged to challenge their intellectual potential in a heuristic working method. In the education process the students are closer to a real situation and the theory and creative practice become less distant.

In the current paper we present this idea using the example of workshops about architectural conception of the New Silesian Museum in Katowice. The five day workshop was organised as virtual real life; the students and a group of tutors were from two schools, namely from the Faculty of Architecture of the Silesian University of Technology and from the Academy of Fine Arts to Katowice. The workshop had two main goals:

1. experimenting with architectural design – communication between architecture and its users
2. teaching architectural design – an exploration of human and space attributes and the inclusion of new technical and technological solutions in architectural education.

Figure 1
The location of New Silesian Museum in Katowice

Communication between Architecture and its Users – experimenting with architectural design

The students' task was to define the architectural structure of the future museum having at their disposal a very general definition of its size and the functional program and a very precisely defined spatial situation. The architectural concept of the new building is different in each of the four presented designs, which was the aim of the organisers of the workshop – academic teachers of both schools. The workshop was intended to show the authorities of the city and the future users how the new

generation of citizens of the region envisages the planned museum; and what are the possibilities of using the indicated by the authorities building plot which is densely covered with objects of an old coal mine.

In the course of the workshop four architectural concepts of the museum's building were created:

Concept 1 – Medial Terminal of Art and Culture

The Medial Terminal of Art and Culture, as it was named by the authors, is a brave design referring to the experiments of deconstructivists (Figure 2). The concept reminds of a wave frozen in motion rather than a building; a wave that connects the past and the future of the place. A form that is vaguely defined and full of expression is intended by the authors to grow into the urban fabric and at the same time to absorb us in its interior". The building of the museum would connect all important places in that part of the city.

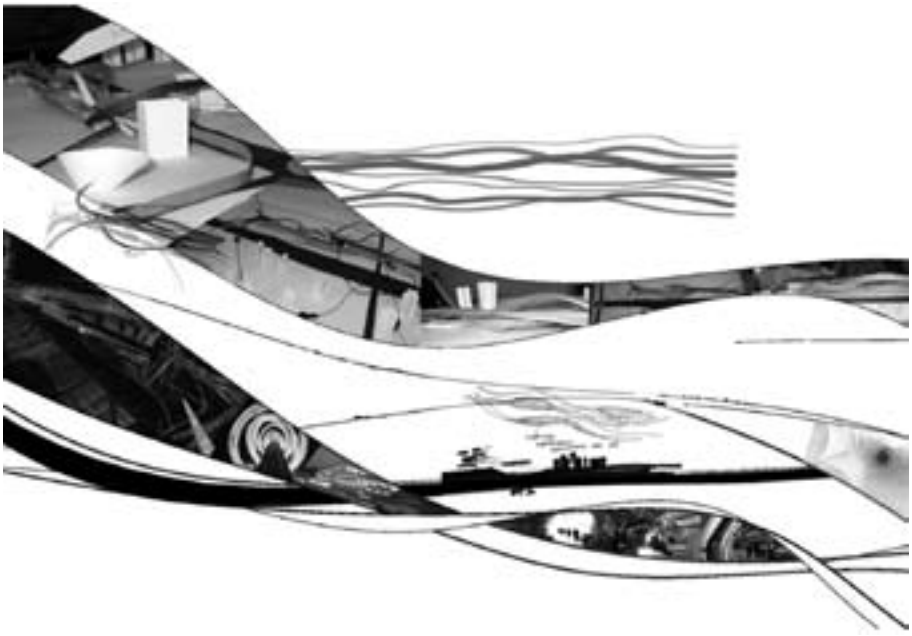

Figure 2 Medial Terminal of Art and Culture

Concept 2 – Time sequences

The concept named "Time sequences" (Figure 3) concentrates on the problem of the proposed project's location and the question whether the building plot suggested by the authorities is sufficiently large. The considerations are whether in the process of defining the shape of the museum it should not be attempted to reorganise and "tidy" the areas around many important buildings situated near the plot for the planned New Silesian Museum.

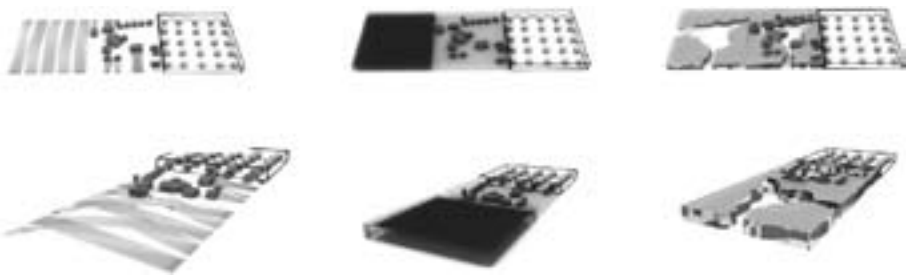

Figure 3
Time sequences

Concept 3 – Museum of Imagination

The third team named their concept "Museum of Imagination" (Figure 4). The idea here was to enclose the old mine in the structure of a cracked glass box. In the opinion of the authors, the simplicity of the illuminated glass cuboid would help in establishing communication between the symbolism of regional tradition and the dynamism of changes in the history of meanings in the modern world. The orthogonal in shape building of the new museum opens up towards the space around the buildings of the old mine, as well as towards the existing buildings that are important for the city. A new important axis of the city becomes clearly marked.

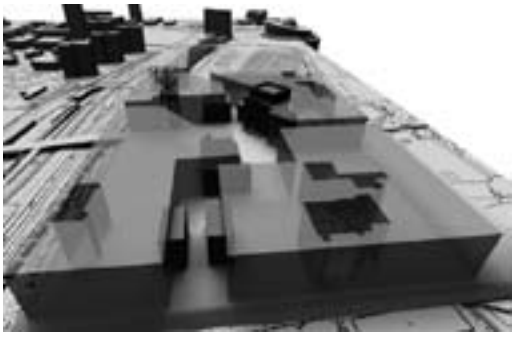

Figure 4
Museum of Imagination

Concept 4 – New Silesian Museum

The fourth team simply called their concept "New Silesian Museum" (Figure 5). The concept directly relates to the principle of a mine's construction. The main function of a mine, i.e. coal extraction, takes place underground. Similarly, in the presented concept, the museum's exposition has been placed on three levels. The old mine's

Figure 5
New Silesian Museum

buildings would remain on the ground, the actual historic museum would be placed underground; the museum of contemporary collection would be located in an elevated structure above the mine.

The patronage and financial support of the local government of the region allowed to conclude the workshop with a publication of a catalogue and an exhibition. A public discussion about the presented concepts and the involvement of the media in propagating the problem in the interested circles led to a wider support for the local government's project. A discussion and the visible effects of the workshop allowed a clearer definition of the urban and programme conditions.

The teaching of design in architectural education - Understanding to explore the human and space attributes for the integration of the new technical and technological considerations into architectural design.

The educational process in architecture is mostly about transforming personal experiences and the culture of a student into professional skills. To be successful it has to deal with architecture in its context. The understanding of the form, physical attributes and shapes of structural phenomena based on observation and studies is mainly based on wisdom and intuition as essential components of synthesis, but the practice of design permits a creative application of principles that leads to learning more about them. Therefore, "real" experience in architectural studios of the teaching staff engaged in the workshops is an essential element of such a teaching model.

The architectural design of a building is a process integrating knowledge from several disciplines; it is also a result of collaborative function of intuition and intellect, based on a series of decisions. The solution of the problem requires several steps.

During our five day workshop we divided the educational problem into four steps:

- problem definition,
- understanding of the site and the city context,
- searching for a conceptual idea
- architectural solution.

Step one

Problem definition. Here we have questions about the functions and about the shaping patterns of a museum building. Thus for the current paper, more interesting are questions about the localization of the building.

The place – the Upper Silesia Agglomeration used to be among the greatest and oldest historical coal mining regions in Europe. Since the 1990's it is in economic transformation, but until today the landscape is marked by old industrial buildings and groups of historical workers' estates. The towers of the coal mining shafts are among the most typical landmarks of the region. Katowice (320,000 inhabitants) is the main city of the agglomeration (Figure 1).

Step two

The site and the city context. The context is meaningful for the New Silesian Museum but not easy for an urban project. It is a post industrial area, previously with the coal

mine “Katowice” which is in decline today. In its direct proximity runs a multi-lane road that connects main cities of the agglomeration but at the same time this road divides the city and places the area under consideration outside the centre. As can be seen in Figure 3 the authors of the concept "*Time sequences*" remained for to long a time at the stage of location studies and the project's context in the city.

The two first steps are an intellectual introduction to the design process; they are based on a series of decisions determined by intuitive and acquired skills and knowledge.

Step three
Searching for an idea. Architectural training from its beginning is about shaping the students’ experiences. This step in the teaching process is very important and it involves:

- developing the habit of synthesis, and
- learning to reduce problems to a basic form of a pictogram or an ideogram

We hope that this may help in defining the students’ thinking system and their critical standpoint. An idea is not an architectural building solution which usually is a picture, but it could also be an intellectual thought in one’s mind. Today, the increasing possibilities of computer aided design and the availability of new types of materials opens up a whole area for the creation of architectural ideas.

Step four
Shaping the architectural conception. In our time we find architectural solutions, created on a basis of apparent “liberation” from constructive constraints. Architecture joins the painter’s freedom to decide on form, texture and image. The last twenty years have produced the most “illogical” structural forms of all times thanks to sophisticated technologies “which appear to be capable of anything”[1]. The actually computing civilization governs the relation between technology and space. Finally, the space concept changes together with the architectural proposition of structures. This brings some unexpected problems to some students who are excessively fascinated by computer technology and with the fabulous liberation of architecture from structural reality. Teaching implies consciousness of issues and methods. Our four groups of students gave us a clear picture how to discuss a particular aspect of the four solutions.

Even if all the four solutions are equally good, each of them becomes a basis for conclusions and comments which are important in the teaching process.

The problems of the excessive fascination with the new possibilities can be seen in two groups participating in the workshop, although the problems are different in each of them.

The authors of the concept "*Time sequences*" spent so much time discussing the possibilities of creating computer models (new computer architectural patterns) that they remained at the stage of localisation studies.

The team "*Medial Terminal of Art and Culture*" (Figure 2) terminates the process of conception because of the antagonism between artistic expression and constructive reality. The fascination with the possibilities of nonlinear architecture results in the

idea of a continuous movement, of a form that never stops. They probably required more time to decide on the grammar, structure and the relation to gravity of the future building. However the aesthetic expression and the very formal studies of the conception lead to very satisfying effects of teaching.

The others two teams in their search for a solution stayed nearer the reality. In the final effect we see the discovering of new visual elements and exploring different modern technologies, which are shaping reality in space. Based simultaneously on the tradition of human culture and on regional identity elements, the architecture apparently includes computer technology added to the new language of physical attributes. Intuition and common sense are well integrated in the creative and successful combination of technical considerations in the presented design.

Concluding remarks

Last years brought on civilisation changes affecting practically all aspects of out lives. Many expressions have been invented like "global village", "third wave", "information society", "liquid modernity", which attempt to name and describe the changes. These changes also apply to architecture.

Together with the development of digital technology, possibilities have been created that change our view how architecture should be. The way ideas or architectural concepts are expressed are directly related to the time in which the object is being created. The architects see their thoughts as a nearly real object. Between the designed object and the material result there exists a large difference, a difference similar to that, that exists between the conceived object-idea and a drawing or a depiction by a model. The construction of an object: the form, type of structure, choice of materials – is being created by means of drawings, mock-ups or computer models. Two main directions – architecture of information and architecture of deformation which appear together, with the expansion of the computer technology seem to connect the new paradigm of architectural space[2]. These changes also modify the teaching of architectural design in the following:

1. New, almost unrestricted possibilities of realisation of an object do not free academic teachers from the responsibility to convey technical, interdisciplinary knowledge needed for the realisation of the function of the object. In architectural design it is important that the team of teachers represented various disciplines.
2. Three tools of the creative work of the architect – a manual sketch, a mock-up and a computer model receive the appropriate and relevant role in the process of creation[3]. During the design process, the concept is being defined in more detail, the amount of information about the designed object increases. A sketch contains basic information, particularly important for the idea presented by the author. The author applies a process of simplification which is largely intuitive. A mock-up is built similarly to an object and similarly, gravity applies to it although it does not have all the physical properties of a real object. A sketch and a classic mock-up made on the basis of drawings are currently replaced by models created by means of computer aided design. In comparison to classical methods of working, computer aided design is characterised by the ease of application of changes

arising from the collaboration with other branches. The advantages of this type of design cannot be denied, however in the teaching process also its shortcomings should be shown. The most important shortcomings stem from the problems of interaction between humans and the computer, particularly visible in starting designers and they are:

- The ease of modification and evolution of the solutions created in models results in students rarely abandoning the initial concept in order to search for better solutions.
- The lack of a clear scale of mapping in the computer model leads to a situation where students taught with the aid of computers have difficulties in reading and transforming various scales of representations. Students have not only trouble with reading the scale, but also in the composition of boards, thickness of lines and similar details which make drawings intelligible.

Our didactic experience indicates that an important factor leading to an insufficient exploitation of computer aided design in the initial phases of the creative process is the lack of freedom in the interpretation of the created model. This feature is best represented in a manual sketch which allows an unrestricted creation of thoughts in situations when we do not have a defined goal – the shape of the designed object. At the same time it cannot be forgotten that thanks to computer technology unreal dreams of architecture become increasingly accessible.

If we look in the past, many wonderful works of architecture came to existence through a human dream and the idea of the architect who created that work. In each epoch, architecture is an expression of its times and the goal of teaching should be to enable young students to apply all possible tools of creative work: the classical ones, as well as the modern ones. The latter contain traps but if they are applied skilfully they can free imagination and allow going beyond solutions impossible up to now.

Notes

1 Pierre von Meiss „The Aesthetics of Gravity", in The Teaching of Architecture for Multidisciplinary Practice, ed. 17th Conference AEEA, University of Plymouth
2 Nina Juzwa, Adam Gil; „The Influence of Design Tools on Architectural Conception and Aesthetic", in Defining the Architectural Space. Material of Architecture, ed.University of Technology Krakow, Z. 9-A/2006
3 Adam Gil „Sketch, mock-up, computer model", PhD thesis, supervisor: Nina Juzwa, SUT, Gliwice 2005

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Maria Hadjisoteriou

Introductory Architectural Design Studio: (re) Searching a New Approach

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Introduction

The design studio has undoubtedly been at the core of architectural design education since its inception in the nineteenth century. The traditional studio-based pedagogy has remained fairly stable and unchanged for more than a century, based on the historical models of the Beaux-Arts and the Bauhaus. The idea of the design studio was first developed as a form of collaborative learning, in 19th century France by students of the Ecole de Beaux Arts. The school's formal activities consisted of theoretical lectures and the setting of design competitions but there was limited opportunity for design tuition. Students consequently organized independently established workshops (ateliers), inviting and paying qualified architects to assist them with their design work. This system has continued into the 20th century, initially within the offices of architects: the atelier of Le Corbusier, at a later stage within schools of art and design, and more recently within schools of architecture.

Research related to pedagogical approaches to architectural education, reveals considerable differences in the process of education of future architects around the world; schools of architecture adopt different models of how learning within a design studio may occur. In some situations (the year system), students will all work on the same project, within a shared studio environment for a whole year. In other situations (the unit system) students from various backgrounds may work together in a similar way to the Beaux Arts ateliers[1]. However, the overriding primacy given to the studio as the main forum for creative exploration, interaction and assimilation remains a common characteristic: *"The design studio is the melting pot of different types of knowledge thereby occupying the core of the education of architects"*[2].

We cannot of course overlook the fact that during the past decades the traditional design studio has come under considerable criticism enforced by social, cultural, epistemological and economical factors, knowledge and technological developments and increased use of information technology and computer aided design. However, we believe that it can still be rightfully considered as the foundation of architectural education albeit in a possibly different form. Students encounter fundamental principles, basic skills and knowledge of visual environment and start formulating initial ideas about their future role and responsibilities as architects to be.

First Year Architectural Design Studio

Visual literacy of first year students, however, is found to be through our experience, either absent or preconceived; similar observations were indeed noted by a number of architecture educators including Salama[3]. New students have difficulties relating to basic principles related to visual composition such as proportion, balance, depth, continuity and are often unable to express visual ideas into two- and three-dimensional mediums (such as drawing or models). Architectural educators including ourselves, have observed that as these students enter the process of architectural education, the problem is exasperated by the fact they often come with "preconceived ideas" about architecture that are based on an uncritical acceptance of the architectural settings in which they have grown[4]; these preconceived ideas are mostly about:

- spatial organization (for example relationship between space and labeling of space, room-function relations),
- social organization (for example family structure and profile in a domestic environment is inevitably influenced by the social and personal background of students) and
- formal organization (for examples students may be influenced by "styles", "fashion trends")

"Preconceived ideas" or the designer's "prestructures" is, we believe one of the most important issues central to the approach towards architectural education in general and the introductory architectural studio/design in particular; it raises a fundamental question in relation to the pedagogical approach to the studio. Historically, we have been familiar with a "rational" approach to design as a problem-solving method which links a procedure to a field of information (analysis and synthesis of a number of constraints through a given brief, user profile and site conditions); in fact the designer has been repeatedly referred to as "problem-solver".

According to a very interesting article on what makes design possible, Hiller and Leaman suggest that this "rationality" in design aimed basically at purging the mind of preconceptions[5]. Approaching the question "how is design possible", Hillier and Leaman suggest that design is a relatively simple set of operations carried out on highly complex structures. They stress through their work that the designer's "prestructures" are not at all an undesirable phenomenon but the very basis of design. Moreover, it is exactly these "prestructures" they argue, that are not only the basis for creative action, but also the basis for understanding and interpretation[6]. Design, they conclude, is the transmission and transformation of "prestructures", a process of elaboration and discovery within which every solution may be unique; this is what facilitates and enhances design creativity[7] and possibly allows for a multiplicity of approaches through a range of possibilities.

In line with the aforementioned observations, this paper presents through a number of case studies, experimentation in teaching architectural design during the first years of study; this experimentation aimed at exploring and questioning a) preconceived ideas and conceptions about spatial, formal and social organization[8] b) the "brief" or "program" traditionally given to architecture students at the beginning of each project.

Case Studies

Case study 1 – adding

Task:
Students were asked to create a rectangular volume of a given size on a scale 1:1; no architectural scale, program or site was given. They were asked to deal with the volume as an object, think of it in terms of lines, planes and volumes and experiment with a variety of materials.

Outcome:
Understanding, interpreting and exploring formal relationships facilitated by students' personal and cultural background; as a result we had a number of individual approaches (emphasis varied from structural properties through vertical point, column or plane organization of elements to elaboration of horizontal planes) that facilitated discussion and questioning of important spatial and formal issues (enclosure, transparency, voids and solids, vertical and horizontal relationships, spatial continuity).

Fig. 1
Case study 1

Case study 2 – subtracting

Task:
Students had to deal with a solid cube that consisted of smaller units of a given size; they were asked to subtract these units from the cube in order to create voids of different forms and scale. No architectural scale or program was given to them. The only constrain given was the underground placement of the cube.

Outcome:
Elimination of exterior form allowed an in depth understanding of space as solids and voids. Proportionally interesting volumes facilitating discussion on visual and physical continuation of interior space was the outcome of this exercise; the underground placement allowed issues of natural lighting influence design decisions.

Case study 3 – research based theory incorporated in the studio – contemporary concepts of living

Task:
Explore, understand, interpret and re-present contemporary concepts of living (based on research based theories on contemporary inhabitable spaces).

Fig. 2,3
Case study 2

Outcome:
Very interesting interpretations of contemporary living revealing the importance of individual student's preconceived notions and ideas (personal and cultural history); these led to a diverse re-presentation and analysis of inhabitable spaces. Students suggested that although dwellings serve the same basic needs all over the world (living, cooking, eating, entertaining, sleeping etc.), research reveals variety in the ways in which these activities are accommodated in the houses of different historical periods and cultures. Projects' outcome suggests that contemporary concept of living has been transformed; it is no more a list of activities nor a room-function (labelling) relation; it is rather a pattern of space (how are activities connected, separated, facilitate or inhibit interaction, enable privacy etc). Spatio-temporal interpretation also becomes important (activities vary over time influencing the "get together" time of the contemporary family. Students' exploration focuses mostly on activities – boundaries/thresholds relations influenced by personal, social and cultural history, rather than room-label or room-function relations.

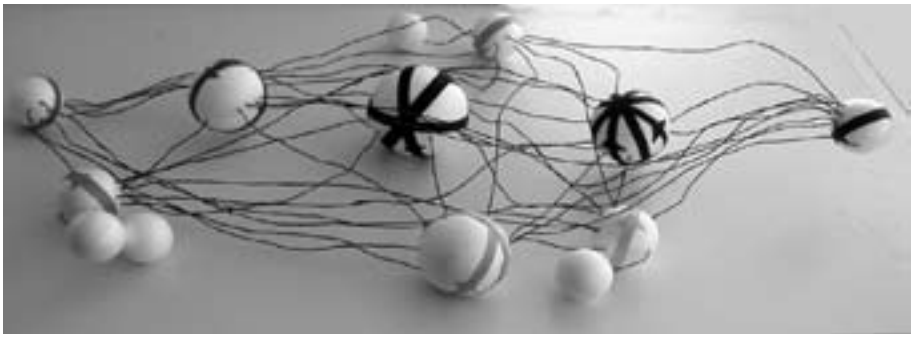
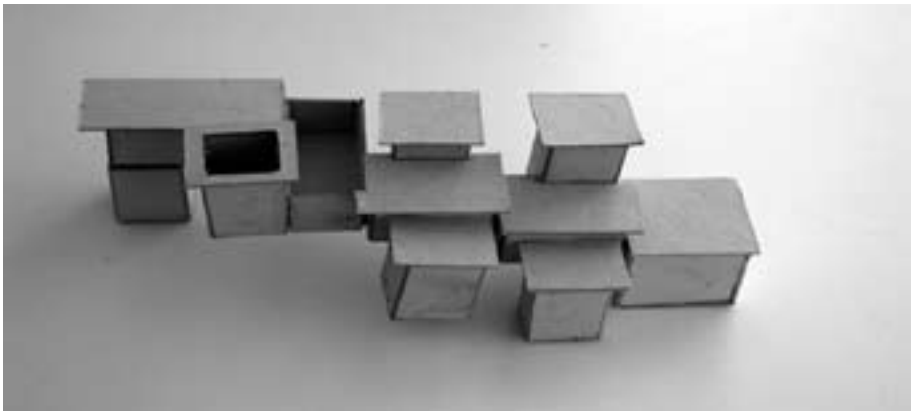


Fig. 4
Case study 3



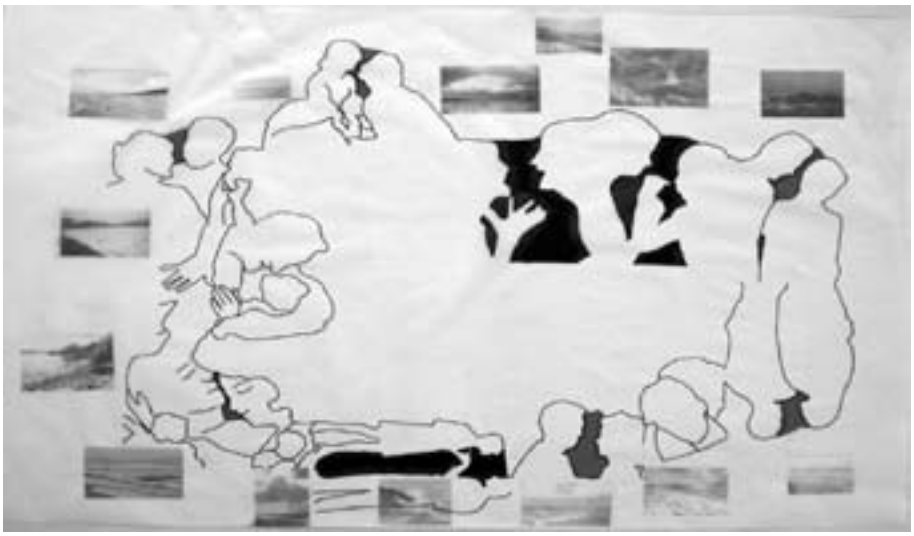


Fig. 5,6,7
Case study 3

Conclusions

The experiments presented are neither unique nor new to architectural education; nonetheless, they yielded gratifying, encouraging and effective results and we strongly feel that they influenced both the form of our teaching as well as the learning outcomes achieved. Students and lecturers acknowledged the importance of individual "preconceptions" and explored spatial and formal relationships in a novel and fresh way[9]. The experiments raised important issues as how to design is actually possible, the nature of students' preconceptions about space, form and the built environment, and how should architectural education deal with and assist the transmission and transformation of such preconceptions into unique and creative solutions.

References

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Salama Ashraf M. A. ( ) *"Towards a Knowledge based Architectural Pedagogy and Practice:The Design Studio under the Microscope!"* in

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Schön, Donald, 1983, The Reflective Practitioner; how professionals think in action, Temple Smith, London.

Notes

1 This enables the sharing of expertise from experienced to inexperienced, usually under the guidance of a 'unit leader'.

2 Salama, A

3 Op.cit.

4 Op.cit

5 This paper is on line with the work of Bill Hillier and Adrian Leaman in a very interesting article "How is Design Possible?", the suggestions of which we find appropriate for contemporary approaches to architectural design education; Hillier and Leaman (1974).

6 According to the authors, to ignore these prestructures in representing design as a design procedure is like assuming that a speaker re-invents semantic and syntactic structures which he depends on knowing in advance in order to use and understand the language.

7 As they suggest through extensive research *"the problematic of design method studies is therefore twofold: to characterize the autonomic prestructures by which the designer interprets his problem and which also act as a "solution field"; and to characterize the operations which may be performed with and upon such structures in a more or less complex environment to produce unique and effective solutions"*; op.cit. p.5.

8 This was partly attempted through assisting students in exploring the nonrepresentational aspects of architecture; efforts were made to encourage them to think of architecture in terms of lines, planes, spaces, and masses, rather than to define it in terms of representational elements such as doors, windows, columns, roofs etc.
At this point we should also mention the observations of that many view form-making primarily as creation, and, lamentably, creation is usually and associated with "freedom"

from constraints, principles, and rules; the emphasis placed on "self-expression" leads to a contradiction between cultivating a student's creative freedom and teaching this same student in the instructors formmaking value system. A coherent body of knowledge and skills is pivotal to the teaching of architectural formmaking and should consist of, among other things, explicit rules, principles, and methods.

Consequently, this exercise was supported by a number of lectures on the principles of form and space (planes, elements etc.); the experiments also aimed at assisting students in developing a sense of discipline in approaching visual form that depends on a thorough understanding of the principles of visual composition

9 The reiterative nature of these projects has also been particularly valuable for setting individual educational goals and standards. Discussions at the critique of each project included identification of appropriate issues and goals for the following project. Thus, although students were given a degree of autonomy in framing projects, we also had the opportunity to cooperatively agree individual educational objectives during the year.

Bianca Bottero

After the Lisbon Conference Utility of History

Polytechnic University of Milan
Italy

What the Lisbon conference effectively registered is the fact that a crucial language modification – as Paul Valery sustained – directly regards also the contents that language conveys.

Form/contents... an ancient *querelle*, strongly re-emerging today in the field of architectural design, while information technologies are so rapidly spreading and affirming themselves.

Those technologies indeed have surely brought – and the Conference confirmed it – a new spirit and fresh ideas to the worn-down disciplinary debate and to the traditional ways of its educational transmission. The possibility to build complex systems through the definition, overlapping, articulation of several information layers opens to the architect a huge perspective of solutions, suitable to be controlled not only in space, but also in time, to be verified at interdisciplinary level, to be communicated and corrected be the users, and to be controlled in their environmental consequences and in their material and social impacts. An architectural object or the spatial configuration, no more christalized in a static and permanent image, becomes, this way, the result of a process through which the final form takes place, thou never permanent, but mutable, flexible, intrinsically creative.

However, still the necessity remains to establish a rule in the design process, to spot a route, to make a choice: it is at this point that the matter gets more difficult and our love/hate for the values of modernity becomes more charming and ambiguous.

It is true that, since the middle of last Century, a refusal for the architecture of modernity has grown: due to its despotic and paternalistic logic and to its results, that were at the same time elitarian and stiff. But it is also true that its research of a social equalitarian strategy, resulting in a research of modules and spatial rules, remains unequalled.

For us it is difficult to give up, accepting as totally positive the valorisation of the individual creativity - as has been for the Post-modern -, or the futuristic efficiency - as has been for the high-tech hyper-functionalism.

These, therefore, are the values that we are still used to build when we faithfully embrace the new information technology: no more assuming the sharing of collective or collectivistic visions as constraints, but encouraging diverse and diversified behaviours, that are expression of unforeseen meanings, abilities of imagination and re-gained satisfaction in living together and enjoying places. Which in the end should represent the deepest meaning of a sustainable architecture.

I have found these meanings, these keys of interpretation in the Conference presentations that have interested me most, and I think that what I have proposed in my course at the Faculty of Architecture of the Polytechnic University of Milan (titled "Sustainable Architecture", and complementary to a Design Laboratory) are coherent with them.

Here I wonder weather the meaning of "sustainability" is not already present in some architectures of modernity I have always loved, sometimes belittled, uncomprised or ignored by an architectural critique which is all oriented toward some hypotheses, some dominant personalities. If this is the case, what an information, education source do these architectures still constitute!

If they are read from another point of view, in that state of mind that Bachelard called the "constant restructuring of the past through the present", their recovery, their re-interpretation in the light of new or critical approaches may constitute a precious source of concreteness; that concreteness that new technologies tend to cancel and whose recovery, if done though only direct practice, can be spoiled by a serious emptiness, an emptiness of history and memory.

During the first half of the XX century, architects like Adolf Loos or Rudolph Schindler, Bruno Taut or Alvar Aalto, Gunnar Asplund or Hans Scharoun, Aldo Van Eyk or Ralph Erskine, Frei Otto or Buckminster Fuller included in their methods and projects those same premises aimed at a new balance, at a new pact between men and nature. which we nowadays mean with the word "sustainability". And this with completely different linguistic and individual achievements.

Concepts like: connection with *place, how do you enter the house, light in the making of the space, environmental quality of glass, links between building and the ground and its openness to the sky, the sensible skin, architecture of democracy*… and others are all precious tools for reading with a new perspective many architectures

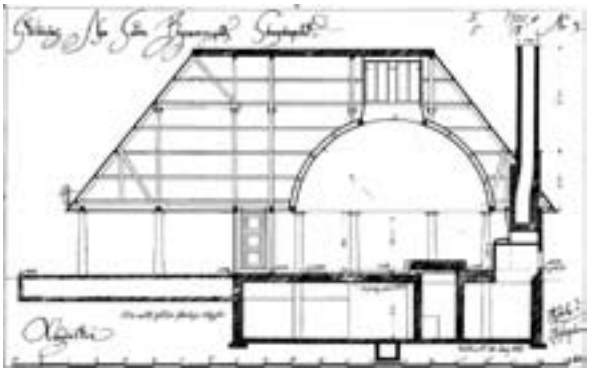


Figure 1
Eric Gunnar Asplund and Sigmund Lewerentz, Woodland Chapel, Stockolm, 1918-20.

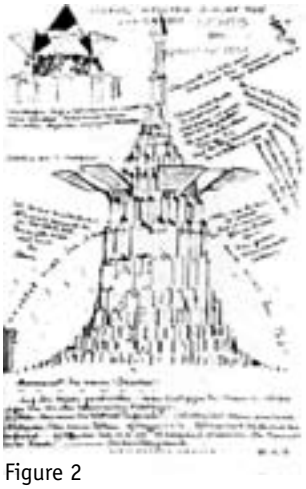


Figure 2
Bruno Taut, Alpine Arkitectur, 1912.

Figure 3
Frey Otto: living and non-living nature.

of our near past: where the results are obviously connected with the final formal solutions and have to be found through a kind of deconstruction of architecture itself, according to the concepts listed above, mainly aimed at the enhancement of users' comfort.

By this insight a very rich and interesting general view arises that sheds light on what awful simplification has been operated by the criticism of also very important scholars about that so rich and useful research. Which, in a new reading, shows not only many important aspects which the current disciplinary interpretation obscures, but also gives us many tools for a deeper understanding of contemporary architecture, where obviously the connection between building and the environment is much more dramatized.

So we discuss and carefully redesign the achievements in techniques and technologies in the buildings by Sverre Fehn and Alvaro Siza, Thomas Herzog and Georg Reinberg, Toyo Ito and Kazuyo Sejima, Herzog&de Meuron and Renzo Piano, Lacaton&Vassal and Lucien Kroll…; achievements that should not be read only as a personal gesture, but mainly as signs of a deep research in the direction of sustainable architecture: for their connection with the culture and the experiences of local traditions, for their attention to the inhabitants' participation to the design processes, for the general new vision of the environment and its identification as a necessary reference for a different future human presence.

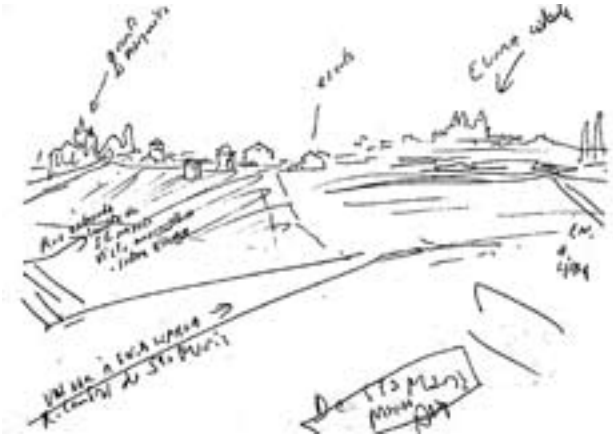


Figure 4
Alvaro Siza, Malagueira Estate, Evora, Portugal, 1977.

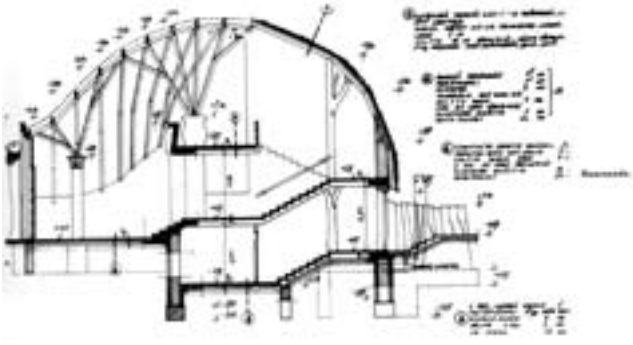


Figure 5
Imre Macovecz, Cultural Centre, Bak, 1985-1988.

Figure 6
Umberto Riva, School in Faedis, 1977-79.

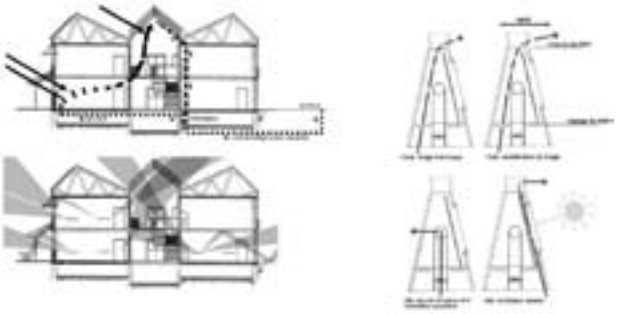
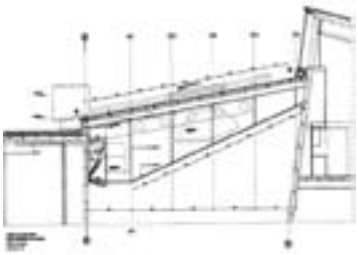


Figure 7
Lucien Kroll, Licée. Caudry, France, 1997.



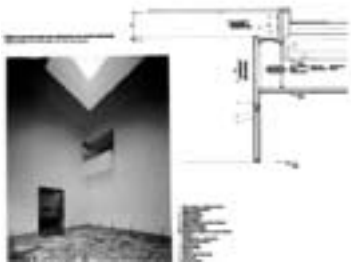


Figure 8
Steven Holl, Contemporary "Kiasma" Art Gallery, Helsinky, Finland, 1992-98.

In fact we know that more than often the quite frightening freedom that new virtual tools give to the users (the students mainly, but not only them), can bring to a kind of unconscious solutions which have nothing to do with an effective creativity, where the interest in sustainable constructive technologies is combined with a loss of memory about what the architecture of the past already achieved through the special quality of its formal research.

So, the deep knowledge of single technological topics as expressions of formal qualitative results in the different architectures can allow the students to reuse them in their design practice as a kind of abacus whose semantic consistence can help them in choosing appropriate architectural solutions.

Maria Bottero

Importance of a Bio-eco Approach

Polytechnic University of Milan
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Teaching methodology

I have been teaching, since many years, Environmental Design, interpreting it as the relationship between building and environment. This relationship to me is a kind of revolution in design for it implies to take into consideration the role of energy flows and matter cycles both in landscape and in building.

Landscape is used to be thought of as a visible range of natural and man-made elements, and surely its visibility (view and perception by people who live it) is one side of the environment.

But the other side of the environment is less visible, and it may be at all invisible in what concerns the dynamic cycles of matter moved by energy flows in the biosphere, - which are to be taken into consideration in architectural design.

A building in fact has to cope, not only with space and landscape, but also with climate (sun radiant energy, sun heat, rain, wind, humidity, users comfort), ecosustainable materials (the energy cost incorporated in them) and users comfort.

Users comfort by the way is part of individual aesthetic perception and as such is not less important than sight-seeng, touching, smelling, moving around etc.

The complexity of environmental design at building scale is then to be well understood, before any possible temptation of playing with building volumes morphology, - which today is certainly facilitated by software programs.

Such understanding of complexity at building scale can be successful only by being aware of both nature and man-made environment complexity.

My course is composed of three main teaching modules, eventually distributed in different years: 1) Theories on environment and society; 2) Building and environment; 3) Landscape and environment.

Theories on environment and society

This introductory module deals with environment scientific theories in XIXth and XXth century.

I try to follow some research paths in different authors and schools, both in scientific essays and in literature.

A. Evaluation of man made objects, through matter-energy-labour costs

Explicit and direct dissertation on this subject is developed by the XX century bioeconomy school of Georgescu Roegen and his followers (Hermann Daly, Jeremy Rifkin).

But in "Gulliver's Travels" by Swift (1726) one can find a sort of anticipation of the bioeconomic themes, when Gulliver describes abroad the rich life in London of the upper class, not in terms of money costs, but in terms of energy costs (travels around the world in order to get special food or special tissues) and in terms of labour costs (how many hours of work for sewing an elegant dress).

B. The limits to growth: technology scale and urban size (decentralization)

The negativity of big scale institutions is to be found in XIX century anarchist phi-

losophy of famous men like William Morris, (who, quoting Pevsner, is a pioneer, father of the architectural Modern Movement), and Petr Kropotkin, the Russian geographer, escaped from Russia to London where he observed and criticized the the structure of English economy and the big scale of its industry - theorizing the necessity of descaling industry and integrating it with agriculture.

This line of thinking, which implies the choice of small scale instead of large scale institutions, is also present in XX century authors like Simone Weil and especially in many scientists debating the environmental question around the '60, such as the biologist Barry Commoner, the (already cited) bioeconomist Jeremy Rifkin, the supporters of renewable fonts of energy like the physicists Amory Lovins, David and Marcia Pimentel, Peter Chapman and, last but not least, the economist Ernst Schumacher, famous above all for his studies on tecnological help to poor countries of the third and fourth world and his theory about the necessity of descaling the rich western technologies while inventing an "intermediate technology" suited to the local users.

Almost all the XX century discussions about environment, industrial production and technological scale, are, like in Morris and Kropotkin, linked to a negative evaluation about the opportunity of opposing strong people concentration in big towns against a deserted land where the "monoculture" agricultural production proves to be – again – a big scale, high energy cost and low employment technology.

C. Energy, resources, environmental pollution

The energy crisis of the '70 gave way to a large debate on traditional fossil fuels power plants, criticized because of their big scale, lose of energy along the transmission cables and consumption of a non renewable resource like oil. All the already cited energetists, especially Barry Commoner with his "Poverty of Power" and Peter Chapman with his "Fuels Paradise" maintened that an energy saving policy in agriculture, in manifacture industries and in buildings was to be started immediately, while the energy production technology of big power plants was to be abandoned, in favour of small decentralized plants, eventually using renewable forms of energy (hydro, wind, solar).

And while the "Zero Growth" MIT report was predicting the near ending of non renewable resources, "The Closing Circle" by Commoner was the first denounce of the biosphere generalized pollution, in air, land, water.

Building and environment

Energy saving in buildings has been intended, up to now, as:

A. The use of better insulated walls and roofs

B. Different systems of thermal conditioning through active and passive solar gain technologies

The use of solar panels or solar walls in buildings is quite complicated, for it implies a careful analysis of climate in that specific geographic area.

Even simplifying and following Victor Olgyay's rules about the four main typical climates on the planet (cold, temperate, hot arid and hot humid), the constraints of

right orientation, wall dimensions, choice of materials on one side, and clever and expressive design on the other, and are often creating problems of integration in each project. These problems are relevant in multy storey buildings and in urban textures more than in isolated and one storey houses.

What the design method?

I have quoted, as a source of inspiration, Victor Olgyay's "Design with Climate" (1963) because, notwithstanding the fact that this publication is quite old, it remains all the same a beautiful example of inquiry in the complex relationships between building and climate. The peculiarity of this treaty is to make visible in an elegant graphic and structural form, the invisible aspects of climatic parameters. The solar energy flows on roof and East, South, West, North walls, in a building in different climates and seasons; the dynamics of a region climate parameters (temperature, humidity, winds, solar energy, rain); the role of sun, wind, rains and orography in creating a special microclima, the behaviour of wind inside a building and around buildings etc.

We must remember that the design of a solar building has two purposes, one is climate answer and energy saving, while the other, even more important, is the thermal comfort of its inhabitants.

C. Ecosustainable use of building materials, not only for what human health is concerned (harmful or venenous materials), but also from the point of view of their energy cost in production and transport. The analysis of the energy cost of building materials (Lyfe Cycle Analysis, or Life Cycle Assessment, LCA) is very laborious and is usually studied in PHD thesis.

Environment and landscape

Landscape is the visible settlementt of the many processes, antropic and natural, taking place in a certain geographic area. Land, water and green are the main design materials, which can be considered for creating parks and leisure but also resource production: oxygen, water for civil uses, food production, wood etc.

A. Green and water in towns.

Historic towns have always used parks, gardens and green squares not only for leisure but also for bettering the quality of air, for shadow and climate moderation in summer.

Today the dramatic shortage of water and change of climate, with summers more and more hot, suggest a design strategy in towns for water saving and energy saving in order to obtain natural cooling systems wich could be multipurpose, functioning also for conservation of rain water and recycling of water from houses (kitchens, washing machines).

Another landscape hypothesis is the use of greenbelts around towns for citizens's food production. No longer fields for industrialized agriculture, these greenbelts could become, and they have already become in different towns in France like in Italy, "urban countries" or "campagnes urbaines" following the definition given by the French landscape professor Pierre Donadieu.

B. Agriculture as input to bio-industry

In the last years of XX century a very interesting theory called "Progetto Zeri" was described by Gunter Pauli. As a consultant engineer in different agricultural plantations in Asia and in Latin America, he promoted integrated systems of combined agricultural-industrial production.

The leading idea of all these productive systems was the use of biomass on site, saving the cost of transports to factories located far away and, even more important, building on site a network of industries (food industries as well as chemical and pharmaceutical) using the wastes or outputs of one line of production as inputs to other lines of production, - in so far reaching the result of having no wastes at the end of the matter/energy transformation cycles of the network.

C. Agriculture and landscape for creating biodiversity

Europe policy for agriculture is more and more interested to landscape, encouraging and subsidizing a new kind of agriculture aimed at producing biodiversification through a variety of vegetal and animal species, both for the sake of species conservation and for improving the humus fertility of soils, spoiled by the up to now practiced technique of monoculture.

Conclusions

The teaching program of "Environmental design" above illustrated spans from environment theories, to building design, to landscape design. The students' work can be a theory study or a project, and the amount and deepness of students' elaborates depend on their capacity and career degree: whether they are at first and second year of the "laurea specialistica", or at final degree, or at PhD.

Jerzy Gorski

Face to Face Contact in Teaching Architectural Design Architect vs. client

Faculty of Architecture
Warsaw University of Technology
Poland

Architecture deals with people. It deals with meeting and working with people. It involves gathering information and coordinating with people. It involves the arts of persuasion and compromise in order to create a building envelope for people. The list of those involved in the design and construction process is almost endless. First of all there is a *client* for whom and from whose money the architectural object is created. There are also the various technical support engineers dealing with structural, mechanical, electrical and communication areas of design. There may also be engineers dealing with site work for sewers, water, gas and communication lines, traffic and parking experts, fire protection, and security and terrorism experts to name a few. As an architect, we sometimes deal with individuals in real estate and financing. We have contacts with governmental officials in various planning, zoning, and building departments. There are different agencies dealing with environmental, historical and social issues that may have to be dealt with. Finally there are the contractor and subcontractors and building material suppliers who will provide the materials and put the building project together. Those are realities waiting for young architects after graduation. Ability of dealing with all these people comes with experience along years of practice. But nowadays most of young architects want to become an independent self-employed designer as soon as possible. In such case knowledge of all legal procedures, formalities, technical solution is necessary. Having this in mind why not introduce the student to these matters early on in the design studio as preparation for dealing with mentioned people "*FACE TO FACE*".

The role of architectural design studio is crucial and difficult. The obvious task is to develop and extend students ability to create a form of architectural objects. The difficulty lies on finding the appropriate proportions between formal and artistic aspects on one side and practical ones on the other. The teaching methods should not limit students' imagination but rational aspects of architectural design (function, stability, physical aspects, lighting, material solutions) are also important. In my opinion the student should be also exposed to the experience on how to meet and deal with people. This aspect is rarely trained in the architectural design studio.

Observation of design studio present education shows that too often there is emphasis on a current design fad or latest technological or computer graphic advancements as the core of design. Too often the architectural student is led down a design path that is false that could lead to disillusionment when the student leaves school and enters practice. By early introduction to meeting those people, who influence the final realization of a building, the teachers of design, are able to build confidence in the student as to what is really involved in the design of a piece of architecture.

Basing on the educational curriculum in our school I can see that in normal teaching practice in the architectural studio it is not easy to extend design towards elements of management type. In the preliminary design the objectives are more abstract with the aim of developing students imagination. Objectives of designs of upper years are based on functional program set for specific types of building. Student must fulfill this program and depending on view and experience of the teacher the design is more or less realistic. The student develops the design often on the basis of freely interpreted functional program and abstract site.

Generally the topics of architectural design are as follows:

1. semester - small abstract studies concerning feeling of material, texture, scale, light.
2. sem. - spatial arrangement for individual person,
3. sem. - single family house,
4. sem. - interior design / small public building in landscape,
5. sem. - multifamily housing,
6. sem. - public services building (school etc.),
7. sem. - commercial building,
8. sem. - diploma (bachelor degree),
9. sem. - supplementary residential building within city development,
10. sem. - big commercial building,
11. sem. - modernization and conservation,
12. sem. - diploma (master degree)

Additionally there are some elective designs of specific types of buildings.

At school face-to-face contact is limited to interrelation between student and teacher but usually both act as architects. The discussion is carried within the realm of the same profession with its dreams, priorities, visions. Visions and ideas of other professionals with whom the architect constantly deals in real life may be quite different from those of architects. The school curriculum covers other areas of knowledge (technical, economical, historic) but they are taught as separate subjects and treated by students as non-architectural elements. The interest of this type of knowledge should start at the design studio treated by students as the only really architectural part of their study. If at the studio it is stated that the ideal form should be supported by rational knowledge of technical, economical, logistic elements and this is necessary for transferring the design to real building (which only then may be called an *architectural object*) there is a chance that students will look for such knowledge. If they acquire at least part of this knowledge during study period they may be less shocked when meet realities of professional life.

I would like to present an example of design class where we tried to supplement architectural designing with practical elements, especially trying to imagine client's attitude to planned investment. It was organized in the mixed group of students taking part in exchange program between Warsaw University of Technology, Faculty of Architecture and University of Detroit Architectural School . The visiting professor from Detroit was an architect Frederick Bidigare.

The design was divided into three parts. The objectives of the first one were as follows:

PROJECT NO.1

AIM: To act as both an architect and a client in the development of an architectural project.

REQUIREMENTS: As a client you are to have your architect design a small shop in one of the empty retail spaces. The store type is to be selected by you as the client (preferable being something that you are knowledgeable about or interested in (i.e. pet shop, ice cream parlor, skydiving shop, tattoo parlor, etc.). You will select the specific site with your "architect". Try to be specific as possible.

As an architect you will design a shop to the specifications of the client. You will aid the client in the development of a program and advise in the selection of a site. You will present a well thought out preliminary design solution to the design jury. The design jury will compose of the two design instructors and your client. Method of presentation is up to you.

SCOPE OF PROJECT: The project shall be limited to 100 square meters of retail area. Storage and support areas (toilets, mechanical, etc.) to be additional as required by the program. All work to conform to all health and safety codes.

CONSIDERATIONS: site context, basic structural, traffic flow, basic mechanical, Graphics, fire protection, lighting, security considerations.

In this part students worked in pairs (one American, one Polish) acting permutably as client and architect. This exercise was interesting also from point of view of different national backgrounds.

As we expected acting as a client and setting well-specified requirements was more difficult than creating an architectural space afterwards. One of the aims was to make students aware that architects ultimately must have a client. This client, whether private or public is usually highly intelligent, organized and experienced individual or individuals who have strong instincts as to how the world works in dealing with people. In my experience I have found the following: in the private sector client is usually a self made and highly aggressive individual while in the public sector the person is usually extremely organized and power orientated. Both are extremely focused on time, efficiency and cost. Again, they know how to deal with people. This was a trial of exposing a young architectural student to these types of personalities early on.

Second part of the design was directed to sociological issues and teamwork characteristic for professional reality.

PROJECT NO. 2

AIM: To revitalized Marszalkowska Street and Constitution Square (Place Konstytucji)
PROBLEM: There has been a general degradation of the commercial and retail business along Marszalkowska Street and Constitution Square over the past 15 years. Many established and vibrant businesses have relocated to the suburbs and/or the larger malls (i.e. Arkadia, etc.). There is also an apparent demographic shift of the young and affluent leaving the downtown in favor of the outlying areas. The problem at hand is to see if it is possible to reverse this trend.

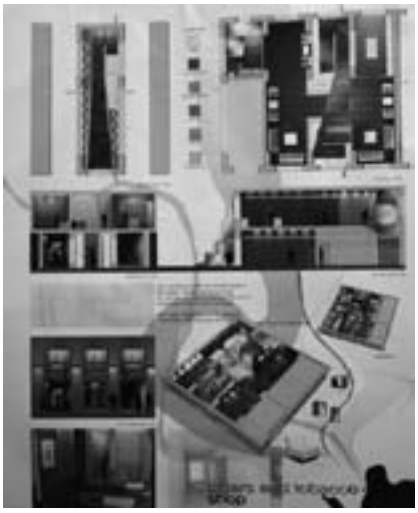
ANALYSIS: You will initially be broken up into teams to analyze the following areas. You will select a team leader who will be responsible for organization and delegation of duties (much like Donald Trump's "The Apprentice").

- *historical considerations*
- *building and spatial documentation*
- *past, present and future demographic conditions (economic, age, etc.)*
- *past, present and future zoning requirements*
- *transportation systems (including vehicular and traffic patterns) and parking*
- *general economic growth projections for specific areas dealing in retail, office, housing, governmental, cultural*

Exhibition of PROJECT NO.1

Prof. Frederic Bidigare from Detroit

Fragments of two interior designs of two students acting permutably as client and architect for each other.



Examples of interior design of PROJECT NO.1

Examples of students' design for PROJECT NO.3

ORAL AND GRAPHIC PRESENTATION: Each team will present a coherent explanation of what they have discovered in their analysis. Exact method of presentation is to be discussed. It is, however, to be first-class and thoroughly professional.

The third part of the project consisted of individual designs of commercial buildings situated at analyzed previously sites prepared individually by each student.

PROJECT NO. 3

AIM: Architectural implementation of plan to revitalized Marszalkowska Street and Constitution Square.

ANALYSIS AND PROGRAM DEFINITION: You take the analysis of the information gathered in Project No. 2 and prepare a basic preliminary architectural program and scheme with this data. You will be focusing on a specific site and/or sites for your project.

AREAS OF DEVELOPMENT: You will concentrate on a specific area of development with the possibility of mixed or multi use functions.

At this stage proposals of technical and material solutions were expected at students' works.

Conclusion

As we know, gravity is constant, the change of seasons is fairly constant, the sun still rises and sets everyday and human nature is human nature. Roofs constantly leak throughout the world but the latest fads in teaching and ideology in architectural design studios come and go. Technology, both in the design studio and in construction, is on a tear. The constant with technology is that we know it will change. The best teacher of the young architectural student is EXPERIENCE. Seeing the world and meeting people through travel and the design studio is a great learning experience for the architectural student.

The design studio must instill an ATTITUDE in the architectural student, which involves developing a sense of maturity and confidence. It is the beginning of a great ADVENTURE. It also must instill a basic sense of values and responsibilities as to what it means to be an architect. It all comes down to people and dealing with them FACE TO FACE.

Session 3.2

Chair:
Dimitris Papalexopoulos
Technical University of Athens
School of Architecture
Athens
Greece

Saeed Arida
Becca Edson

Digitizing High Performance

MIT
School of Architecture
Cambridge
USA

Introduction

This paper suggests a novel framework for teaching architectural design by investigating a graduate design studio at MIT in which sophisticated digital tools were employed. Form, which was the central concern of the studio, was not understood as a decontextualized abstract entity, but rather as an object that is shaped by a multiplicity of fields. In critique of the contemporary digital design culture that privileges abstract form making, the studio aimed at making students more aware of the parameters that control the form generation process. The notion of "high performance" was used as a vehicle to investigate the topic of the studio.

This paper will be divided into three sections that correspond to the process of design generation and evaluation used within the studio environment:

The first section illustrates the pedagogical framework that was followed along with the digital tool-sets that were developed and used.

In the second section, I will describe one of the student's early exercises and final project. The student whose work is presented in this paper is Becca Edson.

Finally, in the third section, I will evaluate the success of the pedagogical approach undertaken by the studio in terms of a) the student's engagement with the tools and the program and b) a critical evaluation of the final projects to assess the goals of the studio.

High Performance

"*High performance*" has long become a ubiquitous expression used in the context of both cultural production and consumer goods including the design of sports equipment and apparel, vehicles and engines, hardware and software, materials and methods, stocks and bonds, etc. The notion of *high performance* is challenging within a design mentality as it promotes the maximization of output along with the minimization of resistance; maximum control along with minimum risk. It responds to both variables and consistencies, incorporating variation along with continuity. It seeks to establish balance between rigidity and flexibility, to harness opportunity while diminishing weaknesses, and to transform liabilities into assets. High performance is the optimization of redundancy in order to render it no longer redundant.

One of these objects of high performance is the bicycle helmet which responds to the different criteria of aero-dynamics: structure, weight, ventilation, ergonomics, as well as branding and aesthetics. The result is an articulated but non-uniform object sculpted as each different criterion changes across the surface and volume of the helmet. Consequently, changing any one criterion will impact all of the others. To increase the impact strength, for example, may require the addition of material or new ribs that would then adversely impact ventilation or the aerodynamics and necessitate further volumetric counter-manipulations until a new form with the desired "balance" is achieved.

Part I: Pedagogical Framework

Structure

The studio was divided into two phases. The first phase involved analyzing an object in terms of its performance. The second stage involved designing a sports museum along the Hudson River Park on the west side of Manhattan.

Design studios traditionally start with abstract exercises to cultivate students' creativity and help them formulate frameworks, conceptual and technical, that can be later used in the final architectural projects. These exercises usually address specific issues pertaining to the topic and scale of the studio. Contrary to this practice, our studio started from analyzing an existing object with prominent formal features. This was followed by a process of abstract manipulation which involved developing computational systems that suggest architectural interpretation which led to the final form. In so doing, the studio started and ended with form, and was mediated by a process of abstract manipulation.

Computational Background

Design is an iterative non-linear process in which many shifts of perspective occur. In the studio we sought after a computational system that can accommodate these shifts of perspective in the design process without having to rebuild your system every time.

This strategy materialized in response to a previous studio at MIT in which parametric software was used. Parametric design is a process of rigidifying certain parameters while keeping others variable. By changing the values of these variable parameters, new variations result. Although the extreme manipulation of certain parameters might sometime produce an emergent form, parametric design is still a very limiting design methodology, especially in the early design phase. Therefore we chose to focus on a more flexible design process.

3D Studio Max was the software choice. 3d Studio Max offered a fluid and flexible set of tools to work with especially at the early stages of design. As a modeling tool within 3d Studio Max we used *editable poly*. Editable poly is an editable object with five sub-object levels: vertex, edge, border, polygon, and element. Each poly is equipped with controls for manipulating an object at various sub-object levels. Editable poly can also be subjected to all the modifiers that already exist in 3d Studio Max.

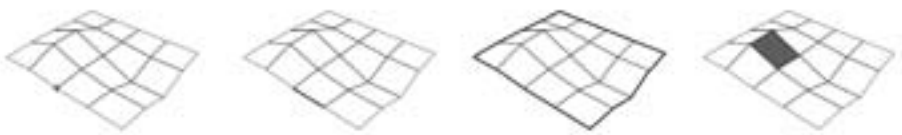


figure 1

Tools

The idea of high performance necessitated decomposing the object under investigation into smaller components that can be handled separately. We sought after a

computational tool that can model each of these mini-systems separately, and at the same time offer strategies of negotiation between these sub-systems. The aim was to find a tool that is intuitive, visual, ambiguous, and easy to use, while being sophisticated, numerical, precise, and empowering.

Morphing

After exposing the students to all the tools offered by 3d Studio Max, morphing seemed to be the right tool for our investigation. Morphing is a process that locates the interstitial states between two different conditions. Inherently, it offers a computational means for precisely negotiating between different states of the same system.

figure 2

Morpher is a 3d max modifier that implements morphing. It was originally developed to animate facial expressions. The interesting part about this modifier is the capacity to hold up to 99 channels which are the targets manipulating the deformation of the form. These targets become the seeds of a hybridization process. Changing the percentages of mixing among these channels generates a new variation.

Due to its visual interface and ease of use, students felt very comfortable and empowered by the tool. Rather than spending much time learning the tool, they spent much of their time exploring what they can do with it. This was an important pedagogical aim for the studio.

figure 3

Part II: Student's work

Phase 1

The students were asked to identify an object of study and elaborate on it (graphically as well as verbally) in terms of the high-performance aspects that are suitable to this investigation. The analysis of 'High Performance' objects and assemblies was supposed to address the formal, material, and structural systems that guide design and culminate in analytic and transformational diagrams, models and drawings that suggest new architectural interpretations. Students were encouraged to use the conceptual and technical strategies developed in this stage in the final project.

Student's work

Becca Edson's object of investigation was the running shoe. Due to the complexity of the interaction between the different systems at play, Becca decided to focus only

on the lower part of the shoe, i.e. the sole. The sole proved to be very complex in itself as it has to negotiate between the foot and the ground, diffusing the weight of the body into the ground.

1. Defining performance criteria

This process involved understanding the performance of each formal feature. The criteria which Becca used to evaluate the performance were: speed, stability, comfort, flexibility and control.

Becca then outlined the formal features that are responsible for producing certain performative aspects.

For example, speed necessitates a streamlined sole and light weight body, as well as an articulated front grip. For stability, the sole needs to have a wider profile, structural support, and a thickened section. For flexibility, the sole needs to have recessed channels and a second surface.

Some of these performance criteria require different and sometimes contradictory formal manipulations. The aim was to negotiate between these formal features to get the form with the desired performance.

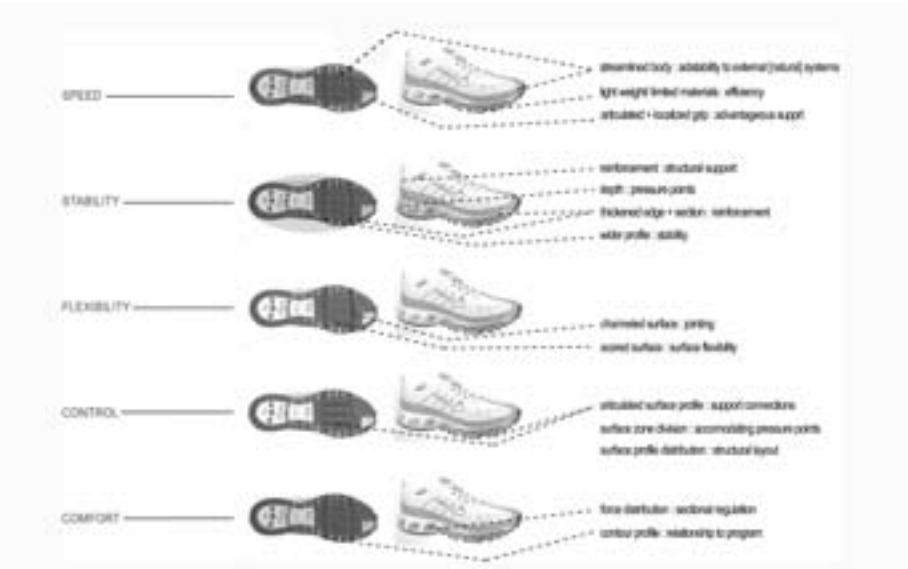


figure 4

2. Constructing the targets

After identifying the performance criteria relevant to their objects, students were asked to remodel their objects so that they optimally respond to one criterion while ignoring the other criteria. This process of speciation helped the students elaborate on how each formal feature dictated a particular performative aspect.

For speed, the sole has to have a narrow profile and front toe grips. For stability, the sole has to have a thick sole, zones of comfort, and a wider surface area. For flexibility, the lower surface has to be scored. For control, the surface has to be

articulated per foot movement. Finally for comfort, the heel has to be thickened.

These newly constructed objects will serve as the seeds or targets of the hybridization process that generates new formal variations with exact precision. Using the Morpher Modifier that was explained above, the students uploaded these objects into the empty channels.

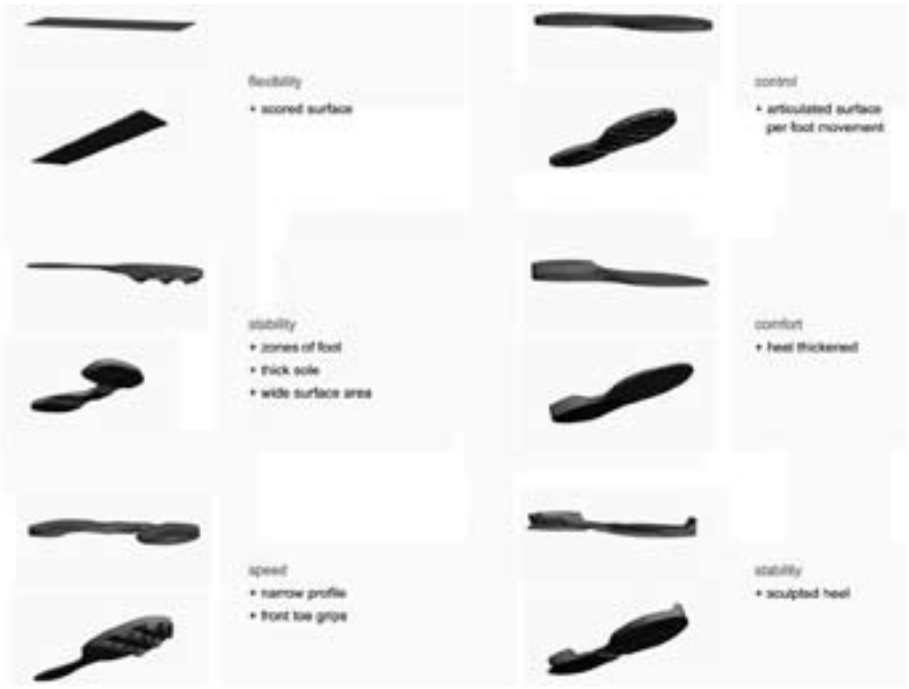


figure 5

3. Hybridization

This process of hybridization entailed producing entities that negotiate between different conditions, hybrids that respond to certain criteria more than others.

Students immediately started realizing that some of their performance criteria contradict each other. For instance, obtaining a shoe that performs at a maximum speed, control, and comfort is impossible as shown in the diagram below. The resultant object is too distorted, to an extent that it can not function as a shoe anymore.

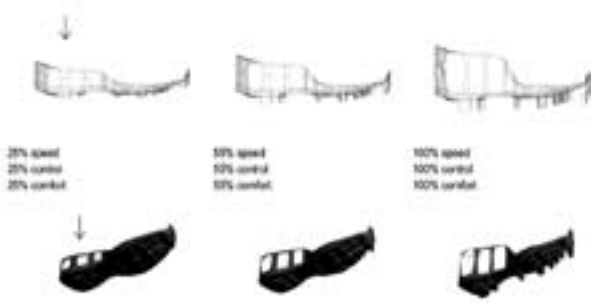


figure 6

4. Diagramming

The hybridization process was followed by a systemized process to understand the relationship between the formal features. In this diagram, four relationships between formal features were identified: (1) a positive relationship, exists, meaning an increase in the first variable results in an increase in the second one; (2) a negative relationship exists, meaning an increase in the first variable results in a decrease in the second variable; (3) a relationship exists but not affected by the increase and decrease of the two variables; and (4) no relationship exists.

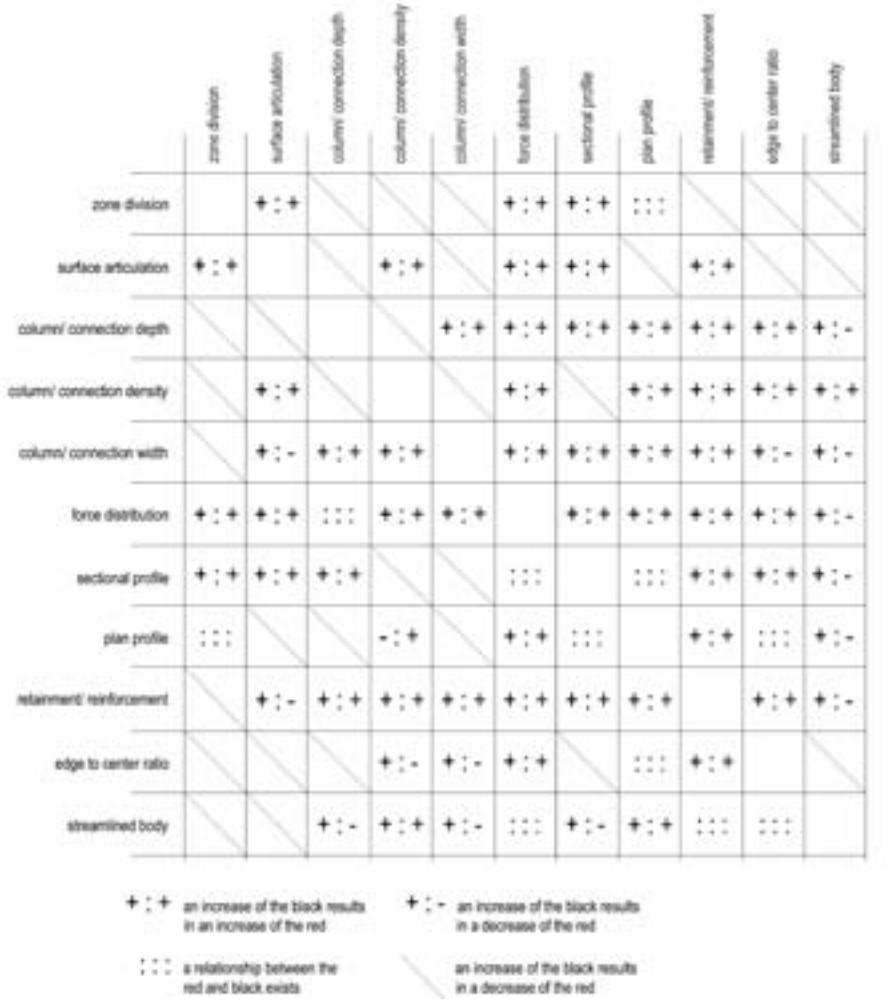


figure 7

5. Testing the system under new conditions

To evaluate the robustness of the constructed system, students were asked to test it under novel conditions. In Becca's case, she started adding more pressure points.

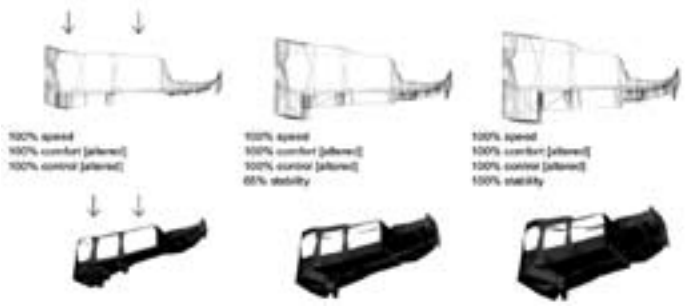


figure 8

6. Changing the context

After testing the system under new conditions, students started experimenting with different contexts. Becca's object of investigation was a thickened surface that got affected by multiple pressure points.

Students felt that they needed to have more control over the location of the effect. The function of soft selection proved to be very essential because it allowed the students not only to control the intensity of the effect but also the placement of it. Soft selection is a built-in function in 3D Studio Max that allows users to localize effects.

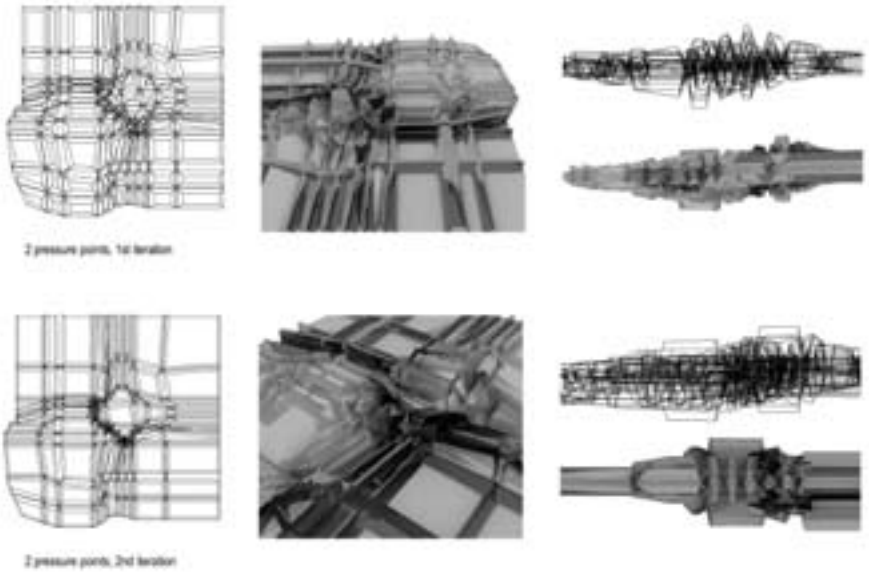


figure 9

7. Building new seeds

Students were asked to disregard the old seeds that they used in the previous morphing process and construct new ones. The new seeds were supposed to be more general and deal with issues with which the students wanted to engage in the final

project. This process was intended to push the students away from their objects and to develop systems that suggest some architectural interpretations.

In Becca's case, her five seeds dealt mainly with pressure. As illustrated in the diagram below, the first seed dealt with uniform pressure and was called "depth 1", while the second dealt with focused one and was called "depth 2". The third dealt with zoning. The fourth one dealt with section. The fifth one dealt with density.

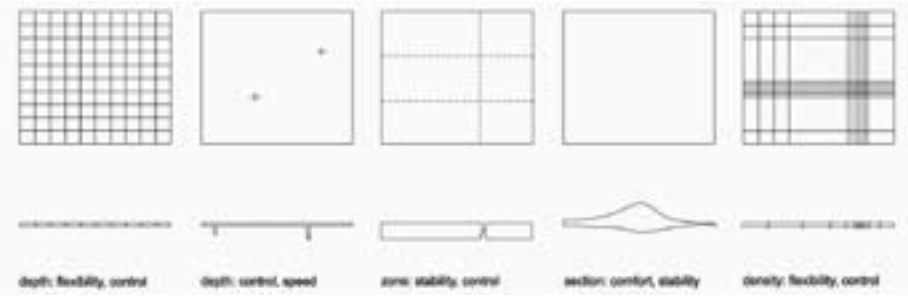


figure 10

8. Identify emergent spatial conditions

Students used the newly constructed seeds to produce new hybrids. Students were then asked to identify certain spatial conditions and build a catalogue of them as they emerge from the hybridization process.

For instance, one of Becca's spatial conditions is called "centered" which is constructed by mixing a hundred percent *density* with sixty percent *section*. The "fold" condition is constructed by mixing fifty four percent *density*, eighty seven percent *section*, and eighty one percent zone.

This was the end of the first phase. It was clear, at this stage, that students had complete control over their systems. After a systemized and rigorous process, students built an intuition of what the tool could do. Although they could not precisely predict the outcome of the hybridization process, students were able to predict what type of a spatial condition is going to be produced by the numerical mixing.

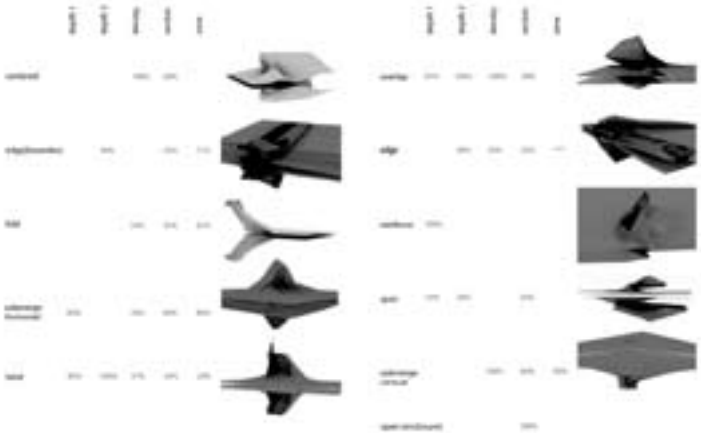


figure 11

Phase 2

The program of the final project was to design a new Museum of Sports and Athletics located along the Hudson River Park on the west side of Manhattan. It was anticipated that the different realms that would affect the architectural outcome, such as tectonics, landscape, museum, culture and technology would present competing and complimentary agendas of varying importance and shifting order. The students would establish a conceptual response and generate design parameters or a system of constraints to 'negotiate' with the intelligence gained in phase one. The result of this 'negotiation' would be an architecture of shifting 'gradients', of simultaneous difference and continuity, an architecture of High Performance.

1. Understanding the site

In understanding the site as an isolated lot removed by the very linear paths of traffic, city edge and park, and its former life as a transfer station for garbage, Becca sought to re-appropriate the site as a point of transition within the city. The program of a triathlon center will re-enable the site to serve as a transfer point. The transition between sports (swimming to biking to running) mandates a design that in turn transfers between the water, road and city. A third layer of transfer will be carried via the circulation, enabling movement between the city and the river while negotiating between the interior program, the exterior program, the park and the surrounding context. The diagram of the building on the site acts as a block, disrupting and redirecting existing north-south flow in order to reinforce the building as a gradient between the interior and exterior—drawing people into the building.

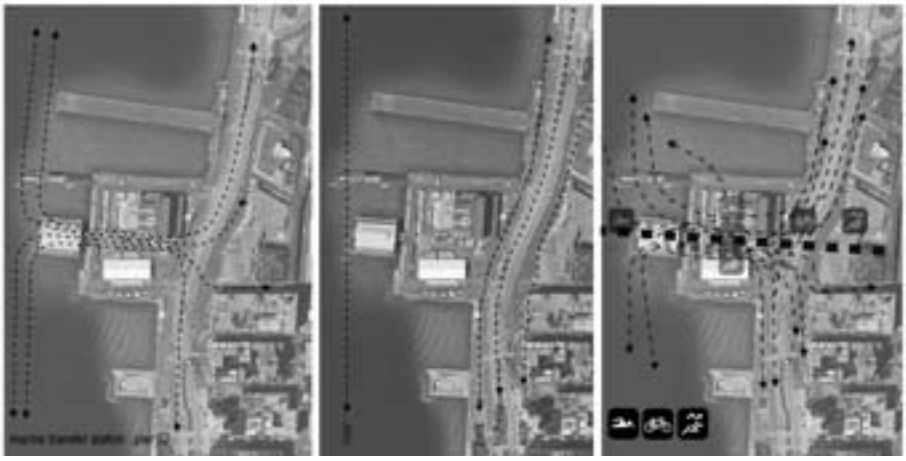


figure 12

To optimally achieve this vision, Becca coded the site in terms of the spatial conditions developed in phase one. For example, the area where the building touches the water, the spatial condition “submerge” was used. The key issue was to read and understand the site using the same spatial language developed in phase one. This coding process facilitated an easy transition from phase one to two.

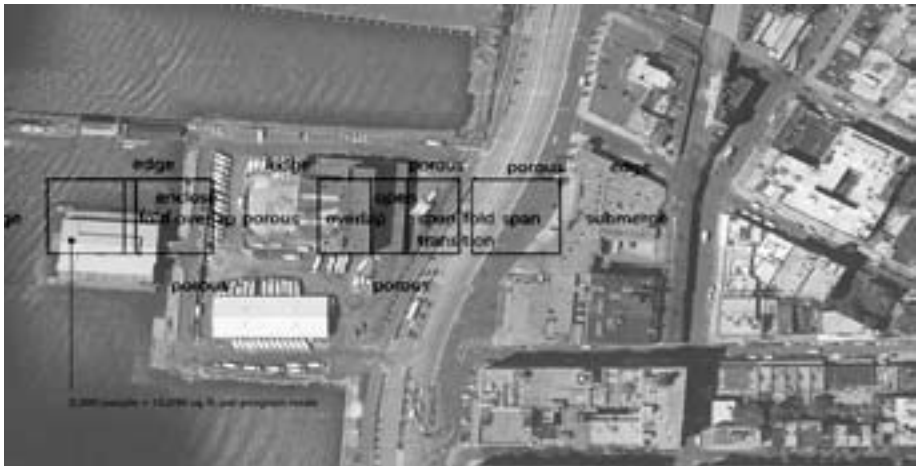


figure 13

2. Deployment of spatial conditions

This process involved deploying the spatial conditions coded on the site in the previous stage. The diagram below shows how these conditions were sequentially deployed.

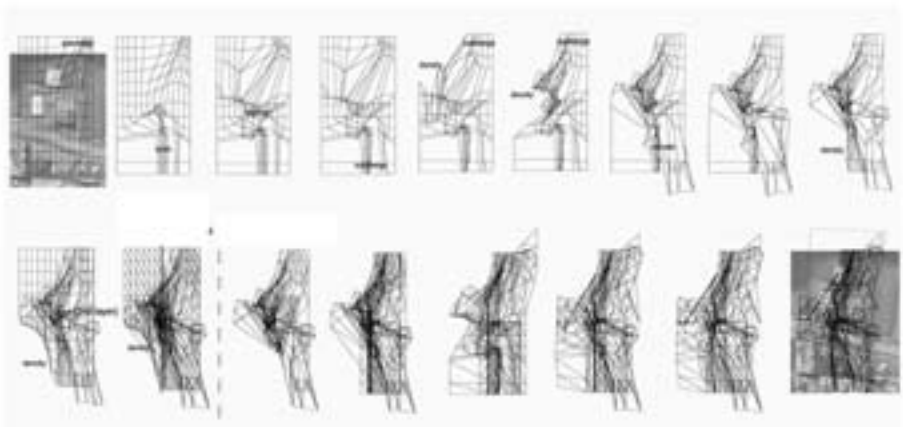


figure 14

3. Editing

Although the previous process produced a form that optimally responded to Becca's vision of the project, that form needed editing. Students were able to predict the type of spatial conditions that will be produced by their systems, but they could not precisely predict the type of geometry that is going to be produced.

The editing process entailed keeping some spatial conditions while disregarding others. Having used the editable poly as a modeling tool made this process much easier. Editable poly, as explained in the beginning of this paper, allows users to edit objects on five sub-object levels: vertex, edge, border, polygon, and element.

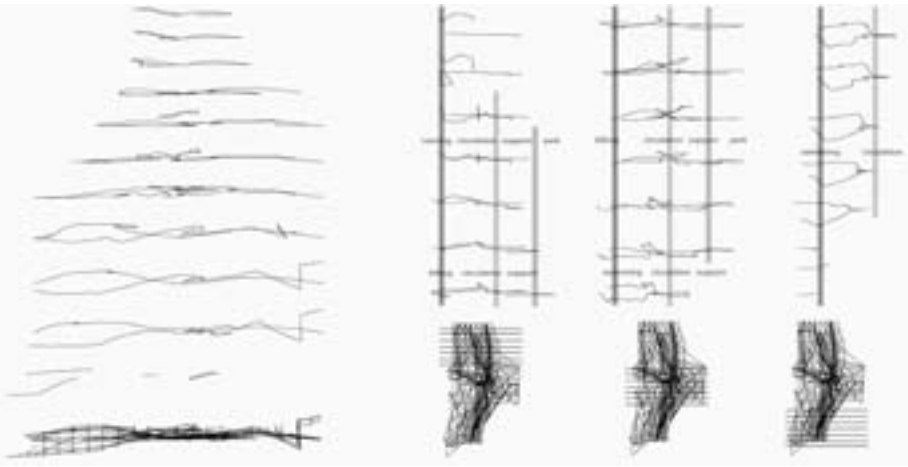


figure 15

4. Final renderings

figure 16

figure 17

figure 18

Part III: Evaluation

How do we evaluate our pedagogical experience, especially when dealing with a creative discipline like architecture that has fluctuating notions of values and aesthetics?

We believe that the role of the instructor, especially at a graduate level studio, is to evaluate the design process rather than the product, that is, to evaluate the students based on the decisions they have taken to reach a certain conclusion.

1. Design process _ rigor

Working with an explicit system during the design process gives us the opportunity to understand this process more, to track all the design moves, and to preserve the knowledge developed along the way. It also forces the students to be explicit about their design parameters. It develops a responsibility in the students towards the architecture they are producing.

Because the process is registered through the use of an explicit system, the students were able to go back to any point in the design process and use it as a departure point.

As illustrated in the paper, students embarked on an extensive systematic process to construct a computational system that is robust and relevant to the issues they were dealing with. Most of the students did not have any trouble employing that system in the final architectural phase.

2. Smooth transition

A main concern for us was how to bridge the gap that always exists between the early abstract exercises and the final architectural project. We believe that starting with form then moving to abstraction then to form again made the transition much smoother. The abstract phase was mainly concerned with understanding how every formal feature dictates a certain performative aspect.

3. Visual & numerical

One of our main concerns was how to design a process that requires both numerical

and visual input. In our process, the students built their seeds visually and mixed them numerically using the Morpher Modifier.

4. Tools

We came to the studio unknowing of what type of tools would work best for the studio. We embarked on a process of exploration with the students. We did not approach the studio with prefixed ideas of what tool would work best in our context. We embarked on a series of explorations with the students that led us to a specific computation tool.

In studios that require high technical skills, students usually spend much of their time learning tools. The issue was how to shorten this period and make the students feel comfortable and capable with the tool very quickly.

5. How not to get stuck

An important issue for us was how to offer a framework that allows the students not to get stuck at any point in the design process. As we said before, design is an iterative non-linear process in which many shifts of perspective occur. We sought after a computational system that can accommodate these shifts of perspective in the design process without having to rebuild your system every time. In our case, the morphing process was not limited to the original seeds. Students would take any of the resultant hybrids, modify it and use it as a seed for the next generation. The process was not linear by any means. This fluidity allowed the students to keep the design process flowing.

Through rigorous studies in form generation, coupled with systematic hybridization, students were able to produce proposals that are formally intriguing while generating architecture that is optimized to 'perform' at the highest level.

Inês Salpico

Stop and Think
The Teacher as a Tutor of Self Questioning

University Lusiada
School of Architecture
Lisbon
Portugal

Contemporary world finds us in a corner point where we deal with unprecedented awareness with a general loss of unanimously accepted paradigms and shared values. We live in the age of post-postmodernism, post-colonialism, post-imperialism, but what meaning does this have just yet? Institutions, namely the disciplinary sacred Academies have suffered a process of disaggregation, ultimately collapsing, and the consistency of response they once offered and imposed through universal assessment criteria has given way to an ambivalence difficult to cope with. Ambivalence appears, as a matter of fact, not so much as transitional state but as a new fundamental value, constraining both the experience of the present and the perspective towards the future. It frames our citizenship and our self and mutual judgements, which now explicitly embody within themselves their arguments and their contradictions at the same time. This growingly verbalised ambivalence defines an underlay of constant uncertainty and anxiety, a mist that filters our thought and our experience of life and others.

It is time to deal with the possibility of this ambivalence being the new status quo, the very essence of contemporary zeitgeist, perhaps embodying the new paradigm itself.

Architecture, often referred to, especially among architects, as a sort of tool of redemption, above life and its minor constraints, is in fact in the centre of life itself, an expression of it, inevitably placed in the core of the turmoil of contemporariness. The referential concepts in which it was based, taken for granted and thought to be definable in themselves, will have to be rethought after having lost their aura of absoluteness and their unquestionable status. The ongoing crisis claims for a deep change in architecture education models and processes, which will have to be brought to deal (perhaps for the firsts time) with the constantly relative and questionable without an anchoring frame of solid references and to place themselves in a context where the institutions that legitimised them have pretty much collapsed (at least as accepted legitimizing committees). What is there to define then as constant and stable in the context where facing? Only that very same relativity and questionability, maybe needing to be looked at as the new possible operative referential.

Tools, methods of work and communication processes and pedagogic approaches urgently need to incorporate this metabolism of change, walking along and embodying, instead of fighting, that restless ambivalence. Architecture can no longer aspire to be a refuge of stability and a lexicon of idealism: it must meet a society that deals with paradox and with the juxtaposition of multiple discourses, gaining a certain flexibility of discussion (of meaning, not merely of appearance) and committing itself to communicate beyond the professional forums on a regular spontaneous basis.

The Individual Mythology – The Rebels and their Causes

The void left by the wear down of universal values and ideals pushed the individual towards the vertigo that nourishes ambivalence and anxiety. Our position in the world is defined within paradox and contradiction and, most importantly, experiencing a constant questioning and perplexity, that no longer relies on a collective matrix to

give substance to a sense of self and to share our fears and weaknesses. Expectations, achievements and speeches are diffused and polarised. As individuals we were left alone building a personal narrative with the mighty constraint of having no explicit constraints to build it upon.

James Dean, 1954

We face a loneliness of being and growing, and have to bear the burden of total responsibility in shaping an identity and a mental frame work. Here lies the core of the paradox of contemporary society: how to define an identity in a system of self-reference? If identity is essentially the result of a process of building an image in contrast and comparison with the other, its characteristics and form being always carved as a negative of something exterior, how does it build up within a dynamic of self-assessment? Society, history, politics and ideologies are just not there anymore to be engaged with or fought against. And if they are any engagement or fight will also be one of self, individual motivations, not widely shared so as to place us with or against society as a whole. Being a rebel or a follower implies that you define your own cause, arguments, motivations and fragilities.

This is the key point: society is not understandable as a structural whole; we are dealing with a process of disaggregation in which social environment consists more and more of individual paths running in parallel, unaware of how dependent on each other they always will inevitably be.

The matter of identity is critical in architecture practice and perhaps even more in architecture teaching and learning. As a creative activity architecture structurally requires a degree of self-commitment that makes it directly imbued with the author's idiosyncrasies. The coherence and authenticity of a work is related to whether one is able or not to recognise these structural idiosyncrasies and give them substance and material consequence, avoiding a mere mechanical response, literally influenced by context or others' work.

This made it easy for architecture to become an open field for the growth of an individual focused working system, supporting the affirmation of a sort of individual mythologies. As far as architecture teaching/learning is concerned the question is therefore the same as was referred before: how to assure the coherence of a work, assess its methods and legitimate its premises when there aren't referential parameters and criteria. Everything is questionable and therefore everything is potentially accepted. In other words, the system (or its absence) is open to any work reference as long as it affirms a solid inner structure and is back grounded by arguments strong enough to stand on their own.

The Role of Theory – The Battlefield of Thought

The collapse of the academic model of professional validation and proclamation has put an emphasis on the individual and his/her autonomy and responsibility. The architect (and the architecture student to begin with) is confronted with the need and the mighty responsibility of defining not only an expression of his/her work (what we could generally call answers or results) but also, and fundamentally, the disciplinary attitude towards professional practice.

It is now virtually impossible to adopt a posture of rational distance from work and its results; in order to place it and see it recognised one is inevitably brought to a complete commitment and to an explicit self and mutual awareness, adopting (and showing) a certain degree of emotional involvement. The polarisation and multiplicity of simultaneous discourses demands for an ability to communicate and justify options and methods, making them converge in consistent and meaningful results. What is implied is that results stand as a lexicon for which the individual is required to clarify what syntax is structuring its correspondent line of thought. Furthermore there is the matter of pointing out what values are assessing the criteria and working premises, in a complex process of self criticism, questioning and exposure, made difficult by the seduction of so many immediate influences and self-proclaimed masters.

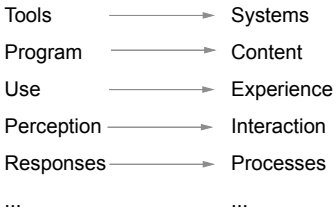
Thought articulation and verbal communication are increasingly becoming daily working procedures and, most importantly, programmatic content. This is a key issue in a moment when architecture is recurrently used as hardware to convey messages and iconic images and can be easily instrumented if not properly framed by its author. Architecture works are subject of an unprecedented vulnerability for which the only protection is a complete engagement by the authors in framing it and standing for it.

The possibility of developing an *individual mythology*, a personal structured language, appears then not so much as a synonym of omnipotence, as it might seem at first glance, but as a dramatic challenge, requiring a much larger array of competences and inter-related capacities, along with personal skills of perseverance and self-leadership.

Within an ongoing moment of paradigm metamorphosis there is an obvious claim to contextualise work and give it a solid theoretic and methodological background, revealing a critical approach and coherence between the practical steps that lead it and the base in which it stands. In parallel with the operative individual empowerment should therefore emerge a significant development of a new strategic role of theory and thought, no longer understood as a privileged and safe viewpoint for inconsequent speculation but as a battlefield where work is put to discussion, argued, defended and given content. Theory/thought must take part in every working and creation method so as to validate its intrinsic self assessment as well as the dynamics of its modus operandi, becoming an operative sub-system altogether.

Theorising around practice is particularly critical in a moment when so many concepts are shifting so quickly and dramatically the role they play in architecture, the importance they have and even the meaning they bear. When fundamental terms such as tools, function or program are being readdressed and put in confrontation with others that are emerging and apparently taking their place, the rawness of

doing is just not enough; action must be sustained by a will to think over the way correspondent objects/images position themselves within this change and frame these ill defined concepts.



Media and Technology as Physical Structures

The operative individual hegemony is often referred to as a consequence of the emergence and spread of technological equipments and media. The multiple and simultaneous scales in which we know experience citizenship and structure our identity has obviously been amplified by this technological possibilities and autonomy of discourse has been greatly supported by the new media supports. However, looking at technological breakthroughs from a simply instrumental point of view is undoubtedly a great sophism. Technology has not merely introduced new tools and working methods; media didn't simply bring a different speed and scale of communication and information flow; what we are dealing with is the structuring of new languages altogether, requiring different systematic approaches and assessment criteria. Moreover, we can't consider these new languages as purely visual or formal when they in fact shape a new understanding of the real both from a structural and symbolic perspective, mutating the way in which concepts are formed and interrelated and, ultimately, the way thought is articulated.

It is difficult not to recognise that such a mutation is taking place and the deep level at which it lies, when it implicates so directly with the use of body and mind (about to have, some authors say, biological translation on the medium term), with social dynamics, with relationship management and, most importantly in the context of this discussion, with space understanding and interaction. Technology has brought a reconfiguration of perception and experience with direct consequences in spatial and formal interpretation, at the light of new mediating concepts and structures.

The role of media and technology in architecture teaching processes cannot be that of a mere operational, technical and visual instrument. If it is, it will indulge with superficiality and give way to that instrumentation architecture is so vulnerable to. It cannot be addressed as a plastic resource otherwise becoming a pretext of arbitrariness and producing nothing more than flat meaningless objects and images. One of the central issues within this problematic is the matter of image and the role *visuality* plays in the working processes and in the identity of the work itself. The answer might be in what king of content does each image bear: a coherent autonomous process or the coating for a past-referenced frame of thought. Paradox and inconsistency are bound to emerge from works in which new communication supports don't effectively

derive from new and correspondent languages and modus operandi. New media serve with almost perverse perfection the iconic dimension given to (and demanded from) architecture, making it easy to become an accomplice of inconsistency and deceiving visual seduction. Technology has to be introduced with a systematic understanding of its disciplinary, multidisciplinary, transversal implications, nourishing its operativeness with content and methodological consequence.

Facing this context the teacher must deal with media and technology as a structural underlay of people's, namely students', thought and perception of the real, which pedagogically means that not only practical methods change but work discussion and assessment is also radically different. As it has repeatedly been said, we are watching at the growth if a generation with a whole new set of physical and mental limbs and with a clear, although maybe not conscious, perception of technology playing a central role in experiencing reality and defining subjects as individuals. If now there seems to be an overlay of different ways technology is approached and recognised as a more or less decisive factor in our lives, in the medium term all active subjects will have always lived with it (and trough it).

Architecture, both as a discipline and as a framework for living and being, in inevitably not addressable in the same way it used to be when life itself and our individual and social identity aren't either. Teaching and discussing architecture is necessarily drawn to the core of the mutation of fundamental concepts such as form, space, program, structure, continuity, placement, etc., catalysed and conditioned by technology and media, and must be aware and engaged with the practical reflections of this debate.

Teacher – Tutor of Self Questioning: Confronting the Rebel

In the absence of validated and established answers and criteria, the dynamics of discourse (may it be between teacher and student or among professionals) has been given a major role in architecture practice. The teacher no longer appears as guardian of an academic model; exercising a dialogic pedagogy is now the only possibility of effectively assessing that much larger array of required competences and skills. Pedagogy is shifting from an institutional based model to focus on personal commitment and on the teachers' (together with the students') responsibility, creativity and shared engagement. The teacher should willingly assist the student in the complex process of shaping an individual narrative by identifying the idiosyncrasies that will ultimately make each work coherent and serve as singular essential references in the development of a working method. The teacher's theoretic and practical knowledge and experience must emerge alongside to confront the solidity and logical evolution of each student's line of thought and methodological procedures, and will appear as relevant pedagogic tools not because they are institutionally framed (which they simply won't be) but because they are already a direct result of the teacher's own self confrontation and criticism.

He/she must place himself in the convergence of the students' working methods and respective results, demanding a clear mental mapping of the language and syntax being put together, by this mean catalysing the students' need for self awareness

and consciousness. The result of this constant questioning and confrontation must be an affirmative bi-univocal correspondence between aims and processes, between speeches and images, guarantying that objects are not plastic, mechanical answers to proposed problems but the materialisation of operative thought around the questions aroused.

From the paradigm of "right vs. wrong" the teacher-pupil dialogue is shifting to that of "*PASSIVE AWARENESS VS. PASSIVE RESPONSE*", meaning that the degree of success of a teaching process won't be focussed in the apparent quality of its answers (even because such a quality will be growingly difficult to define) but much more in the level of involvement they embody and the degree of complexity to which the debate around them could be taken. Teachers must adopt a posture of complicity with the students work but of simultaneous constant confrontation, assessing its substance and proving its arguments' strength, exposing it in first hand to the vulnerability it will suffer in professional context (or perhaps more correctly, professional market).

The matter of technology and media and the way they are being used is fundamental in such a learning context: in this demand for coherence the student must inevitably be confronted with whether he/she is merely performing a visual script taking pure instrumental advantage of those resources or is actually using their possibilities and specificities to structure a methodology and justify its aims and premises. Once again it is about assessing if the student's individual working and creation path is being given substantial content and is aware of how it frames fundamental concepts within its singular identity.

Facing apparent total freedom and absence of constraints there is a high risk of not being able to keep track of one's own learning and professional route and to manage the multiplicity of inputs given by the contemporary overflow of information. Therefore, the teacher's task mustn't only consist of giving options but also, and essentially, about demanding conscious and coherent choices, making students develop that critical, analytical, selective approach of the real (and with it of their own identity) that is the key part of professional maturity and creative adulthood.

Seductive as they might appear works without a solid background won't resist the dilapidation of time and the unpredictability of this ongoing paradigm change that will introduce and define perhaps unthought-of assessment criteria, to which only thought coherence and argumentative strength will be able to respond. In conclusion, there really isn't a future for "rebels without causes".

James Dean, 1955

Debate on the papers of Session 3

Chairs:

Dimitris Papalexopoulos

Technical University of Athens
School of Architecture
Athens, Greece

Oliver Fritz

Liechtenstein University of Applied Sciences
School of Architecture
Vaduz, Liechtenstein

Neil Leach, London, United Kingdom
I just wanted to make a comment on the last paper. I detected some references to Jean-François Lyotard, the critique of the post-modern tradition, the breakdown of the grand narrative and these sorts of minor narratives that are appearing, which of course has been the sort of standard paradigm people have accepted; and I want to be a bit provocative here and suggest that if you pick up on Freddie Jamieson's thinking, you could actually find an almost opposite argument going on there, that in contrast to the kind of homogenising space of late capitalism we are getting these kinds of calls for difference through these kinds of alternative approaches. But his argument is not actually resisting the marketplace of late capitalism: it is a product that feeds the marketplace of late capitalism. In other words, we are not actually breaking away from homogenisation; we are actually becoming increasingly homogenised, in the sense of marketplaces out there. I will just simply put my experience to you, and maybe it will help to show some examples of looking at education. I curated a show in Beijing last year, to which we invited twenty-four schools from all over the world. Strangely enough there is a kind of process of universalisation that is surprisingly everywhere apparent, wherever you are, even in China. And two of the possible reasons for that are, firstly, the way in which we, and the tools that are being used, Maya etc., are leading to a kind of universality in expression that is somehow unavoidable, and secondly, that there is a kind of marketplace of people who are teaching. For example George, who we heard this morning, has taught in Harvard, in Princeton, and so on, and I teach all over the place, so I think that there is this kind of networking of educators that has led to a kind of surprising homogenisation in a certain sort of way. So I think I would be more dialectical about that process and think more about the reciprocal processes at work; and while I appreciate the subtleties of your paper, I suspect that one could even be provocative and argue almost the opposite way.

Inês Salpico, Lisbon, Portugal
But don't you think that the universality you are referring to might also in some way freed from an ability to cope with the need to affirm one's identity and to assess one's individual values?

Neil Leach, London, United Kingdom
I do not know. I think that the kind of dialectical approach to connections and separations is to say they exist absolutely. You cannot have separation without connection and you cannot have connection without separation; and therefore identity and distinctiveness are, actually, from an intellectual point of view, folded into their opposite. This is a kind of provocation. I think that one has to be aware that it is not quite that simple, that identity is not something that is so discrete. The more universal the world becomes, the more we begin to see individual differences, and the more we see individual differences the more the universalising of things become apparent.

Dimitris Papalexopoulos, Athens, Greece
I have just a few words to say on that. I think that this is much more complicated, and I wanted to mention the theory that says we have to distinguish between identity and personality.

Jorge Sousa Santos, Lisbon, Porugal
I would like to make a comment on what Neal Leach said. I do not know if you were at this double session this afternoon, but I think that you would see enormous differences between architectural discourses. I think that you are referring to a kind of universal statement that is very precise. It is the Anglo-Saxon way of teaching that connects in itself in this kind of cyclical movement. So I do not think that universalisation of architecture is really happening. You can see an immense fracture between the production of architecture in different countries, and we saw this today.

Neil Leach, London, United Kingdom
I do not know about Anglo-Saxon architecture teaching, to be honest, because I have not taught an English person for four years. At the AA there was no one English in the class that I was teaching. And likewise at SCI-Arch, and they were not just American, they were from all over the world. In Dessau, we have 60 people in the Master's course from 40 different countries, and it is very difficult to talk about "discrete notions of an Anglo-Saxon culture" when there is a kind of pervasive international marketplace all around the world which everyone is somehow part of.

Jorge Sousa Santos, Lisbon, Porugal
You do not think that there is a strong influence from some Anglo-Saxon schools that are positioned in the USA or in the UK?

Neil Leach, London, United Kingdom
I agree, but look at American schools and see who is teaching in those places. Manuel De Landa or Mark Wigley, they are from all over the world. In SCI-Arch, most of the people are from Argentina or Italy or elsewhere. And yes, I think the American educational establishment, which is well funded, has been a platform for a certain way of thinking that has become actually a very successful marketplace; but the student body and faculty are extremely universal. There are not actually all that many Americans either teaching or studying in American universities, in the end.

Antonino Saggio, Rome, Italy
Since tomorrow there will be a final session of debate at which we are supposed to say something, I cannot use many arguments now; so excuse me if I am being a little superficial, but I have to keep something in reserve. I just wanted to point to one thing that I think is very interesting. I was thinking of Rivka Oxman's presentation today, and you probably remember that she started the presentation showing different pedagogies. I will try to remember that our central topic is changes in pedagogy, and that this is what we are supposed to be focused on. Anyway, in the different pedagogies she showed there was one common factor that is really interesting and that is that each of those pedagogies were a jump forward. Each of those pedagogies was actually done in order to address a very important shift in culture and society. We do not understand anything of what the Polytechnic is if we do not understand that particular moment of birth of a completely new world of positivism, industrialism, and all that. There can be no idea of polytechnics without addressing that issue. And of course the Bauhaus is exactly the same thing. How can we conceive of the

Bauhaus pedagogical revolution if not in relationship with the whole effort to finally address the important substance of the new society, and how to do that with design in architecture? Why I am doing that is because those examples, those changes, those real jumps in pedagogy always originate in one way or another in very important paradigm shifts. I think one thing we have to focus on in our discussion is whether we agree that we are in a paradigm shift now. That is the first thing that we have to address and to decide: whether or not we think that we are in a paradigm shift at this time. And secondly, if we are in a paradigm shift, then we have to change much from the past, and as a good beginning change everything. Because the important thing about the Bauhaus is that it changed a lot of things and basically threw out many things connected with the whole idea of pedagogy, first and foremost history. I think that these are important things for us to consider: first, do we believe that we are in a paradigm shift; and second, if we do then we must at least on this occasion – when we are in our schools, that is another story – decide how to change everything, at least theoretically. That is my point of view, and I expect we will discuss it more tomorrow. I am thinking in terms of paradigm shift; I go along with Toffler's idea that this is really a new phase of humanity. So it is much more than a purely cultural shift: it is a major, major shift.

Dimitris Papalexopoulos, Athens, Greece
I think that you are tackling a big problem, and that maybe we will just make a few observations; but this could be in a way the theme of this gathering. I am not sure that we are in a paradigm shift. I need to think more about this, because it is very easy to talk about a new paradigm and never sit down and define what it is. On the other hand, too, we have very serious works that advance the concept of technological paradigm. And because we make artefacts, because we speak about technology, we have to listen to what constitutes a technological paradigm and then we can decide if we have a technological paradigm shift. A technological paradigm is a paradigm that has a broad spectrum of interesting research involved. It is a very complicated situation, from the point of view of the theorist. Turning now to Rivka Oxman's presentation this morning, it gave a very interesting series: Beaux-Arts, Bauhaus, Eisenman, today. And there I totally disagree. Certainly I would leave Eisenman outside, probably I would leave Bauhaus outside, and it is very possible I would leave Beaux-Arts outside as well. I would go a hundred years before that, when we have a really important paradigm shift, with the rift between civil engineering and architecture and the birth of the profession of architect. So the question for me today is if we have a change, a fundamental change from that time, then that means circa 1700.
I would like to point out just a few more things that, apart from the huge question of paradigm shift, are also important. This afternoon we also had, coming from different directions, questions about creativity and strategies of morphogenesis. We have different approaches to that, and today we have seen two very clear positions approaching the morphogenetic theme. The most recent one was from Saeed Arida, who said that from objects we go to sub-objects and then we make manipulations in order to have a new whole in the performance. The other approach was totally different. We saw it with Oosterhuis and we saw it with Paul Coates, and it is that what exists, exists only as particles, and particles can provide us with different forms

depending on the information manipulations that we make. And the question here is whether we are moving from a swarm kind of thing, where we have an object which we can divide into sub-objects that can collaborate towards the goal, to a kind of a utility-focused paradigm, where different particles that through information exchange suddenly form different multiple substances and objects. This has to do with what Paul Coates said, and I think that he is right, and Oosterhuis too is very clear about this, but it is a very risky thing.

These are the two main directions concerning creativity that I saw this afternoon: one is objects divided into sub-objects that are then used to re-form the whole, and the other is particles forming different objects. And I think that the question could be between those two. The other question that came up along with creativity was that of performance, which is also not new. I remember that during my PhD in France in the 80s I made a lot of analyses of value – so the performance is reviewed; what is very interesting is that it is reviewed with these tools.

Saeed Arida, Cambridge, U.S.A.
Just a quick comment on the question of the paradigm shift. I do not know why we are so obsessed with knowing whether we are in a paradigm shift or not. It is a tricky question; I think only Michel Foucault would be able to answer it in the order of things. It is always a historical thing to discover if the human culture went through a paradigm shift. I think it is an impossible task to know if we are experiencing a paradigm shift now. It will take us some time, twenty or thirty years at least, to be able to look back at the present time and decide if we have a paradigm shift or not. So I think that it is an unproductive question.

Antonino Saggio, Rome, Italy
It was a rhetorical question, you see. It is evident that we are in a paradigm shift, otherwise you do not understand absolutely anything. We are already in a shift that is has been going on for at least fifty or more years. A huge amount of literature has been written about this. It is clear that we are in a completely different phase.

Saeed Arida, Cambridge, U.S.A.
But history says that human culture does not move by shifts, it has always moved by small transitions. Only when we write history do we define shifts, so…

Antonino Saggio, Rome, Italy
The idea of the shift of paradigm is not invented by me, Thomas Kahn wrote about this. There is a moment when we cannot build and progress with old tools and we must "jump" into the use and understanding of new tools.

Saeed Arida, Cambridge, U.S.A.
That is excellent.

Constantin Spiridonidis, Thessaloniki, Greece
I think that it is beyond any kind of discussion that we are experiencing a shift of some kind, whether it is paradigm, or a technological paradigm, or a paradigm

according to Kuhn; but we are experiencing serious changes, and the changes we are experiencing are mainly changes in society. Otherwise we would not have the possibility to experience changes in architecture, because all changes in architecture happen because changes happen in society and in the way that we understand ourselves in the world. And I think that if we follow these changes in the way that we understand ourselves as individuals, as human beings, that defines more or less the way that we understand all these things related to architecture and all the issues mentioned previously. For example, the discussion that started previously between Neil Leach and Jorge Sousa Santos is not, I think, a contradiction. I remember that in the 60s our orientation towards questioning about the world was directed towards the definition of the common things. In the 70s and 80s, by contrast, we were looking towards an understanding of the world on the basis of differences. I think that what has changed now and what updates this debate is that nowadays we are looking for differences and similarities at the same time; and I think that this is the definition of the parametric aspect that we are discussing here, because in the notion of the parametric there is not the different and the similar, but there is something that is common and something that is at the same time completely different. This is why I think that in the 60s we were speaking about systems and at the same time about persons, and in the 70s we were speaking about actors and at the same time about structures or living structures, and today we are speaking about individuals and diagrams; and in the notion of the individual, the way that we define this through the concept of diagram, the similar, the different and the same coexist. So we are all similar, yet we are all at the same time completely different. And this is why we are trying to define it as identity or personality, which is precisely our imperative today: not belonging to big groups or living structures as it was in the 70s and 80s, nor belonging to the biologically defined persons in our society. So I think that we are in a different way of understanding the world, and because of this different way of understanding we are seeking a new aspect of architecture. And I think that all those things that we have had the possibility to follow are attempts to translate these new conditions into architectural terms. And for me, the very promising and optimistic thing that happened this day is that we had three excellent, really excellent, presentations from students, who brought their fresh ideas and told us with a very strong voice that all those changes are already there and we are just following what is already in place. So it is not a question of innovation. It is something that is already there, and we have to open our eyes, our ears and our minds in order to use it to improve architecture and, of course, teaching.

Dimitris Papalexopoulos, Athens, Greece
That makes a very good ending, I think.

Per Olaf Fjeld, Oslo, Norway
May I make a comment?

Dimitris Papalexopoulos, Athens, Greece
Yes, of course.

Per Olaf Fjeld, Oslo, Norway
This is an interesting discussion, for it is in some ways full of optimism, in that we are all very well fed and can sort of rethink our world, which can somehow be even better than what we have here today. What I am trying to search for, then, is that we somehow take on all the complexity and the possibilities that our world has. We sort of take everything we know into our discussion, which of course is very positive in a way, because as I said we are all very well fed, but at the same time we drive this complexity into some sort of architectural concern. But we do not necessarily have any ideas, which may be too strongly put, or even any interest, which may be even more so, in how to simplify that complexity, to bring it out of its own realm and into an architectural concern. It seems as though the only tool we have in that sense is a different type of abstraction; and it will be interesting, I think, and a future challenge to bring all the complexity that we talk about into whatever the simplicity, if I may say so, of an architectural concern. I do see that there is a difference between the two.

Dimitris Papalexopoulos, Athens, Greece
I think that if there are no more interventions or questions we can close on that.

Keynote Lecture*

Søren Sørensen

Architectural Representation and Emerging Technologies

The Oslo School of Architecture and Design AHO
Oslo
Norway

Søren S. Sørensen *is an Architect and Assistant Professor at AHO Oslo, Norway. He studied architecture at NTH (NTNU) in Trondheim, Norway with final diploma in 1982. He is a practicing architect and project leader employed by some of the most important architectural offices in Norway until 1996. During this period he had one year of Urban studies on an Italian State scholarship in Rome, an assignment with UNHCR in Hong Kong and established and ran a gallery of contemporary art in Oslo, Norway. From 1996 he is a freelance architect/own practice and employed at the Oslo School of Architecture and Design, AHO. Assistant Professor with responsibility for teaching digital architecture and the implementation of digital technology in the educational curriculum at AHO since 1997. He is in charge of the research on Virtual and Augmented Reality at AHO with an ongoing PhD within the field of Architectural Representation and Augmented Reality.*

**included in the attached DVD*

Keynote Lecture*

Fabio Gramazio
Matthias Kohler

Informing Architecture

ETH Zürich Department of Architecture
Hönggerberg
Zurich
Switzerland

Fabio Gramazio, *dipl. Architekt ETH SIA*

1.8.2005	*Assistant professor for Architecture and Digital Fabrication at the Department of Architecture, ETH Zurich*
2000	*Foundation of the office Gramazio & Kohler with Matthias Kohler*
1996-2000	*Scientific collaborator and assistant at the Professorship of Architecture and CAAD, Prof. Gerhard Schmitt, ETH Zurich*
1994-2000	*Co-founder of the etoy art project*
1990-1996	*Architectural studies at the ETH Zurich*
1970	*Born in Langenthal, Switzerland*

Matthias Kohler, *dipl. Architekt ETH SIA*

1.8.2005	*Assistant professor for Architecture and Digital Fabrication at the Department of Architecture, ETH Zurich*
2000	*Foundation of the office Gramazio & Kohler with Fabio Gramazio*
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1997-1999	*Scientific collaborator and assistant at the Professorship for Architecture and Design, Prof. Dr. Marc Angelil, ETH Zurich*
1990-1996	*Architectural studies at the ETH Zurich*
1968	*born in Uster, Switzerland*

**included in the attached DVD*

Session 4

New Pedagogies, New Teaching Approaches

Chair:
Antonino Saggio
University of Rome La Sapienza
School of Architecture
Rome
Italy

Jan Slyk

Virtual Window towards "Pure" Architecture

Warsaw University of Technology
Faculty of Architecture
Warsaw
Poland

The past

Architecture suffers lack of free will from its early beginning.

According to Vitruvius' idea with its fundamental - *firmitas, utilitas, venustas* – architecture is in two thirds pragmatic (durable, useful). People build their houses just like bees construct nests. The beauty of the architectural object corresponds with the beauty of nature. It is a consequence of structural and functional logic, more than purposely established artistic value.

Rediscovering ancient masterpiece *De architectura* in XV century Florence brings new strength to the theory. However, renaissance ideas are not revolutionary in deliverance of architecture. Alberti appreciates ancient treatise just like the majority of theorists throughout modern history. The so called Vitruvian man remains the proportion paradigm until *modulor* appears. Studying analogy between Greek orders and musical modal scales we discover profound difference. Scales create universal harmonies (moods) to build in musical form. Orders describe proper proportion and decoration manners. Load-bearing role of the column influences its formal sense in theory.

Modernism does not change the practical principles of architectural tradition. Quite the opposite - functional patterns, material technology, ergonomics - dominate aesthetics. They reach the culmination point in the statement *form is function*. Mies van de Rohe says *less is more*. However, understanding of "*less*" is wide enough to embrace enormous fascination for steel structures: columns and beams.

Finally, it is not much different in present time. Studying Rem Koolhas SMLXL one can feel like breaking the wall of tradition. Nevertheless - redefining context value, looking for new language, questioning historical patterns - do not allow to pass into new creation territory. Building reality remains what it was. Architectural "new value" still demands foundation, depends on gravity and exists only in social and urban context.

New perspective?

Since William Gibson "Neuromancer" appears in 1884, new category of 3D environment gains its identity. Computer games scenery grows with (often unconsciously) use of architectural tools. Soon cyberspace will absorb fields of architectural experiments and practice.

Growth of Virtual Reality technologies overtakes architectural thought. We (architects) do rather deal with issue: "How to derive from existing technologies in design?" more than solving problem: "What kind of technology could support NEW theory".

Obviously I did not mention some examples not confirming introduced hypothesis yet. Works of Marcos Novak, Asymptote, NOX, Kas Osterhuis and many others exploit five "I" environments. Some works terminate a relationship with the physical world. Transarchitecture seems to be the hope for a pure art.

Unfortunately progressive designers tend toward beyond-architecture. Marcos Novak visualises his manifesto very clearly. New branch of art separates from mainstream and makes its way close but not parallel. While the clock is ticking, transarchitecture fades away behind the horizon of "real" architecture.

VR application in visualising spatial ideas is quite obvious. Everybody uses it. Vitruvian tradition pushes us into a pragmatic cycle: imagine what can you build (construct), check if it is useful and durable, after all - try to make it beautiful. Use of the computer makes the process much more effective. Simulation saves money, VR tools dramatically improve simulation quality...

Can we think the opposite way?

Architects need pure art exercises. From ancient Greece and the Renaissance till Russian constructivism and Archigram we try to study buildings not to be built. Can we imagine these ideas supported by VR instruments?

With help of pen and paper ideal Vasari's polygonal cities, industrial landscapes of Tony Garnier, structural Tatlin's towers and organic Herron's metaballs become "real". Moreover, the basic purpose of creation abstract forms is not looking for new art. Sketches illustrate architectural theories - academic background of building activity.

The test

The CAAD department in Warsaw Faculty of Architecture researchers look for new environments to achieve both - experiment background and experiment subject. Basing our efforts on realistic, conservative tradition of the school, we tend towards work that incorporates new media and new tools not losing the association with conventional practice strategies (spatial need, spatial solution).

Referring to Kippniss scheme, our curricula comprise:

- on "old paradigm" field - works involving augmentation of spaces, adding information layers into traditional architecture
- on "new paradigm" field - works incorporating traditional architectural techniques and theory in new media design

Research profile of the studio influences didactic activity. Since new media architecture does not belong to mainstream of education process in school, seminars and workshops take lead in recognising the new territory. We considered international activities in both - virtual and real senses - the most fruitful experiences. Forming teams we usually try to avoid monotony of skills and experience.

Even first year students bring lots of contribution into experiments. Incoming "information society" is them. Teaching through combining impressions and understandings, demands two directional communication. Young participants bring intuitive behaviours in using digital technology, more experienced - professional routine and knowledge.

Introducing two pedagogic events in the next section we would like to share observations and conclusions. Both of examples refer to facultative part of curricula and were organised in the limited time as very intensive activity. Participants were free to chose work methods and techniques, however given result format had to be achieved at the end. In both cases work was done for the audience embracing mostly not professionals. The response was recorded and given as input to the following experiments:

International groups of architecture students took part in two experiments organised to explore VR environments. We proposed themes coming from the field of information space receipted only with use of computer in both cases.

fig. 1
Students' presentation "Florence sense of perspective" - urban perspective

First exercise, located in Florence, was based on the Internet. A group of students, in 5 days visited the city, its monuments, museums, contemporary architecture. They listened to several lectures, communicated with Italian students and accidentally met inhabitants. All experiences were recorded digitally mostly as pictures and sounds.

We assumed that the designed virtual enclosure would allow to present participants' observations and feelings. In the same time it would create a symbolic meeting place to gather, chat, get information.

The experiment was based on Adobe Atmosphere (beta version). The software incorporates features of WWW functionality and virtual interface. Distant user navigates avatar getting information and interacting with people logged on the server with Atmosphere files. Java scripting brings more efficiency in programming interactivity. Rendering options and texture downloading mechanism are unexpectedly efficient and give very good results even with mediocre Internet transfer.

The information space designed by the team was based on the idea of Florence spirit enclosure with functionality of internet chat-room. "Universal palace" interior court, the central element of the scheme, works as framework for communication and entrance space for several information levels (perspectives). The user of the space, visualised as avatar, can physically communicate with other visitors or explore the virtual exhibition left by workshop team as their impression record.

fig. 2,3
Students' presentation "Polish Room" - virtual (left) and real (right) pavilion

Second experiment took place in Trondheim, Norway. Students designed and realised exhibition pavilion - symbol of national identity. Building process included both - real 1:1 scale and virtual modelling. The formula of workshop gave us special opportunities. We compared attributes of work processes during physical building and simulating architecture.

Real model arose in Room-LAB (modular 1:1 interior modelling laboratory). It was accompanied by virtual model presentation during the exhibition.

A computer environment was created with use of Blender modeller and Blender game engine. Functionality of the presentation did not demand network interface. Visitors of the exhibition were given an opportunity to navigate inside simulated symbolic space.

Two parts of the real pavilion referred to nature and civilisation - two aspects of polish identity. Architectural image was based on the idea of homogeneity and difference between elements. The virtual pavilion was designed in four layers: first - entrance space - built as the reflection of real space, three parallel spaces embracing past, present and future aspect of polish spirit.

All spacial features, aesthetics, navigation and interactivity were invented and programmed by students. Graphic interface of software scripting allowed students to design virtual world without long term studies. After the exhibition visitors were asked to fill in a questionnaire comparing real and virtual perception.

Both of described experiences confirm the need for spreading architecture (and architectural education). Even without special equipment and software involved, experiments brought significant result verified in records of recipient's impressions. In several elements of design idea digital result was evaluated higher than the real one.

Technology of today brought convenient digital tools within the range of common use. Tomorrow common digital fabrication and digital transport can get its real shape. From the period we had to look for technology suitable for purpose, we came to the point with excess of possibilities.

We have not met the problem of lack of skills during workshops although we worked with students not educated in computer sciences. Paradoxically - limited "knowledge" very often led to creative and innovative ideas.

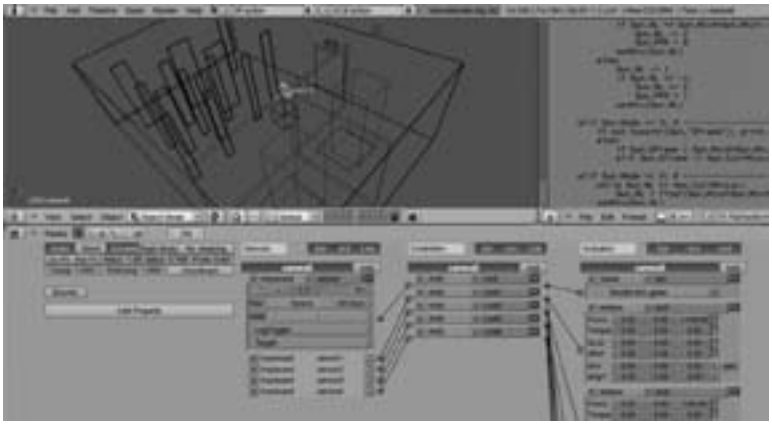

fig. 4
Students' presentation "Polish Room" - scripting in Blender game engine

Conclusions

Virtual Reality gives new chances to architectural theory. New ideas and design concepts could be verified in the environment faithfully simulating real world. VR offers amazing powerful sketchbook to theorists. Education receives a playground unattainable for architects until now. Students can use it as musicians practice scales. New idea, experiment does not cost much if it fails. However it is still very hard to break off with traditional perception and understanding of spatial reality. The barrier of glass divides two worlds. Even experimenting through VR window outside real, we still feel our feet on the ground.

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Socrates Stratis

Managing Complexity in Architectural Design

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The notion of complexity is considered as the coexistence and interdependence of various systems of different things that influence the final architectural outcome. The aim is to contribute to the architectural culture that would feed a new role of the architect in the contemporary society. Which is this new role and how the architect could keep herself/himself creative and innovative? What could be the role of a "project" oriented education in such a context instead of the actual "object" oriented one? Such an attempt was made by the author through the design studio of the second year in the Department of Architecture[1]. It is important to mention that this course is taught only once so far. Any observations and conclusions could thus only be on the modest side.

Case Studies 1 to 4: Superimposition of the X-small onto the X-Large

Case Study N° 1:

"Melissa Pastry Shop" in Nicosia old city centre (image 01). It is a small pastry shop that opened in the 1950s and run by Mr Kyriakos and his mother.

Case Study N° 2:

"Flying Coffee Shop", in Nicosia old city centre (image 02). A tiny coffee shop, whose owner, Mr Giorgos, has transformed the traditional coffee delivery, very popular in the eastern Mediterranean countries, by servicing his clients in the area by a motorbike and not on foot.

Case Study N° 3:

Mr Argyros' tailor shop, in Nicosia old city centre, (image 03). It is a tailor shop that opened in the 1950s by Mr Argyros, who is now in his early 80s. He has stopped working as a full time tailor due to luck of work. He is still in a 3 X 4 metres room with all tailor's accessories but practicing the neighborhood's "muktaris" (a sort of a neighborhood chief, responsible for state certificates)

Case Study N° 4:

"Orphanides Hypermarket, in the periphery of Nicosia, (image 04). It is a large scale shopping centre that serves a large part of Nicosia agglomeration. It has a ground floor for parking and above a generic floor for a shopping centre and a supermarket.

The cases studies N° 1 to N° 3 refer to the most traditional way of living and working in the old city centre. There are extra small activities where families or single persons run the business while living most of their time in the working place. The case study No 4 refers to a contemporary condition in the urban periphery. It is in fact, an extra large activity with generic characteristics. The presence of these two extreme conditions in the city of Nicosia is indeed, one of the side effects of the globalised processes that the Cyprus urban environment is undergoing.

One could study in fact, a scenario of superimposition of the X-small (case studies N° 1 to N° 3) onto the X–Large (case study N° 4). How can the level of complexity generated by such superimposition be managed in architectural design and why should

image 01

image 02

image 03

image 04

be? The question that relates to this conference would be: Can such condition of complexity be taught in architectural design studios and why? Can such condition become a vehicle of constructing an architectural culture which the architect would need in the contemporary society?

Shifting the role of the architect - Towards a "project" based architectural education?

One could observe nowadays that the technological development provides more and more tools for designing and constructing buildings. But, there are always more and more up to date engineers to handle such technologies, taking away parts of the making of the project done in the past by architects. Plus, the rapidity and complexity of doing things in the contemporary world have yielded to uncertain but rich environments running insufficient the architectural knowledge of action.

How the architect could compensate in such environments? One could argue that there could be a new role for the architect not on the technological level by acquiring more and more capacities but on the management of such complexity by acquiring capacities of keeping herself/himself creative and innovative.

In order to do so the architectural design needs to shift from being concentrated on the "object" to construct towards the design processes that yield to the final outcome. These processes involve in fact, systems of actors and things from heterogeneous contexts (political, financial, technical, social, etc.) Could the architect then shift his / her role from an "object" designer to a "project" designer? Guiding through, reconnecting systems involved, contextualizing knowledge that exists in these systems towards the best possible outcome, intervening into non linear design processes plus, in disciplinary areas where he / she did not have a say in the past: formulating the right questions for a building brief, working on communication tools in order to sustain cohesiveness in the various processes between the actors involved?

Continuing in the same logic, the education of the architect needs to shift from an "object" based education into a "project" based one, giving more importance to the notion of the project.

Defining the notion of the "project"

It is very crucial to define the notion of the "project"[2] beyond the usual references in architecture as that of the physical object projected.

The way it is defined for the purpose of this text is in fact, that of a hybrid form of action between analysis and proposition. It is a form of action in which means and ends are interrelated. There is always a universe of possible and plausible directions that are constructed dynamically through the system of actors involved.

In this case, the system of actors becomes decisive in the project becoming. Such actors usually operate independently with their own communication tools. It is not evident that when they are put together for a project they will succeed in communicating. A process of constructing adaptive communication tools[3] becomes a major issue.

Another important aspect of project based logic is that there is no linear way of designing. There is in fact, a continuous interrelation between all project parts and actors that make the whole process dynamic and complex.

What is very crucial to note in this case is that within the project based logic there are built in mechanisms of context evaluation which allow the construction of the possible actions, readjustment of possible directions and means. The notion of the context becomes central going beyond the physical context into the cultural one. One could in fact define the cultural context as a register of contexts referring to the physical, temporal and pragmatic domains[4].

Public vs private in the Case Studies 1 to 4 as a vehicle for the design studio

The purpose of the architectural design studio was to introduce in fact, the students into the "project" based logic in architectural culture. The number of students was 17 and they worked in dynamic groups of 6 and 3 as well as on individual basis. The small number of students with two tutors allowed the careful handling of quite complex issues in the short time of a semester (14 weeks). The attempt was to expose them to the characteristics of a "project" based logic in implicit and explicit manners. The scenario of superimposition of case studies N° 1, 2 and 3 into case study N° 4 became the vehicle for such attempt.

The students were exposed into complex conditions and they learnt how to manage their way in such environments from the very beginning of their studies. They began to learn in fact, to become creative and imaginative by getting exposed to "extreme" conditions that question all given images and preconceptions in their minds, (a pedagogical method that does not reproduce any limiting static world[5]).

Their main project was to design a small family business (case N° 1 to N° 3) with living spaces in a given site within a large hypermarket (case study N° 4). Through an architectural language developed by the study of morphogenetic forces, in this case those of public vs. private they worked their way out through various phases:

Phase 1: Constructing a language of communication through public / private.

The students had to circulate around the Nicosia old city centre and study threshold forms between public and private. They were given a matrix of domains in which public and private exist, such as property, use, view (physical and tele-view), sound, smell etc. They were invited to fill up the matrix with all possible examples of relations between public and private (for example, public property vs private use, private property vs public view etc), (image 05)

This method enabled the students to construct a language of communication that facilitated their comprehension of the urban environment, encouraged the communication amongst them but also between them and the tutors.

Phase 2: Analysing case studies 1-4 and enriching the public / private relations

Phase 2a

The students were invited to analyse the case studies N° 1 to N° 3 and define threshold forms between private and public, from the private point of view. They were

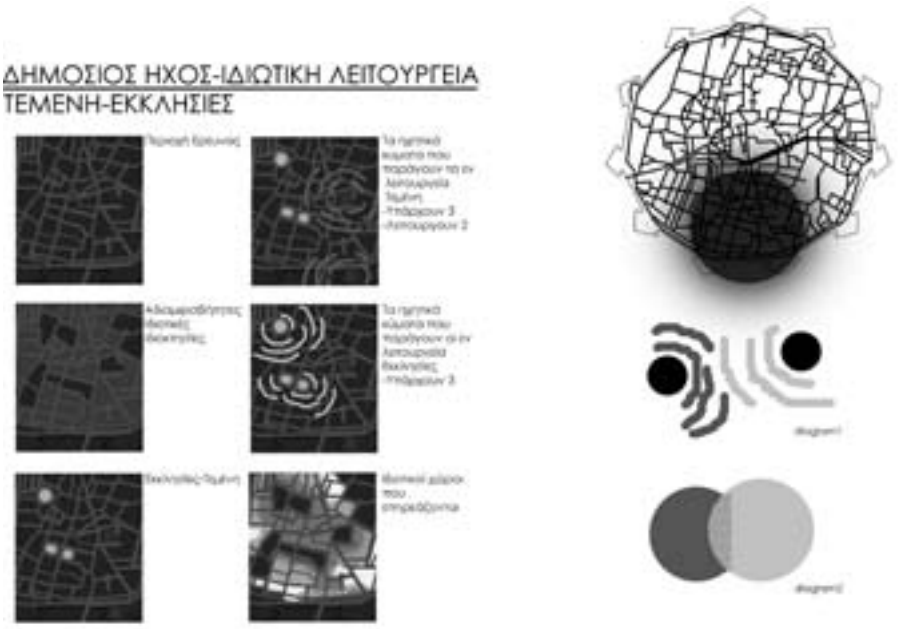


image 05

divided in three groups, one for each case study and they had to document through the language constructed, the content of each space and the activities taking place. Documenting the content of the spaces through the public / private relationships encouraged them to develop their own means of representation that begun to refer to heterogeneous environments. For example one student attempted to differentiate the personal objects of Mr Kyriakos in the pastry shop, case study N° 1, which coexist with the more public objects of the pastry shop, (His fish tank and puzzles on the wall together with the clients' tables and chairs -image 06). What was impressive in this phase was the fact that the tutors needed much more time to "enter" into these drawings than any other homogeneous representations. The issue of privacy was transferred in the drawings themselves.

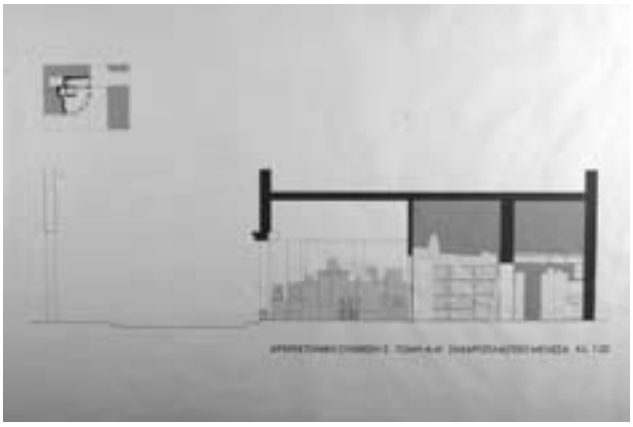


image 06

Phase 2b

The students were asked to analyze the case studies through the relations between private vs. public and construct models of such relations. They had in fact, to deal with the time factor, a rather tough issue to touch upon. What came out of this exercise was that they had to discover and analyze mechanisms that form the relations between public and private and how these relations vary over time (image 07). One example is that of case study N° 2, the flying coffee shop, where a student constructed a model representing in fact, the unfolding of the movement and servicing of the flying coffee shop man in the old city centre (image 08)

Analyzing the case study N° 4, the large shopping centre in the periphery of Nicosia, was rather a difficult task for the students. They were exposed to the large scale of the shopping centre and the consumer "noise" that in fact became crucial for their design on the final phase.

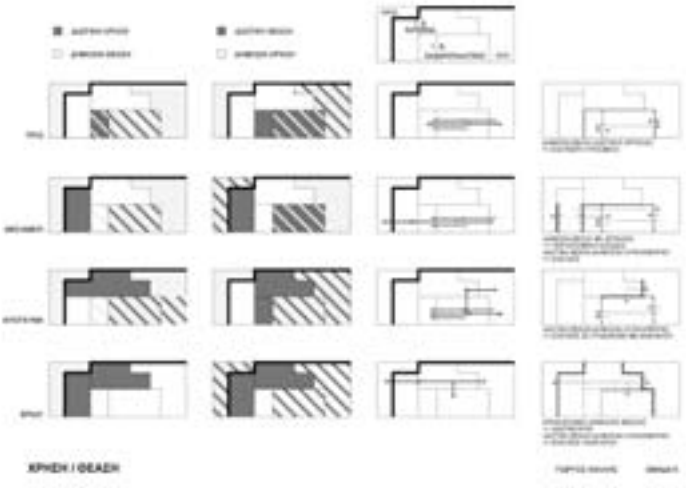


image 07

image 08

Phase 3: Constructing a "project" brief by public / private relations.

For a "project" based education, it is crucial for the students to get exposed to the formulation of a brief, a framework of directions and priorities. They were asked to formulate such brief in terms of preferable relations between public / private, a sort of transferring of knowledge acquired up to this phase. What it is important to mention at this point is that by formulating a brief by relations of public vs. private and not by a quantifiable manner, a "project" brief was constructed rather than a building brief.

The "project" brief was created on two levels: On a group level, where all students working on each case study had to decide amongst them a priority of relations and then on an individual level where each student could add a personal level on her / his brief.

What was very interesting with the "project" brief was that it became a sort of a road map for the students who could consult it on an individual basis and readjust their directions and priorities. The role of the tutors was to bring them back to their brief when necessary with a sort of an intermediate role, rather than that of a Master.

Furthermore, the construction of a language around public/ private relations through the various phases, enabled the students to include in their briefs a range of very generic and very specific issues. The potential users of the building to design had names and specific characters: Mr Kyriakos and his mother in case study No 1, Mr Giorgos, his wife and two kids in case study N° 2, Mr Argyros as a lonely guy in case study No 3. The public vs. private way of entering the project facilitated them to circulate continuously from the specific to the generic, from the detail to the whole.

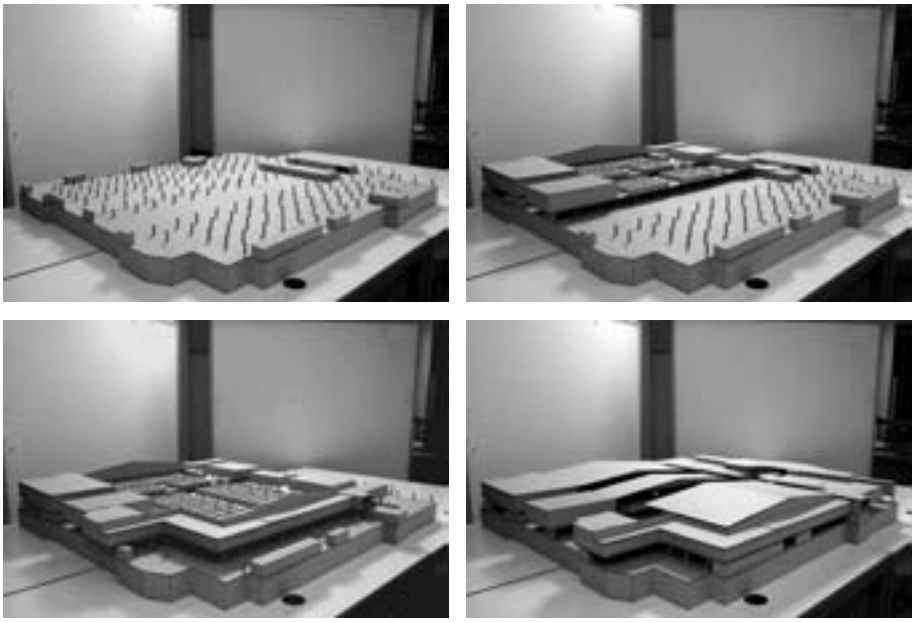
Phase 4: Plot assignment

The students were assigned a plot within Orphanides Hypermarket (case study N° 4) (images 09, 10) where they had to design an activity of the same sort as the case studies plus a living space. The plot given was in fact the smallest possible built plot in Cyprus which is 10.5 X 24 metres, (image 11). Through some simple rules they could operate within that plot perimeter and on a vertical level (three levels). Plus, they had to incorporate a small garden which forced them to introduce natural light, a sort of openness within an artificial environment.

Three plots where assigned, one for a pastry shop (case study N° 1), one for a coffee shop (case study N° 2) and one for a tailor shop (case study N° 3). The exact position of the plots was given by the tutors attempting to relate the character of each insert with the existing context. The Pastry shop plot was amongst the shelves of sweets and chocolates in the supermarket, the coffee shop plot was at the cashiers' counters enabling the coffee shop activity to take place not only within the supermarket but also within the rest of the shopping centre. Lastly, the tailor's shop plot was located above the shopping centre's escalators encouraging the students to readjust the role of the tailor.

Phase 5: Contextualising an insert

The design of an insert in the given site had to go through a series of transformations of the public-private relations in the project "brief" into architectural form. In order



images 09a-b, 10a-b

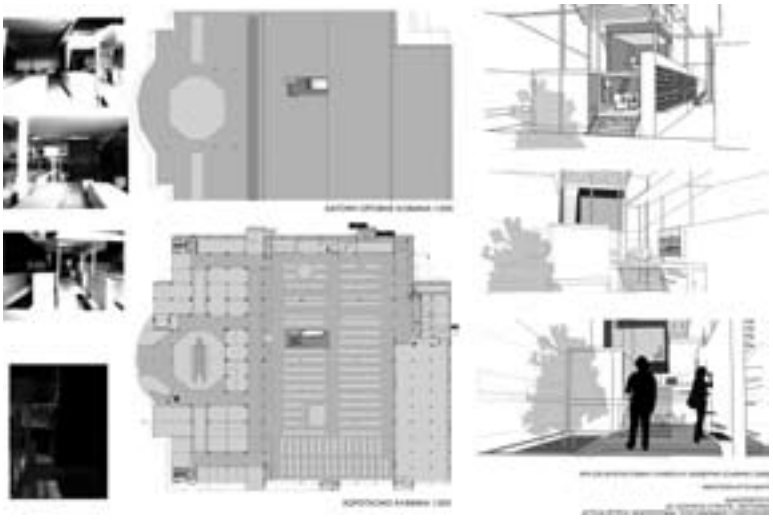
image 11

to facilitate such a leap, rather difficult indeed for the design process, the students were assigned to construct a section model that would enhance their preferable public-private relations and begin to react to the given context of the site. Plus, they had to begin to design possible interfaces between the X-small of the insert and the X-large of the shopping centre. As references they had a parallel study they did in relation to the notion of the parasite in its biological sense and how it takes advantage of the organism on which is plugged on and at the same time serves it. Furthermore, they had to analyse forms of living through architectural references that could use them for their project. The students chose various ways to manage, the coexistence of extreme conditions:

In Case Study N°1, Pastry shop, one student chose to open another entrance to the supermarket through the site and to use that as the driving force for the design of

the insert. (Anastasia Aggelidou images 12, 13). Another student, on the same site, chose to lower the ground level with steps so that the pastry shop area could become a shopping trolley-free area, a sort of an exception (Theoula Evzona images 11, 14). In that same logic another student designed a loop for the customers flow but this time in the open air, (Giorgos Kallis, image 15, 16).

image 12



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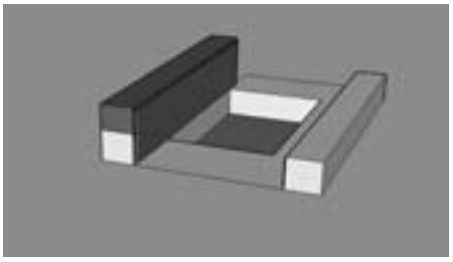

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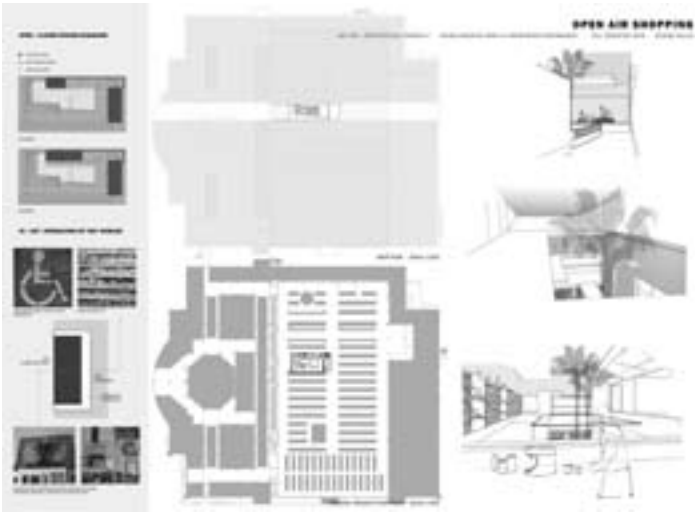


image 15

image 16

In Case Study No 2, that of the coffee shop, one student chose to design the ground floor through the differentiation of the flows which cross the site. Being on the cashier's spot of the supermarket, one had to manage the entry and exit of customers who could take a coffee while entering, plus the flow of the flying coffee shop man who had his own service counter to pick up the orders (Christina Armosti, image 17). Another student concentrated on the expandability of the coffee shop activities. She designed a core of minimum floor area and suggested that the rest of the activities could parasite on the existing infrastructure of the shopping centre (extra sitting area in the existing café, extra bedrooms for guests in the shopping area where they sell bedroom accessories, (Maria Mattheou, image 18)

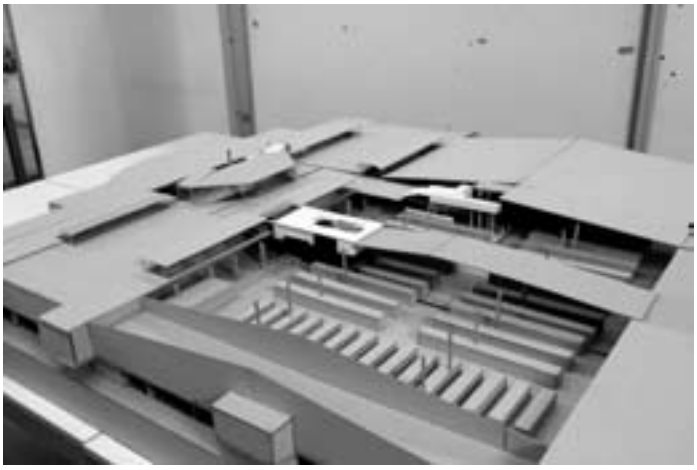


image 17

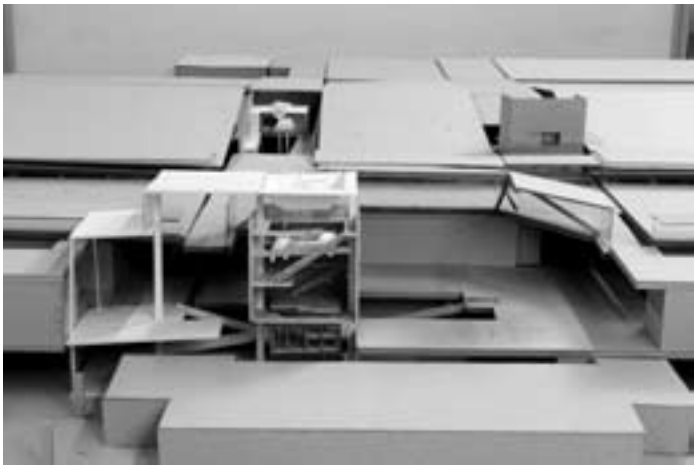
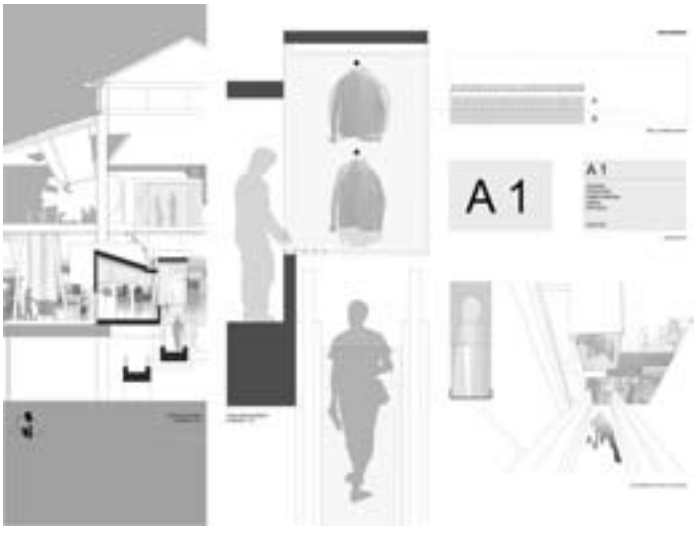


image 18



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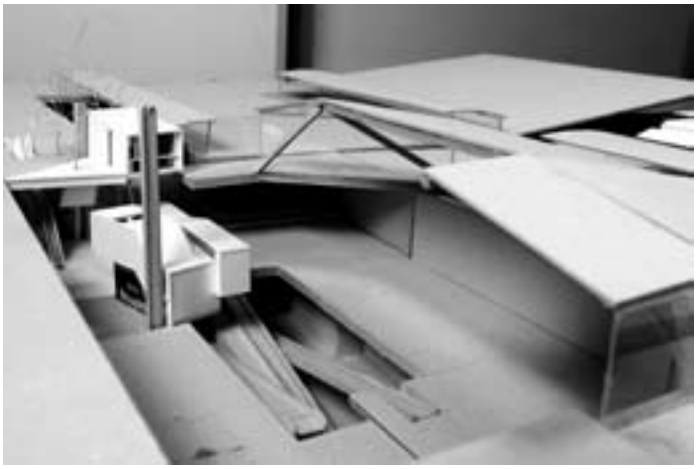

image 20

In Case Study Nº 3, that of the tailor's shop one student (Argyrw Stylianou), chose to give another role to Mr Argyros, the tailor himself. His actual role, as the responsible for state certificates for the neighbourhood was transformed into the person responsible for the surveillance of the shopping centre. So the insert design reflected indeed, various scales of surveillance of the flow and how that was managed with his own personal living (image 19). Another student (Christos Pasadakis), chose to extend the logic of the escalators into the design of the insert and a sort of quick stop and mend tailor's activity. (image 20)

A project based action as a mechanism of managing complexity

Through the text there was an attempt to raise some issues beyond the technological development related to architectural design into that of managing complexity. The design studio outcome demonstrated that it is possible to introduce students in that sort of complexity from the very beginning of their studies. It is true that it is an ambitious undertaking and the design studio presented has run only once. Nevertheless, one should not ignore the multitask ability of the new generation achieved in fact through

their everyday friction with a multiplicity of environments at the same time, virtual, real, hybrid ones developed in fact by their continuous friction with computer games and communications. For sure, one could take advantage of such capacities and their education cannot be the same as that of the previous generation.

Notes

1 Department of Architecture, University of Cyprus – Fall Semester 2006-2007. Studio assistant, Aggela Petrou, architect.

2 There is a large range of bibliography on that issue that the author has studied through his doctorate degree titled: "Forms of "local / global" dynamics in a project based action

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3 Schon Donald, cited in Christophe Midler, *Organiser la création: l'exemple du projet Twingo (Organising the creation : the Twingo project exemple),* pp. 219- 238, in Robert Prost, Concevoir, Inventer, Créer.

4 Amphoux, Pascal, The included third as urban project, in *Europan 6 – Theme*, p.17, Europan editions, Paris, 2001,
Stratis, Socrates, op. cit. p. 29.

5 Panayiotis Papaconstantinou, 'Practical exercise of students in pedagogigal departments: the transformational importance of research' (Πρακτική άσκηση των φοιτητών στα παιδαγωγικά τμήματα: η μετασχηματιστική συμβολή της έρευνας), in *School Experience – theory and action,* edited by Giorgos Filippou, Maria Kaila, Ellinika grammata, 1999.

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Cross Scale Architectural Pedagogy

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Introduction

Contemporary theories stress the fact of the multi reference cognitive and cultural association, a fact that seems to be in value for architectural cognition and cultural association as well.

The implementation of the above theories offers an ensuring theoretical foundation, explains the immediate empirical results of architectural teaching and facilitates the reform of studio teaching.

We are going to present such theories, and the way they influence the program we run, in the 4th year of architectural studies in the practice oriented School of Architecture in Athens.

In this architectural studio program, students are expected to resolve a public building to its very detail. The question that is raised here is how one can challenge such a down to earth orientation, to produce a creative experimental atmosphere, within which students can find their own path of expression on all levels of design.

Multi reference cognitive and cultural association, in contemporary theory

From almost a century ago, Vygotski[1] offers in the domain of genetic epistemology, a new approach to cognitive development an interactive model that of a cyclical non linear development. He argues that development is a complex dialectic process, characterised by unevenness in the progression of different functions, metamorphosis or qualitative transformation of one form into another, intertwining of external and internal factors and adaptive processes. He rejects the concept of linear development and incorporates into his conceptualisation both evolutionary and revolutionary change. Development proceeds in a spiral, passing through the same point at each new revolution, while advancing to a higher level[2].

In the same historical period, psychoanalytical approach stresses, the value of free association. Association of images offers according to freudian and post freudian theories, non predictable relations, confronting rational to irrational elements.

In contemporary semiotic theory, Jacques Derrida underlies through his text on the science of grammatology, *De la Grammatologie*, that not only language and thinking depend on "difference", on the structure of distinctive oppositions which make up their basic economy, but that meaning is always "deferred" by the endless supplementarity of signification.[3] As a result meaning is created as a constant transformation, as a constant state of association and comparison between different moments of thinking.

Thus the multi levelled state of relations must be accepted as a central problem of contemporary theory. The term "rhizome" as used by Gilles Deleuze and Félix Guattari, in their famous book *Milles Plateaux: Capitalisme et Schizophrénie*, describes the internal movements among different cultural formations, comparing them with the multi directional roots of a rhizome brunching away, through thousand levels - "milles plateaux"[4] of cultural expression.

It is not surprising that the last two theoretical references flourish, in a period where electronic intelligence offers the means of surpassing the bias of linear thinking. In the case of parametric design, technology offers a multi scale, multi level possibility of research

The cross scale multi associational studio teaching

The new digital era offers easy communication, flow of information, easy exploration of new technologies and materials. In parallel it offers plenty of opportunities of uncritical copying, that may lead to a sterile development of the design, from its initial conception to its final detailed stage.

To be able to overcome the problems that a practice oriented studio teaching program poses, especially when it concerns the design of a big scale complicated building, one has to understand how the different faces of the design i.e. initial conception stage, interim stage and detailed stage interrelate to produce the final result, the building.

We are going to argue that:

a) Each of the above stages encompasses a very similar structure.
What sometimes one doesn't realize and mainly the students, is that conceptual ideas already embody constructional aspects, while detailing in creative thinking posses conceptual value. This structural analogy has to be revealed to the students not only as a way of thinking, but as a way of doing.

b) Final building structure results as the dynamic, overall synthesis of many substructures, concerning partial architectural aspects.
General formal decisions, constructional decisions, detail thinking, decisions concerning the materiality of the project, urban or landscape site, even non architectural aspects participate in different ways, in the formation of the architectural product.

c) This structural synthesis is not developing in a systematic linear way, but in a multi directional way, where all stages are relating simultaneously and are independent at the same time.
A linear way of teaching would accept that the architectural projects have to progress by shifting scales - from minor abstract scales to bigger more detailed elaboration. Creative thinking however is much more complicated. Any type of architectural information or not, may be introduced in any moment of the process to the project, condition that seems to reinforce the originality of thinking.

The above assumptions lead us to develop a teaching method that constantly questions the relation between the different aspects of structure - space, technology and form, as well as the relation between different scales of elaboration.

That also means that students are challenged to work simultaneously in different scales and different levels of abstraction. They can start by being obsessed by materiality or by architectural details, producing big scale architectural models and drawings, or they may introduce extra architectural ideas in their projects. While going through

this process of designing, in part implicitly, they come to realize that abstract forms in architecture have to posses constructive materiality, while creative detailing posses conceptual value.

The above teaching method results in a variety of different building propositions from students, as they are facilitated in finding their own path of architectural expression.

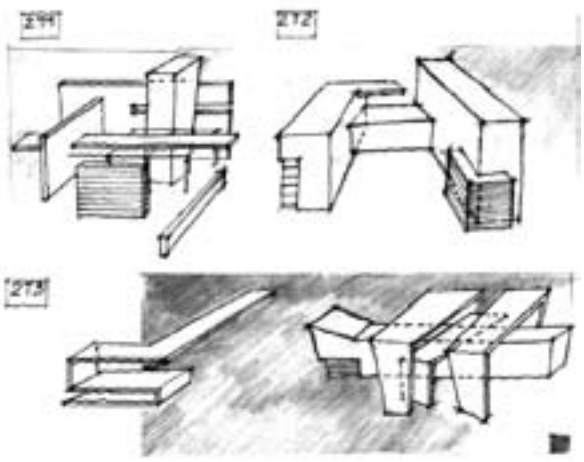
Case Study: A multi storey cultural and recreational building, in Piraeus

The example to be presented concerns the design of a multi storey cultural and recreational building, in the centre of Piraeus, an important harbour city in the vicinity of Athens[5]. The students had to accommodate a cinema complex, a public library, an art centre accompanied by an exhibition space, athletic facilities, a bar and a restaurant. Starting with, the students had to work simultaneously on two dramatically different scales. On one hand they to work on the urban scale, on a contextual level and on the other hand they had to focus on a specific functional space, having to present the textural feeling of the space using mainly conceptual models and sketches. Thus, each group of students could identify their own starting point of the project, this being the library, or the cinema space, or any other space they could choose, bringing in a variety of ideas and concepts.

As they do not fully realise that these first "detailed" conceptual models encompassed structural and technical information about their final product, the students feel freer to express ideas and feelings. While developing these first models by transforming them they keep referencing back and forward, in relation not only to spatial but structural and textural qualities simultaneously.

Presenting the students' projects, we want to stress their variety in terms of architectural expression. For analytical and didactic reasons, we classified them under three different typologies.

(1) Space is organized by the use of horizontal and vertical planes and linear elements that express the structure of the building. 2T1
(2) Space is organized by volumes. 2T2
(3) Space is organized by the use of continuous surfaces. 2T3



All atelier's project were organised under the above mentioned classification.

The initial conceptual models of each project related to specific functional spaces of the project i.e. library, cinema space, bar etc. and contained information about structure, materiality and spatial quality.

These models were transformed several times through the use of different scales, different forms of elaboration and different means of architectural expression i.e. models, drawings, 3d etc. These transformations allowed the students to reread and translate on different levels their initial concepts.

The examples that follow illustrate the above process:

1st PROJECT

Conceptual stage

Interim stage

Final stage

1st project: conceptual model: space structured through parallel planes of the same materiality. The space between them defines different functions. Movements perpendicular to the planes are expressed by linear volumes of translucent material

2nd PROJECT

Conceptual stage

Interim stage

Final stage

2nd project: Conceptual model: the use of a continuous surface, to create an overall global space containing the functions of the building.

3rd PROJECT


Conceptual stage


Interim stage

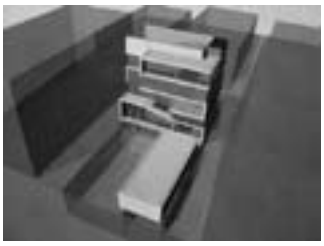

Final stage

3rd project: conceptual model: planes of different materiality, interlocking in a dynamic way. Those planes organise three types of parallel spaces, each of which corresponds to different functions.

4th PROJECT


Conceptual stage


Interim stage


Final stage

4th project: The fourth and final project concerns the creation of space, through the use of continuous surfaces. Specific functions are expressed, as small material capsules within bigger empty volumes

Conclusion

Contemporary theories indicate the mental importance of the multi reference cognitive and cultural association. Thus, the method proposed of *a cross scale, multi level teaching* is nothing more but the acceptance of this psychological and cultural reality as center of the educational communication between students and teachers of architecture.

This acceptance offers the students the ability to purposely acknowledge and use an "experiential framework" as a meaningful design generator. It allows them to experiment with free associations and transformations through the whole spectrum of architectural decisions of varied scales and partial objects, which finally compose the complicated building of the project.

We strongly believe that this method of *a cross scale, multi level teaching* is extremely important in a period of computer aided design, where electronic means positively

facilitate the movement through different scales and levels of elaboration and transformation, but where on the contrary non material forms are easily imposed to inexperienced students and structural details are easier to be copied uncritically.

Notes

1 L. Vygotsky: *Thought and Language*, The MIT Press, 1986.
2 Op.cit. (1986) After word p. 121 and "Internalization of Higher Psychological Functions"
3 Those two distinctive cognitive functions are expressed by the distinction between the terms "difference", already used by Ferdinard De Saussure and "differance", written in an unorthodox way, as proposed by Derrida himself.
4 The term "rhizome" as used by Gilles Deleuze and Félix Guattari: *Milles Plateaux. Capitalisme et Schizophrénie*. Les éditions de Minuit, Paris, 1980.
5 Atelier tutors: Nelly Marda, Kostas Moraitis, Vicky Nakou.

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Information Devices

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The picture shows Private England looking down passively at a naked Iraqi detainee as she holds a leash strapped around his neck. In an interview to the New York Times, she explains how she forced him to crawl down a hallway for "approximately six hours" (Zernike K, 2004). Pointing at a photograph of a pile of naked prisoners, she states: "picture 000015 was basically us fooling around" (Zernike K, 2004). Noteworthy here is not only the *strategic* and *calculated* nature of the depicted abuse, or that the methods employed require a development of skills and a set of abilities and training; but also the sheer *detachment* – these actions are about the torturer "fooling around", not about the tortured. It is a scene from Burroughs' Naked Lunch – Dr. Benway's programme of Total Demoralisation.

The fact that the Abu Ghurayb pictures have come to the public eye may lead us to perceive this raw brutality not only as a condition intrinsic to torture, which has been common place in military prisons, but also as something pertaining to the use of the electronic medium: the will to *document* (with digital cameras) and broadcast (on the Internet) the events in question is in itself *a display of detachment*. We are drawn to the power of new information media and not only the events conveyed by them – Marshall McLuhan´s "the medium is the message."

Documentation can at anytime be turned into *evidence*, as the Abu Ghurayb abuses attest to. Digital cameras and third generation mobile phones expand the presence of the public eye in time and space and disclose new relationships between publicity and privacy. Using his mobile phone, a victim photographs a mugger as he tries to rob him. The picture is used as evidence by Stockholm Police in building a case against the mugger.

Coming into play is a form of self-consciousness induced by viewing/playing and broadcasting as punitive devices or as mechanisms for narcissistic exposure of personal events. The emergence of cultures, in which virtually every individual is potentially a local recorder and broadcaster with access to the required means (third generation mobile phones, digital cameras, computers or other electronic devices) for activating those practices, is an imminent condition. In being publicised through broadcasting and viewing/playing – operations of de-territorialisation and re-territorialisation – the digital images in question change their symbolic meaning. The images before and after publication are very different entities.

The controversy about the publication in the Daily Mirror of fake photographs of British troops torturing Iraqi prisoners points to the autonomy of the image, which for want of a *fact*, finds a referent in the "authentic" pictures of the abuse by American prison guards at Abu Ghurayb. Those counterfeit images reveal the media system looping back onto itself, making news out of news.

Operations performed on information become a subject of study in themselves besides (but not independently of) the content of information. A question, which may be raised in this connection, is whether such *cognitive operations* (that is, operations performed on information) can be treated as transformative tools in creative practices, such as architectural, landscape and urban design. Could cognitive operations, as described here, be integrated in architectural education to a degree that parallels "established" design methods dealing with phenomenological, compositional, material and programmatic conditions, amongst others? Could such cognitive operations be seen to interact with and transform the design methods in question?

What are the implications of those practices and of an intensified publicity to

architecture and urbanism – where little is hidden, most is surface, a celebration of Paul Valéry's formula: "Le plus profond, ces't la peau"[1]? Are we seeing the emergence of architectures and urbanisms of exposure? What are the implications of such extended visibility to architectural education?

This paper looks at the above questions through a series of *devices* primarily as conceptualisations of cognitive operations that may evolve into teaching programmes. These devices stand as exacerbations of cognitive practices and define particular lines of investigation.

Device 1: Publicity/Control

A *publicity/control device* takes its point of departure on the ubiquity of information technology gadgets and technological cooperation systems and the fact that they bring about an expansion of a space of control.

In January 1999 the Danish tycoon Kurt Thorsen was accused of being behind the forgery of documents which granted his company a bank credit worth 1,8 billion Danish Crowns (approximately $300 million). Thorsen, however, denied any knowledge of the forgery which made him and his company primary beneficiaries. Throughout the one year and a half which the trial lasted, Thorsen insistently kept on denying his involvement in the scam. But in June 2000, despite the absence of any "physical" evidence, he was sentenced to a six year prison term. The prosecution built a case primarily on the basis of the inconsistencies between Kurt Thorsen's account of his moves and whereabouts during the period the documents were forged and the data supplied by the network provider on the location of his mobile phone during the same period. Each time Thorsen made or received a mobile call the location of the particular tower which provided the connection was registered, in that way his whereabouts could be recorded.

Patrick Di Justo reports in an article in Wired (December 2003) that the number of surveillance cameras per square mile in Manhattan has gone from 129.4 in 1998 to 396.5 in 2003 to an estimated 1,214.9 in 2008. The figures for London are 80.6 (1998), 247.1 (2003) and 757.5 (2008). (Di Justo, 2003, p.62). Commenting on such development, he writes the following: "Of the 9,000 surveillance cameras in Manhattan, only 5 percent are operated by public agencies. The rest are privately run. It's mostly store-keepers, building managers, and Internet users – not governments – that are watching you… The Carnegie Mellon Data Privacy Lab estimates that footage from as many as 10,000 of the country's [US] public-space cams ends on the Web, meaning your mug could be viewed and stored by anyone, anywhere in the world."

Di Justo further adds that in December 2003, it was estimated that there were "roughly 30 million cell phone cameras and 25 million video-cams in the world…" (Patrick Di Justo 2003 You're Being Watched. Wired December 2003 p. 62)

As suggested above, through the emergence of decentralised forms of surveillance and control, knowledge that at one point was local and that belonged in a closed circuit (such as the pictures documenting the deployment of torture in Abu Ghurayb prison) becomes public by being broadcast on the Internet.

An event may be either remembered or forgotten, maybe it involves witnesses, and the identities of the protagonists are possibly known by one or several actors.

In being publicised on the Web the event is cast as a story, as a documentation, as a case, as data, etc. This re-territorialisation is not only about how the event is represented, how its is framed, how it is linked, but also about the fact that it can be played back, downloaded and stored by people with an Internet access in their PC. Besides being part of a decentralised and uncoordinated archive network, people are in a position of recasting and republishing the event in question. As events are re-territorialised, it could be said that architectural and urban spaces are themselves re-contextualised by the same operations.

Moving away from a defensive position which states that creative activity starts where control stops, a *publicity/control device* consists of infiltrating surveillance practices and using them as tools in building accounts on urban conditions and public spaces and articulating new programmes.

What types of maps can be drawn that illustrate new conditions of publicity created by the proliferation of devices such as digital/video cameras and third generation mobile phones? How can representations be developed, which extend themselves through both physical and virtual spaces?

We are presented here with a twofold conception of a representation. On the one hand Bourdieu's abstract space or abstract map (Bourdieu, 2000, p.2): as a representation that outlines a field for an investigation of practice (e.g. surveillance), which that very investigation seeks to deconstruct. On the other hand, the map is not only a cognitive tool constitutive of representations, it can also be taken as a creative mechanism as in Deleuze & Guattari (1980), an enabler of multiplicities and connections. A *publicity/control device* explores this tension between the urban as a cognitive construct and as an object of manipulation.

What study programmes can be developed, built around the appropriation of surveillance material or in the extensive use of documentation and broadcasting techniques, which create new conditions of publicity? This is not a frivolous connivance with surveillance and control practices; it is rather an attempt to inhabit such practices and to insert creative operations like viruses into their core.

At the other end of the spectrum, the same technologies that can be used for surveillance and control can also be employed for creating spaces free of control. Recent studies show how mobile phone texting and conversation are used by teenagers for dodging the surveillance of their parents. (Rheingold, 2002)

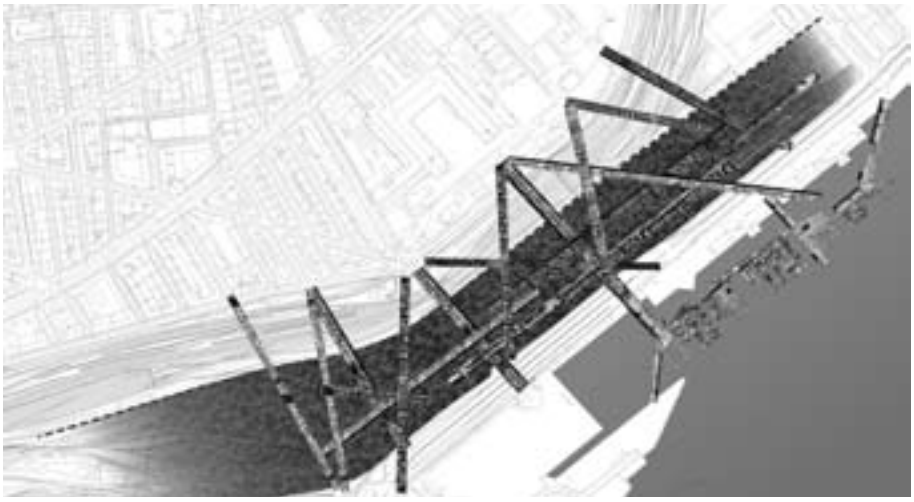
Facing urban trends, media and information cultures from the angle of exacerbation of control, both as centralised and decentralised systems, a study programme could direct its focus to mechanisms and (information) technologies with the potential of generating spaces free of control. Building such an approach into a design methodology may imply the introduction of unprogrammed spaces or unprogrammed devices which undermine design – that is, a space free of control is necessarily a space that escapes manipulation by architects.

During the academic year 2006-2007 I have, together with my colleagues at Department 2 [The Royal Danish Academy of Fine Arts, School of Architecture], implemented some of these ideas, in the first instance in a workshop where students were asked to develop conceptual statements about emerging conditions of publicity and territoriality in the city of Copenhagen, through the making of models and artefacts. One group of students, took a shopping mall as a point of departure, extracting an object from its environment, namely a shopping bag. This object was transformed – an operation of

deterritorialization – and made into a wearable object. Subsequently this transformed shopping bag was reintroduced into the space of surveillance and control of the shopping mall, as part of a strategy not only to subvert conventional social practices in such spaces, but also as a device to extract knowledge about them. [figure 1].

Figure 1
Work by Angelica Waldh and Sigrid Anna Ulrika Bylander consisting of transformation of a shopping back as a device to test and challenge spaces of control and surveillance. Photos by Sigrid Anna Ulrika Bylander

Another group of students worked with a contaminated, post-industrial site of unused rail tracks to develop a concept of a space free of programme and design – a space open to be occupied in unpredictable ways by groups of people, local or not, some of them who have been squeezed out through a process of gentrification of neighbourhood of Vesterbro, where the site is located. The space of the unused tracks is proposed to be planted with trees and bushes, which help to cleanse the soil in the medium and long terms. All urban development is concentrated on bridges connecting the neighbourhood of Vesterbro with the Copenhagen harbour front. [see figure 2 - 5].



Figures 2 and 3
Work by Morten Engel, Gustav Szymala and Sigurd Larsen. The models shows the development of a proposal that re-conceptualizes a post-industrial space, a terrain vague as an unprogrammed area, free of design. The area is left open for unpredictable types of appropriation and thus new types of publicity. A space of unused tracks is planted with trees and bushes that work towards the cleansing of the contaminated soil.

Figures 4 and 5
Work by Morten Engel, Gustav Szymala and Sigurd Larsen. Perspectives showing urban development above unused and used railtracks, with the area below left untouched by urban development as such

Device 2: Use-value

In a study of a shantytown in Brazil, I have described a process in which urban dwellers create footpath networks on a ground covered by natural vegetation, through the performance of daily activities such as going to work, doing their laundry, playing, etc. After a number of years the consolidated urban spaces follow the outlines determined by the footpaths and carry meanings (such as the hierarchy of spaces or their degree of privacy) which are linked with the process of formation of the settlement. A central theme in that study is how a process of collective, uncoordinated action by individuals in time leads to the emergence of a form of unplanned urban order. (Ribeiro, 1997)

With the consolidation of the interdisciplinary field of *emergence* attention has been drawn to systems that display that type of bottom-up order, especially in connection with information technology and the Internet. Of special interest here is how the act of using a programme, a site, an application or a system can lead to an increase in their value. The case of *Alexa*, described below by Rheingold is an example of that:

"Bewster Khale and Bruce Gilliat created a Web surfers' collaborative filtering system, Alexa Internet, in 1996. Alexa is an implicit filtering system: when a person using it visits a Web site, the person's Web browser provides a menu of Web sites that have been visited by other surfers who have visited the same page. Alexa requires users to install additional software that records their choices as they navigate through the Web and adds data about their choices to the database. Alexa is an instance of a "cornucopia of the commons," which provisions the resource it consumes; *users contribute to the database in the act of using it.*" (Rheingold, 2002, p.118) emphasis added.

Other, better-know examples are those of Web sites such as "eBay (auctions), Epinions (consumer advice), Amazon (books, CDs, electronics), Slashdot (publishing and conversation) [which are] built around the contributions of millions of customers, [and are] enhanced by reputation systems that police the quality of the content and transactions exchanged through the sites. In each of these businesses, *the consumers are also the producers of what they consume, the value of the market increases as more people use it,* and the aggregate opinions of the users provide the measure of trust necessary for transactions and markets to flourish in cyberspace." (Rheingold, 2002 p.xix) emphasis added.

David Reed, author of Reed's Law (which "shows that the value of the network grows proportionately not to the square of the users, but exponentially," Rheingold, 2002, p.60) has drawn our attention to group-forming networks (GFNs). GFNs (chat rooms, message boards, listservs, buddy lists, auction markets, etc.) are essentially about jointly constructed value through use. (Rheingold, 2002 p. 60)

Device use-value is about a study programme conceived as a collective space with a focus on how the use of the programme's resources or applications can lead to an increase in the value and usability of those very resources (data, methods, etc.). *Use-value* is especially relevant in the elaboration of architectural and urban programmes as collective processes.

The way *use-value* distinguishes itself from conventional group work is in the

absence of a need to coordinate collective action. Instead, students are invited to operate in a field where traces of their activities are recorded, in the same way that people moving on a soil covered by vegetation create a beaten track, which develops into pathways and eventually streets. Traces generated by the work of students on a programme serve as data for the work of subsequent students. The more students work on their projects, the greater the amount of traces, the greater the amount of data they generate for other students.

Device 3: Info-access

Increasingly, positions of authority concerning knowledge are challenged. There may still be a place in the future for teaching approaches where knowledge predominantly flows from the teacher to the student, but current developments in information cultures challenge us to investigate how emerging cognitive practices may open up for new teaching approaches and programmes.

Device info-access looks at patterns of information accessibility and information exchange. A reverse condition of extensive access to information on the Web is related to local (informal economies) or bureaucratic cognitive practices. In that connection the concept of cognitive capital is introduced here.

The concept of cognitive capital refers to the condition of knowledge as a resource, which can be traded and exchanged for money influence or personal favours. This may be the case where an official in the Planning Department of Bangkok Metropolitan Authority sits with outdated floor-area ratio documentation (that is, the addition of the area of all floors in the building divided by the area of the plot) on plots located in central areas of Bangkok. Those documents show ratios before the 1980s building boom, thus before the erection of several skyscrapers. Because those maps are out of date, taxation of the owners of the plots in those areas is a fraction of what it should be, had recent building developments been recorded. The officer in question sits with that knowledge and, by refraining from updating the floor-area ratio documentation, is in a position to trade the information for cash, influence or favours.

One of the consequences of the above-mentioned attitude to cognitive capital in the planning process is that a certain type of information about the physical and economic development of the city (such as the documentation on floor-area ratios) is not made public. The fact that it is not made public prevents any form of planning or public participation which could influence urban development. Levels of decision-making and instances are treated as personal fiefdoms. Instead of a system whereby information is co-ordinated and supports articulated decision-making, planning, room for participation, implementation and administrative continuity; urban development is fragmented, multifaceted and follows a complex, conflicting and not seldom a contradictory network of spheres of influence and power supported by a knowledge which comes with a particular official position. As pointed out earlier, that knowledge is there to be traded for cash, mutual favours or influence, according to the personal agenda of the official in question. This could in itself be called an informal practice. So, informality is "insidious" to official planning practices. Such informal practices in the planning process contribute to Bangkok's complexity and fragmentation.

Cognitive capital is also a useful concept to describe cognitive practices by those involved in the so-called informal economy. Here we are faced with fragmented, localised knowledge, as a central element in the development of informal activities. For local knowledge to be an asset, it is important that it remains local. An example of that is the collaboration between massage parlours and "tuk-tuk" (motorised rickshaws) drivers, where the latter hustle tourists to use the services of the parlour for a fixed fee. In the case where the tourist has the knowledge about the business and its location, the services of the "tuk-tuk" driver are not needed. In a line of business, which relies on local knowledge, at the moment when that knowledge is no longer local the possibility of making an income by selling it is then lost. The survival of that type of business depends on access to particular types of information and on the fact that such information remains local.

In attempts by this author to gather data on recent and current development of Bangkok, in the form of maps, aerial photographs or written documentation, often some form of resistance was met. In a number of cases, the documentation (reports, digital maps, projects outlining future development) presented in the course of meetings was unavailable to detailed perusal or photocopying. It was argued that the documentation in question was not yet made public or was still under elaboration. In other cases, it was pointed out by researchers in Thailand, that access to official documentation is difficult even for them. In other circumstances, interest in particular issues raised the mistrust and suspiciousness by officials: "Why are you interested in that particular issue?"

The most significant knowledge in the above narrative is not the knowledge that was made available to the researcher, but *knowledge that remained undisclosed*. The incongruence between the various accounts by the different actors indicate that such knowledge is there, lurking under the surface – but which knowledge?

The above account introduces cognitive practices which resist control, surveillance and broadcasting – these practices can be characterised in reference to *capital* precisely to the extent that they are able to resist control, surveillance and broadcasting. The exponential growth in access to information is far from a homogeneous development. "All information should be free" but in practice it is commodity.

Device info-access focuses on *differentiated* access to information as a way of describing urban development. In that way, info-access can be a tool for mapping folds in the fabric of information networks, blind spots, grey areas, etc. An account of urban conditions based on accessibility and flow of information and the development of *info-access* as an analytical instrument provide an entry point for a study programme.

Device 4: Simultaneity + Compression

"What if we could put information in places? More precisely, what if we could associate information with place and perceived the information as if it were really there? WorldBoard is a vision of doing just that on a planetary scale and as a natural part of everyday life. For example, imagine being able to enter an airport and see a virtual red carpet leading you right to your gate, look at the ground and see property lines

or underground buried cables, walk along a nature trail and see virtual signs near plants and rocks." (Spohrer, 1996)

"By assigning URLs and wireless Web servers to physical objects, HP [Hewlett-Packard] researchers are looking at what happens to life in a city, a home, and an office when the physical world becomes browsable and clickable.

"Think of all the public places where inexpensive chips could squirt up-to-the-second information of particular interest to you – such as the time your flight leaves and animated directions to your destination in an unfamiliar city – directly to your phone… Point your handheld computer at a restaurant, and find out what the last dozen customers said about the food. Point your device at a billboard, and see clips of the film or music it advertises, and then buy tickets or download a copy on the spot." (Rheingold, 2001, p.95)

The above scenarios can be perceived as ideals of convenience where a visit to a new city or a walk in the park can be turned into a tailor-made interface with useful information for performance and with mechanisms for shortening the distance that separates desire from consumption. Alternatively they can be seen as nightmares of control in which one's moves become errands in a supermarket where everything is electronically tagged and each purchase is fed into a consumer profile database.

But *virtual tagging* can also be seen as an operation inflicted on space which brings about an objectification of its contents – space is treated as a desktop with clickable icons. In *L'oeil et l'esprit* Merleau-Ponty states that "science manipulates things but gives up living in them"[2] (Merleau-Ponty, in G.A. Johnson, 1993) – and the WorldBoard project may be an extreme, and possibly naïf, example of that condition.

A *simultaneity + compression device* proposes the co-existence of multiple modes of interaction between people and spaces, in which clicking at trees or buildings with your mobile phone constitutes one layer. A *simultaneity and compression* device suggests a transformation of space through the application of mediated interaction amongst other modes. The fact that such modes are not necessarily mutually exclusive – that they co-exist - amounts to a condition of simultaneity and compression.

Technologies such as *WorldBoard* construct simultaneity of events and compress information in particular (physical) sites. The emerging, composite urban conditions outline new fields of architectural and urban teaching, research and experimentation.

Device 5: Hypertext Cut-ups

With Tristan Tzara, the randomness in the act of pulling a poem out of a hat is as much an iconoclastic performance as it is a creative method. And the engagement of two artistic fields of expression – performance and poetry – is closer to an emblematic bridge than it is to an active insertion of one creative method into another. Brion Gysin's cut-ups, on the other hand, build on the raw appropriation of the visual mechanisms of collage and their transposition into writing (Gysin, 2001). Randomness is extensively explored through the formulation of new contents. In that way, cut-ups link the visual to the conceptual – the perceived to the intuitive. A simple variation on cut-ups consists in dividing a text page into four different pieces and then recom-

bining them in a new arrangement (Burroughs, 1982), thus generating new meanings and opening up for new conceptual possibilities. William Burrgoughs' investigations during the 1960s in books such as *The soft machine, The ticket that exploded* and *Nova express* abundantly illustrate the possibilities of the cut-up method.

The sheer vastness of information on the Web is an invitation to use it as stuff upon which to perform creative operations, mutations – random or otherwise – towards the generation of new meanings. *Device hypertext cut-ups* acknowledges having its roots in Gysin and Burroughs' cut-ups, but as a method, it can be more than cutting and pasting, it may be linking serially, googling, chatting, blogging, a combination of these, etc. *Device hypertext cut-ups* experiments with information on the Web as an approach towards conceptual and methodological development.

A Google search on the subject of *architecture and information society* brought up a number of sites, from which extracts were selected and pasted into a Word document. The extracts were randomly shuffled. Below are a few of the formulations that came up through that exercise. The propositions arrived at through the above-described method are presented here in an edited version, where discontinuities and repetitions are edited out. The unexpectedness of some formulations comes about through a random combination of text fragments. Upon that, layers of selection, editing and interpretation are superimposed. The statement that the *architectural discipline seeks to close the gap between the basement and the sunroom* (the very first formulation to come up through this exercise) may sound banal at first, but it also demonstrates the potential of this approach to combine disparate categories into assemblages, in this case linking an abstract entity (the architectural discipline) or cognitive practices (one may expect words such as teaching, research or design to follow the expression *to close the gap between*) to concrete architectural spaces (the basement and the sunroom). Here are some of the other propositions the exercise produced:

A study programme that *models design through information*.

Tools that can be used to *formulate design as a comprehensive view on information*.

Design research by using the Web, which delivers *a vital form of cross-cultural communication* and which is *charted in paths from information to architecture,* so as to create *intelligent sites*.

Snapshots of design information science: aggregated architecture of computer games, museums, electronic global village, information systems, wired cities and movies – broad components of global culture.

How could we model design through information? How paths can be created that lead from information to architecture? Etc. Despite being tentative, or maybe because of that, these statements open up avenues for conceptual investigations – in this case starting off with an exploration of the issue of *architecture and information society* – and for the development of new methodological tools which combine operations such as hyperlinking, googling, cutting and pasting, etc.

Device 6: Interconnectivity<>Blur

Steven Johnson describes the development of the contemporary media space into a densely interconnected system which undermines hierarchical organisations. As an

illustration of that development, Johnson writes about the *making* of the Gennifer Flowers story – a story which started with Bill Clinton vehemently denying the affair in response to a question posed by a journalist.

"... the Flowers controversy blossomed because of a shift in the relationship between the national news networks and their local affiliates, a shift that made the entire system significantly more interconnected. Until the late eighties, local news (the six- and eleven-o'clock varieties) relied on the national network for thirty minutes of national news footage, edited according to the august standards of the veterans in New York. Local affiliates could either ignore the national stories or run footage that had been supplied to them, but if the network decided the story wasn't newsworthy, the affiliates couldn't cover it.

"All this changed when CNN entered the picture in the mideighties. Since the new network lacked a pool of affiliates to provide breaking news coverage when local events became national stories, Ted Turner embarked on a strategy of wooing local stations with full access to the CNN news feed. Instead of a tightly edited thirty-minute reel, the affiliates would be able to pick and choose from almost anything that CNN cameras had captured, including stories that the executive producers in Atlanta had decided to ignore. The Flowers episode plugged into this newly rewired system, and the results were startling. Local news affiliates nationwide also had access to footage of Clinton's comment, and many of them chose to jump on the story, even as the network honchos in New York and Washington decided to ignore it." (Johnson, 2001, pp.135, 136)

As Johnson points out the media machine's ability for self-reflection and an increasing number of media agents linked into "a kind of journalistic neural net" is often what makes a story. (Johnson, 2001, p. 136)

One is drawn to look into the phenomenon of growing, intense interconnectivity and the emergence of decentralised assemblages. And one will recall the statements by top US military officials that the circulation of images of torture of Iraqi prisoners was completely out of their hands. Not even that kind of power could suppress the decentralised agents and instances of information exchange.

The Gennifer Flowers story shows how a quantitative change – an increase in the amount of media agents and instances (from news networks to web sites) – can lead to a qualitative leap to what constitutes a story.

Device interconnectivity<>blur maps the extent of networks of media and information down to students – who emerge as information agents. Each student is a participant in cognitive practices of recording, broadcasting, texting, chatting, surfing, blogging, googling, etc. Interconnectivity leads to blurred identities and methods – including the field of architecture and architectural education. The sign <> suggests a fluctuation between the two states.

Notes

1 "The skin is that which is deepest."
2 La science manipule les choses et renonce à les habiter

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The Building Information Model (BIM) Approach

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B.I.M. in architecture

In recent years, there has been a recognizable shift in architectural design towards the B.I.M. approach. Architects are increasingly adopting Virtual Models as tool to develop their design. The BIM model aims to test design solutions. The inherent wealth of this model, that exceeds mere three-dimensional modelling for visualization purposes, contains basic information that will assist architects over design decisions. The designer needs a dynamic model, easy to modify as the data collected demands it. Therefore, the architect's virtual model needs to be integrated in the design process, used right from first drafts. Architects, by definition, start a project on a blank slate. Their design develops without any prior project, unlike other specialities. Hence, their model will be the basis for all subsequent projects. On the other hand, the architects design activity is based on a solutions and test sequence, where each new idea is perfected by way of testing it. Each design option, whether over space, structural, materials or others, is submitted to some behaviour tests, verifying its validity. This validation is done over all the elements and spaces of one project. One can even say that architects have been developing, for hundreds of years, a Building Information Model for each project. The only difference is that this model, this database, has been transferred form the architect's brain to the computers hard disk. With easily recognizable advantages: reliability, speed, storage capacity, information recovery, and above all, independent access from others. Clearly there are not only advantages. Resorting to a virtual model as a design method implicates a change of attitude for the architect. Intrinsic to these model requirements, design methods change. This change, although inevitable, questions old practices and myths associated with the creative act. Where this clash of methods becomes more evident is at the architecture education level.

Architecture education

Architecture practice has always existed intimately associate to drawing. It is through drafting that architecture student learn to see the world, and later to develop their designs. In the analogical world of last the five centuries, drawing was the most efficient way for architects to develop, test and communicate their ideas. The use of perspective in a bi-dimensional simulation of a three-dimensional reality, resorting to schematic floor plans, sections and elevations to depict complex realities, had been the tools invented by the renaissance architect to be able to develop their craft. This work methodology has taken root in the architectonic culture in such a way that drawing and designing tend to get mixed up. This profession's dogma, this undeniable truth, is being questioned by computers. First by digital drawing techniques- C.A.D., later by the ability to model in virtual environments, the very foundations of architecture design have been shaken by these new technologies. This should not be considered news. Other professions are disappearing or mutating, in its adaptation to societies computerization. Why would it be different for architecture?

The most interesting questions that B.I.M. places on our profession of are exactly those: Will the architectural profession, as we know it, be able to adapt itself to the

digital world? Will it evolve beyond recognition? Or will it become extinct, substituted by other more apt?

Obviously that architects, immersed in their professional activity, have no time to lose on fruitless speculation. It rests therefore on some institutions to analyze the evolution, the trends, the respective consequences, in order to plan adequately on the inevitable adaptation the profession will have that to make. One of those institutions, probably the main one, is the University. It is at the academic level that future professionals learn work methodologies. It is also there that we find the capacity for inquiry and experimentation, free of the source of revenue burden. But, if this is so obvious, why do most Portuguese universities continue to teach pencil founded design, seeing the computer as mere digital drafting board? The problem is easy to diagnose, known to all, and comprises practically all college disciplines: Teachers.

Teachers, product of our university system, have two main characteristics that turn them very adverse to change:

- Their professional activity is exclusively academic, thus protected from pressures and changes that affect the architect's profession.
- They are the outcome of a pre-digital education.

Clearly that this generalization is extremely unjust for teachers who practise architecture, and for those that, despite their classic education, recognize the change and are not afraid to face it. But those are unfortunately exceptions.

B.I.M. in architecture education

There is a key idea pertaining to the use of the B.I.M. in architecture education: It is a transversal discipline. Firstly because three-dimensional modelling implies a good space understanding. One can not take refuge in floor plans, because everything one designs exists in virtual space. Also because it is necessary to have a good notion of materials and construction techniques. One can not just draw two parallel lines, but build a wall with real wall like proprieties. Height, width, material, construction techniques, colours and finishing, relationships with other walls and paving, doors and windows, are all part of that single wall models.

Furthermore because the model does not lie. One can not leave those more complicated situations out, hoping they will pass unobserved. Any uncertainty or error is easily detected. Still because this model allows a variety of external evaluations, like acoustic, thermal, luminance, budgetary estimate and others. Finally because the model integrates in itself the structure and all the networks. It tests its relation with the other specialties that compose a building, motivating the architect to communicate with them. This transversality encourages the integration of BIM teaching into the design methods, and not just teaching it as a complementary discipline.

This integration is crucial for the training of future architects. This is not about appending 3d modelling to the classic design methodology, but to integrate these models, from scratch, into the very design method. Only thus will it make sense. What good is there in having rigorous cost measurements of a building in the final

phase of project, if by then few alterations can be made without compromising the solution?

This cost estimation has to be present in all the stages of project, enabling thus grounded decisions, allowing one to modify solutions in time. This assessment, in real time, necessarily demands a database associated to the model, and also implies that this model has to be developed simultaneously with the project, thus making the model the project itself. This integration presents resistances and difficulties that have to be taken into account.

This is a short list of pros and cons on using the virtual model in architectural education:

Pros:

- Compels students to think tri-dimensionally. The model does not allow designers to take refuge in floor plans or elevations.
- Compels students to take materials and construction techniques into account. Being a reality simulation, it is not possible to create abstract surfaces, without physical sustentation.
- Compels students to solve all problems. Because of the intrinsic honesty of the model, it is not possible for students to hide from problems of difficult resolution. For instance, it is not possible to fuddle sections, because they are automatically generated by the model.
- Compels the student to co-ordinate all elements. The pupil needs to have a clear notion over the way elements of a building are relate.
- Focuses student's effort on the problem solving. Technical drawings, quantity takeoffs and renderings are automatic, allowing them to use the time usually intended for drawing in search of design solutions.
- Allows for more efficient communication. The model is an excellent vehicle of information, which permits teachers to verify the solutions from many angles.
- Allows students to visualize the final result. Considering that academic work rarely gets build, this represents a clear advantage over the traditional method.

Cons:

- It requires managing a complex tool, with a steep learning curve.
- As long as students are not proficient with the software, it adds increased difficulty to the design process.
- There is an added danger that students opt for inferior design solutions, being easier to model.
- It requires an increasing characterization of materials and construction techniques, sometimes out of timing with the project.
- It requires an advanced knowledge of the contents of various projects and construction planning, many times absent of the normal architectural course curriculum.
- It compels teachers of other chairs to understand about B.I.M., in order to make the most of this methodology.

Our teaching experience

The architecture course of the Portuguese Catholic University has been integrating the BIM methodology for the last tree years into the school curriculum. We created three modules that approach in a degree of increasing complexity the manipulation of three-dimensional database models. From the 3rd course year onwards, using this digital database model becomes part of the programs of other modules, including design studio, along with other classic methodologies, like drafting, physical scale models and technical drawings. The adoption of this methodology uncovers some curricular problems of difficult resolution.

At the earlier phase of learning, students have reduced knowledge on subjects like techniques and construction materials, construction documentation and management, interdisciplinary collaboration and other concepts that are part of the profession. This ignorance makes it difficult to understand and apply B.I.M. methodology in a project. On the other hand, there is a natural resistance on the part of some teachers over B.I.M., which has been attenuated substantially with results demonstration.

B.I.M. by steps

To address these difficulties, we developed a B.I.M education concept based on steps. There are 4 steps built to simplify the B.I.M. learning process, distributed throughout 3 years, in the following order:

1- Modelling

In a first phase, emphasis is given to the simple modelling of a virtual building. The digital model emulates the physical scale model, much used in the classical architectural education and profession.

2- Automatic drawings

As students become proficient in modelling, they learn to produce floor plans, sections and elevations automatically.

3- Database management

At this stage, students learn to extract from the model all the necessary information for the construction documentation, beyond the drawings mentioned above, like details, maps and quantity takeoffs.

4- Presentation

Questions related to the production of computer generated images, animations, virtual reality files, Internet and other medias are taught only at the end of the course, giving emphasis to the idea that the building modelling main goal is not to produce pretty pictures, but to manage a complex database.

This learning by steps allows students to a gradual acquisition of competencies, preventing potential dismay face to apparently unrealizable tasks.

A concrete exercise

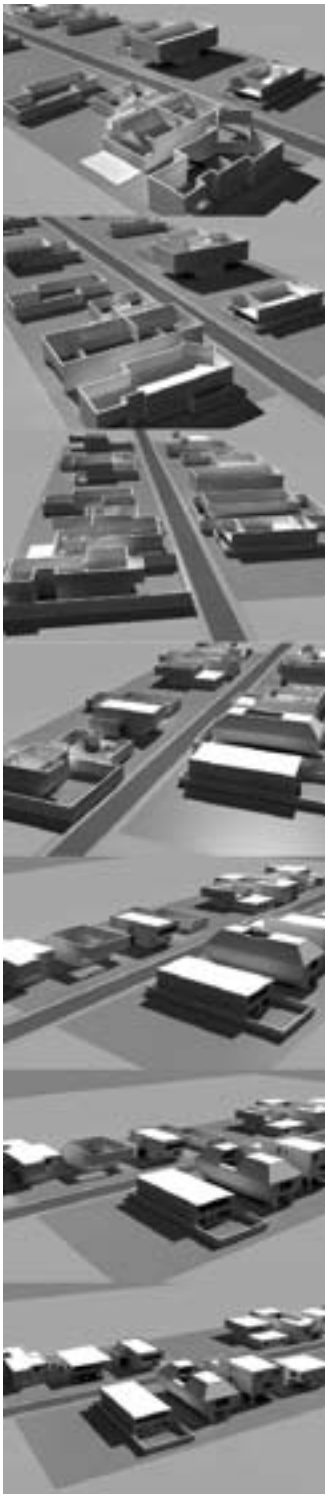
This exercise was carried through at the 3rd year level. The students received a theoretical program that consisted of a fictitious schematic allotment, where each student would assemble his/her habitation. The only design constrains where the implantation polygon and the maximum height of the buildings.

The semester was divided in two parts, being the first half dedicated to the conception phase and the second pertaining documentation production. As a design methodology, pupils where discouraged (but not forbidden) to use any analogical support. The purpose was that ideas would be developed exclusively in a virtual environment, and that the design options would be registered by the evolution of shapes and solutions. The determinative factor of this exercise was that each project, although individually developed, resided on a common database. Trough ArchiCAD, a file was created with all the necessary templates, layers, stories heights, pens, materials, etc. Each student had his own allotment and layer combination. As all the Architecture Computer Laboratory computers are connected through a net, each student worked in a local copy, making frequent uploads of his/her design to the central file, downloading the colleagues work left there. Thus it became possible to have all students working simultaneously on a common data base.

As predicted, it was possible to verify that individual design influenced each other, as the work got along. It was thus possible to create unique operational conditions - 14 students working on one same virtual space, influencing themselves mutually in real time - only feasible trough the employment of information technologies.

This exercise, besides simulating and stimulating collaborative work between architects, intended to demonstrate that the concept of digital databases applied to architectural design necessarily means a redefinition in the methodologies.

In the second half of the semester each pupil developed his project independently, into the documentation phase, with automatic generation of drawings from the model – floor plans, sections, elevations, details, perspectives and quantity takeoffs.



The future

Despite B.I.M. applied to architectural design having more than two decades, it has been only in recent years that the current technology made it possible to the common architects to use it in their practice. Thus, we are still in an experimental period, expecting significant evolutions in the short-term. The introduction of this thematic in the university architecture courses is also very recent, on a world-wide level. There is no true body of knowledge available to guide us. Therefore, the adoption of a B.I.M associated design methodology within our course curriculum has been rigorously accompaniment, with the goal of evaluating the results and to bring about the necessary corrections. Thus far, we can report that the implementation of a BIM methodology has had good results. Not only has there been no damage from the apparently precocious introduction of construction techniques, materials, construction management, interoperability and other essential subjects from the B.I.M. perspective, as there are some signs that they have benefited the students learning process.

If there is an area that needs to be improved, it could eventually be a greater teachers sensitization for the effective reach of this technology to the future of architecture as a profession. Architecture education in Portugal lacks in linking with other disciplines involved in the construction business, like engineering, landscaping, interior design, manufacturers and others.

The B.I.M. offers at this moment an excellent common platform for these areas, essential for the architecture student's education, ideally through a linking with students of other courses. With the experience acquired during these three years, and faced with the professional and academic reality in Portugal, it was decided to develop a Master in Digital Design. This Master intends to be a complement to the architect's classical academic education.

We expect that these professionals, with training in design, to profit better from the B.I.M methodology, integrating it into their professional practice. Besides B.I.M., this Master will comprise Computation in Architectural Design, including programming, computer aided production, rapid prototyping, and tree-dimensional digitalization, and Communication and Multimedia, dedicated to computer generated images, films, web pages and virtual reality files.

There is a clear awareness that the future of the architects activity, and architecture itself depends on a correct adoption of these new technologies in the design flow, and that the University has a crucial paper in the definition of these methodologies.

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Technology and the Interdisciplinary Approach to Architectural Studio Coursework

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Introduction

The paper examines interdisciplinary design in proposed architectural coursework at the University of Cyprus. It is presented in a scalar exposition of various efforts from the regional scale to the urban and community development scale and finally to the scale of building construction design. Scale is not only thought of as the relative unit measurement of the intervention, but suggests rather the interaction between its parts, its proportion and an appropriate level of interdisciplinary involvement in proposing schemes that are sensitive to multi-faceted concerns in developing a building site. Furthermore, the aim of the authors is to consider the formations as part of proposed studio coursework of integrated design consulting teams – with the contribution of external collaborators and research scientists – to guide students through technical and scalar questions they need to address as part of comprehensive studio project evolution and development.

At the Regional and City Scale . . .

Today students of architecture are obligated to produce CAD drawings for certain of their projects. They use CAD and 3D modelling software as well as a multiplicity of other programs. Three-dimensional sketching using the computer is by now both meaningful and desirable for Architects and Town Planners alike. The universities are progressively accepting the use of software, which make possible and/or facilitate easy and direct designing in 3D space. Therefore the logical next step for the use of computer drafting in architectural and urban design would be sketching directly in three-dimensional environment, i.e. the use of virtual reality (VR) systems.

The "Nicosia Project" – An introduction

The "Nicosia Project" is a virtual model of the walled part of the city of Nicosia (Figure 1). It is a dynamically developing network of hyper linked databases on the architecture, the culture and the history of the city. It is an information system based on Internet technology, which uses the World Wide Web as a communication platform because of its open standards, commonly available software and easy use. Vast quantities of information lie fallow because they are not accessible, not connected with each other and not usable because of incompatibilities and proprietary formats. The same work is sometimes done over and over again because of lack of communication and coordination. The concept is an information warehouse, a network of databases that holds data in various formats and points to external sources where data can be accessed directly.

Description of the "Nicosia project"

A significant element of the project is the creation of knowledge concerning the development of new methods in the production, management and promotion of multiple and multiform databases (Figure 2). These databases could include text, multimedia data, (various graphic formats, animation, video data and sounds), 3D models, VR models, QTVR, CAD and GIS data, etc. All relevant information will be collected and processed

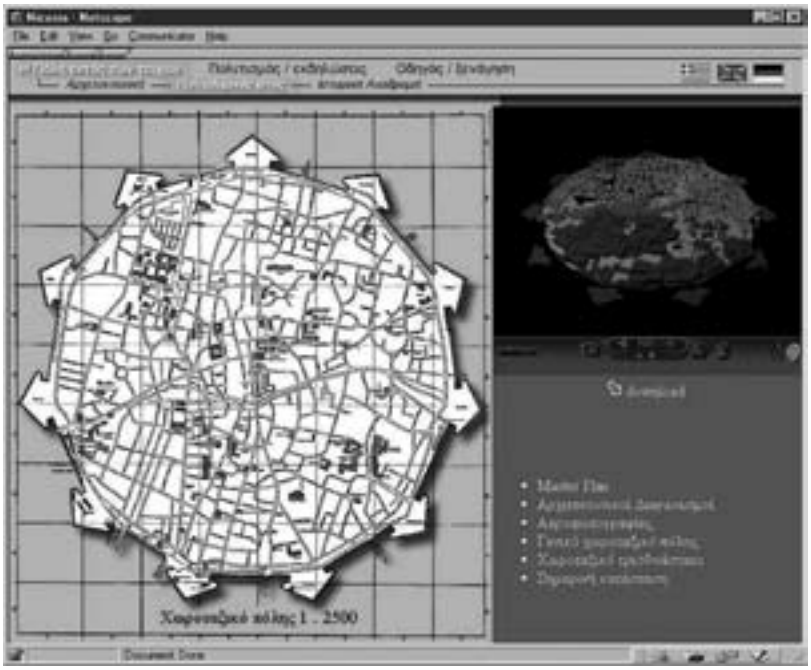

Figure 1
The Nicosia Project

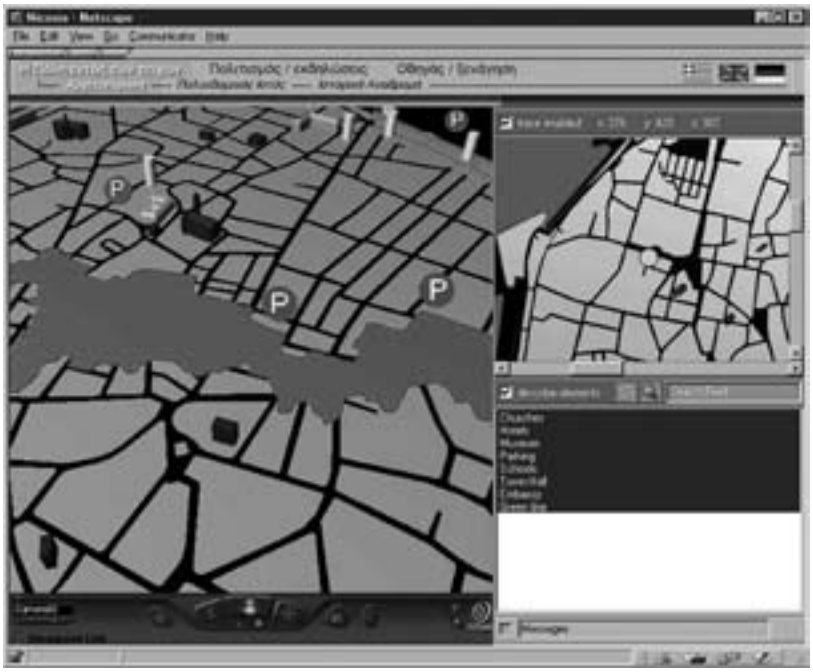

Figure 2
The Nicosia Project Web Interface

in standard formats. These will be stored in a network of hyper linked databases, which will form the structure of the system. An important characteristic of this structure is the possibility offered to the user for easy navigation and simultaneous access \ retrieval to multiple levels and formats of data. This could be achieved without previous experience or specialized knowledge on the part of the user.

Thematic Structure of the Project

For easy navigation the System is divided in three main thematic sections. Each one of these sections is divided in further categories, which in their turn are subdivided into chapters. The user could choose one of the main thematic sections of the system i.e. *The Walled City of Nicosia* and proceed to more specific choices i.e. Architecture. A scroll text appears on the screen simultaneously with a 2D and a 3D map of the city. The user could select from the scroll text one or more categories of architectural works (i.e. museums, mosques, churches, etc). Simultaneously the chosen data appears on the 2D and 3D map of the city. The user is able to navigate through the 3D Model of the City and select specific subjects (i.e. *Hadjigeorgakis House, Omeriye Mosque,* etc) which will be linked to further pages of detailed information – text, photos, maps, 3D models, VRML with levels of detail, QTVR scenes, etc. (Figure 3). Thus, the thematic structure of the System and the Navigator Tools enables the user to make easy and precise retrieval of information.

Figure 3
The Nicosia Project Thematic Structure

. . . at the Urban and Community Scale . . .

For the architecture student involved in studio coursework at the scale of urban and community planning and development there needs to be a comprehensive understanding of the cultural and socioeconomic factors embedded in the site under analysis. Examining the financial, administrative, political and participatory dimensions of designing at this scale should aim at developing an informational database that brings together qualitative and quantitative analysis and visual information. Furthermore, incorporating environmental issues in the design process also requires an interdisciplinary and inclusive dialogue. To achieve this cohesion, widely used existing technologies have been adopted and can be adapted for use in fostering increased understanding of the complexities involved in informed design and in enhanced interdisciplinary participation. Interdisciplinary student teams can use these available technologies to create simple but efficient online frameworks so that they may collaborate with their colleagues and with their consultants and clients. For example, through following discussion threads in online forums and free website hosting services, both students and their target communities can collect information utilizing readily available online survey tools to solicit opinions and ideas. Through the utilization of online proofing tools they may also be able to get direct feedback and markups on their proposed designs and to remain pertinent and informed in the advancement and evolution of their design proposals. Moreover, they can access socioeconomic and cultural data from governmental, as well as professional and non-profit organizations and they can overlay and apply qualitative, quantitative and visual data in relation to maps, to form a simple but dynamic and readily accessible source of layered information.

MetroPortals and the BAC experience

A methodology for interdisciplinary studio coursework and pilot research projects, at the Boston Architectural College and Center for Design Informatics respectively and it could be used as a precedent for the formulation of proposed coursework at the University of Cyprus. More specifically, the use of readily available open source software could enhance the pedagogical combination of including various pertinent disciplines in finding more informative ways of planning for the development, preservation and enhancement of the built environment. This could occur through the use of a common online platform that caters to the interdisciplinary requirements mentioned above. An example of such a platform was used for the setup of the online collaboration interface MetroPortals conceived at the Center for Design Informatics (CDI) (Figure 4). This combined a number of online tools, many of them freeware, to facilitate the stakeholders involved in a pilot project to analyze, understand and influence the variety of forces – social, economic, cultural, legal, political, ecological and aesthetic, as well as to better inform the students in the evolution and development of their proposed design solutions.

This online interdisciplinary platform was utilized as a pedagogical tool by allowing the studio instructors to map out the project review and development process, which was a great learning experience for the students involved in the workshop and an invaluable lesson in the facilitation of urban and community development.

Figure 4
Online Review and Commentary Tools

The process was transparent at all times and the utilization of freeware technology allowed all the participants to familiarize themselves with the various online tools and to encourage community groups to organize similar interactive platforms without the use of costly software. Many of these readily available and free technologies are available to all and if they are strategically synthesized they can provide specific information that helps keep the project review process relevant and pertinent.

. . . at the Building and Tectonic Scale

At building scale, the interdisciplinary character of the design process requires balanced knowledge from the areas of design per se, theory and construction, as well as relevant horizontal relations, the collection of information and the coordination of qualified expert contributions. The basis for such an understanding applies to the profession. At university level, as concurrently already practiced, the courses of architectural design are based didactically on a combination of lectures and supervisions of the students work.

In this context, it may be well stated that building design is construction and construction is always design. Necessary component for the successful design is the persuasion and iterative resisting realisation of an architectural aim, a design vision that binds every element of the design of different scales together. In this way, *construction design* substitutes the merely more empirical act of "architectural design", for the creation of the built environment through an integration process.

The integrated approach to design results from the integrative architectural development of the building's form and functions, construction elements and energy efficiency. In this context the structural building design plays a most fundamental role and influences the subsequent interactive development in detail of all elements

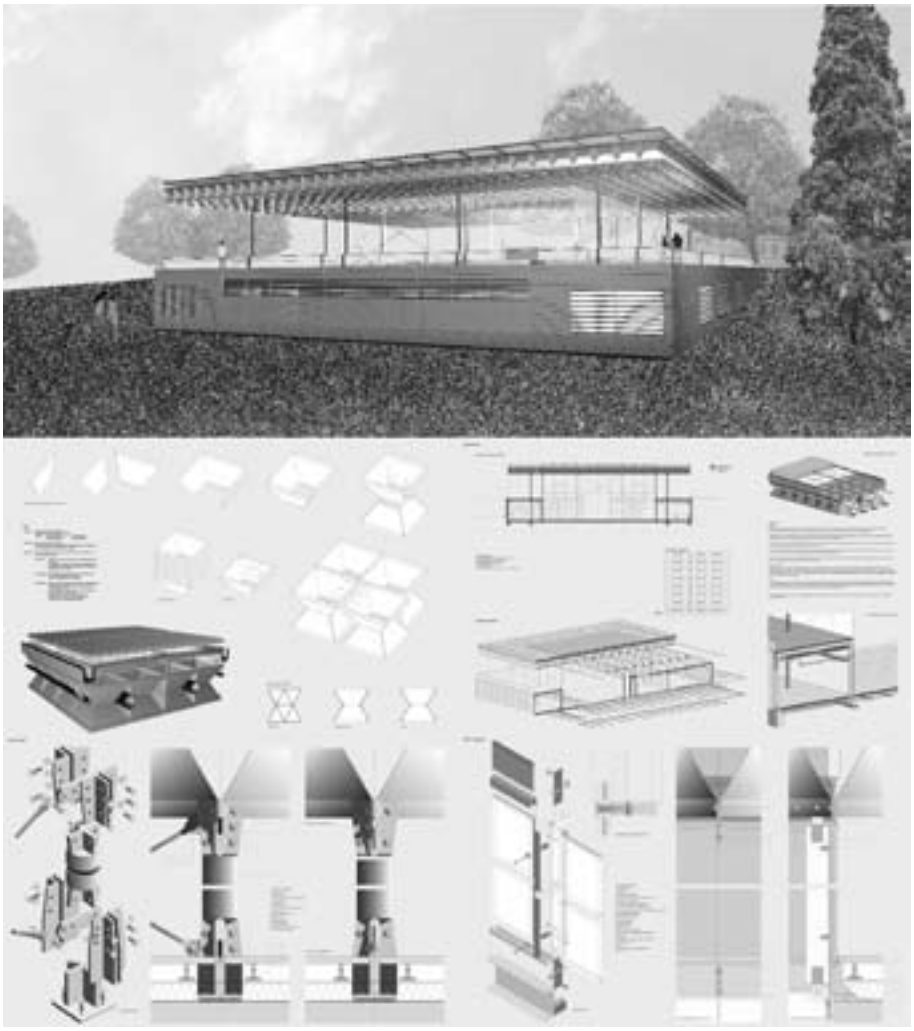

Figure 5
Design Project "Information Centre for Bionics, Rosensteinpark, Stuttgart", University of Stuttgart 2003.

that result from the three main areas of design, i.e. the structure, the construction and the technical systems. In search for honesty in architectural expression, the structure obtains a specific form, a specific morphology. It is clearly defined in its implemented sub elements, regarding their optimal and readable functions, construction and connections.

The integrated design approach

Architectural design projects with emphasis on the interdisciplinary nature of architectural technology, supervised at the Faculty of Architecture and Town Planning of the University of Stuttgart and currently at the Department of Civil and Environmental

Engineering of the University of Cyprus are developed based on the integrated design approach. In a design project in Germany the students in groups of five apply the fundamental knowledge obtained in the first semesters from different areas of study and give emphasis on structural, construction and environmental design aspects (Figure 5). The supervision of the designs is usually performed by three educators, an architect, a structural engineer and a mechanical engineer.

All areas are interrelated horizontally with each other through construction design. While aspects of standardization, prefabrication, easy erection and clarity of connections may have a significant influence on systems development, the composition of the elements often gains meaning, when observed in the broad architectural context. In most cases, substantial time and considerations are devoted to the technological design aspects, from the structural to the construction design and feasibility, to the energy concepts. In the long run these aspects govern not only the development of the designs, as this is often orientated towards design vision, but they also lead to building forms with relevant strong self-identification characteristics. These may yet refer in absolute terms to spatial design by experimentation with new structural systems and their construction design.

The experience gained up to now at the University of Cyprus on integrated design is based on a course in Building Technology. The final designs have characteristics, derived from the developed and typologically adjusted structures within a "technical architectural context" (Figure 6).

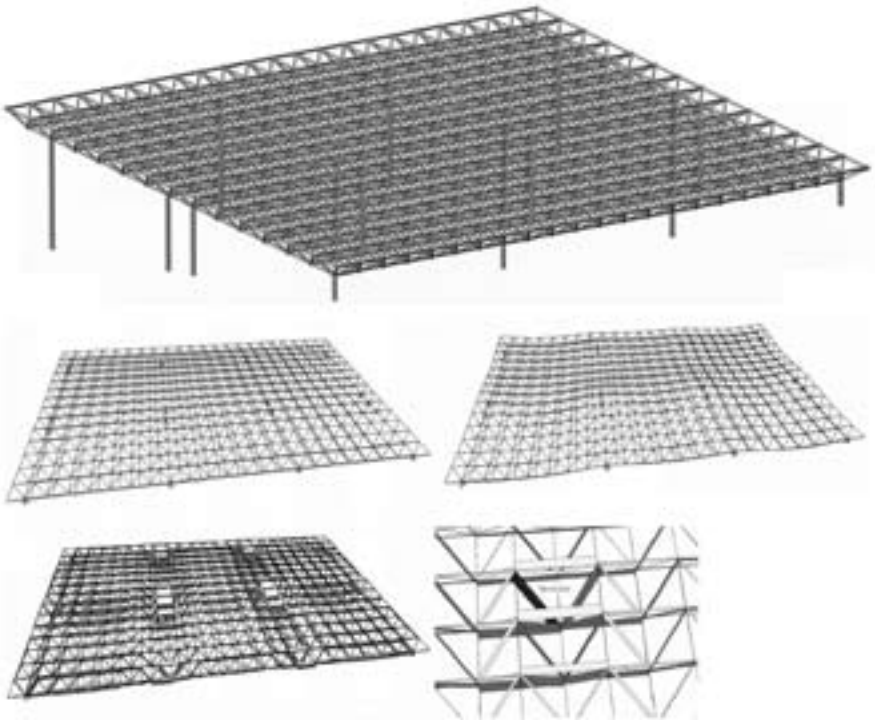

Figure 6
Design Project "Laboratory of Structural Engineering – University of Cyprus 2006

In the context of practicing the integrated design approach method, computer aided design plays a fundamental role in enhancing the methodology applied. It supports the context of design from the stage of formulation of an abstract metaphor up to the making of Architecture through the investigation of design alternatives in different scales of development and the provision of an integrated information technology environment in architectural engineering, planning and manufacturing.

Conclusion

Applying an interdisciplinary thinking approach to studio culture at all the scales discussed above seeks to enhance the final product through participatory learning and research. Consequently, studio coursework may need to draw on the expertise of faculty and design professionals and consultants affiliated to fields beyond that of architectural design, such as engineering and the social sciences and the humanities so as to integrate theory and practice in a comprehensive approach to design through the various scales. Concurrent experiential and academic exposure presents a holistic view of the synthesis of parts and disciplines involved in architectural design. Whether partnering with specialized consultants from a variety of fields or collaborating with fellow students from other departmental disciplines, the aim of the interdisciplinary studio team concept is to create a responsible and creative learning environment.

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Urban Strategies and Digital Design Tools in Contemporary Architectural Education: A Comparative Study

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In the past, whenever architecture faced urban issues by following options that forejudged the future of the city, reality contradicted the outcome by escaping from the order that a plan had imposed. As the discipline of architecture was challenged new, anti-utopian strategies emerged, attempting to approach the city within a new scope. The new methods of inquiry and the proposals that were brought forth by these strategies were not limited to heterotopias and interdisciplinarity. Instead, they have the promise of a catalytic architecture that would respond to interactivity and thus be able to provide unanticipated events.

During the last decade of the 20th century, architectural design adopted computers -Computer Aided Design in particular- and architects got themselves involved with processes that produced non-conventional forms. Having a scientific or pseudo-scientific backing that usually acted as a shield for experimenting with software results, architects hoped that topology would yield something more essential than one more style with rounded corners, organic shapes, complexity and use of metals. In many cases today, those projects are integrated into conventionally designed master-plans and end up being adapted to local networks without having any other preoccupation regarding the context (aesthetics, use, history and social function to be answered by the building) as long as the computer, is used to make the complex, formal design possible.

Criticism of course expressed in many cases its oppositions to the products delivered by this new generation of architects, either within academic courses, exhibitions or even architectural competitions, building that way optimism and confidence for the architectural discipline which saw the chance to upgrade its discriminating function. This same criticism has every right to wonder whether architecture has been carried away by a new Oedipality and to the return of the utopia that prevents any discussion to take place regarding the re-definition of the architects' role both in construction and in urban interventions in the IT era, a role that could define the terms of their education.

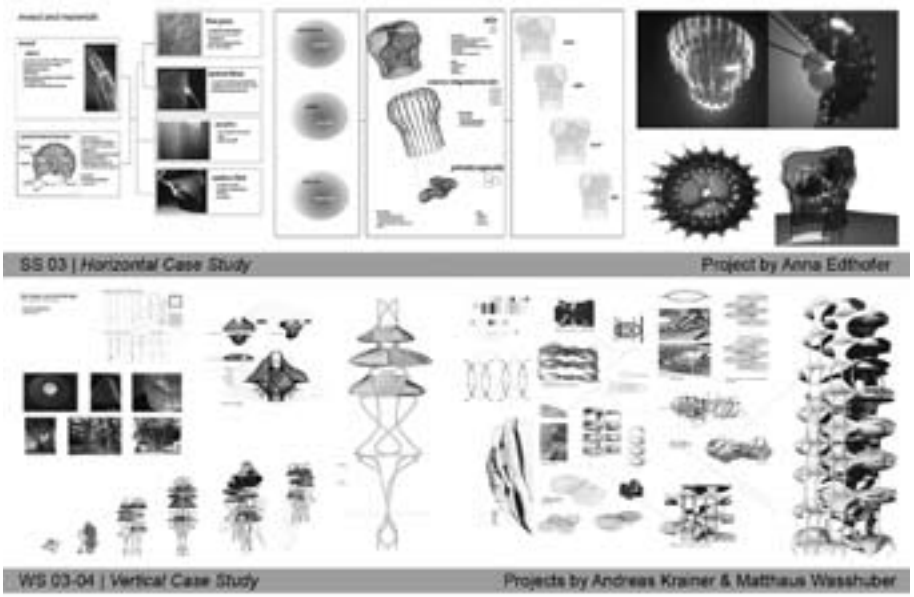
In March 2005, Brett Steele -Director and Head of School at the Architectural Association in London- wrote an article where he juxtaposes 'Cities' and 'Computers' hoping that someday there could be a convergence of these two design fields that are represented by focus groups of adherents, supporters and critics: "To give this division a name, we can call it a split between 'topography' vs. 'topology': between those architects and designers who in order to find lessons that will guide how they then operate as designers, move initially outwards in their search to understand the conditions shaping theirs tasks as architects; i.e. towards the topography of contemporary urbanism (or the city, including its many contemporary 'imposters') vs. those architects or designers whose research efforts are turned inwards, towards the operative tools and concepts (such as topology) of new digital design systems or processes (including their growing array of networking technologies and automated production systems)."[1] In June 2006, Steele was interviewed for the project *Urban Strategies and the Resistances of Euclidean Space* where among other things he describes the present time as the era of information territories: "*Undoubtedly, the arrival of computational systems has changed the nature of cities in the way we*

understand them. It isn't computers so much as the fact that cities like London today have become vast information territories which record our movements, capture our pictures, display information and so on. They do things that they just didn't use to do as much. I think that's just a reality. Whether that changes our understanding of the city or not, I am not sure, but what definitely changes is the reality of what cities are."

The research project "Urban Strategies and the Resistances of Euclidean Space" took place at the Aristotle University of Thessaloniki within the framework of the Pythagoras II program of the Greek Ministry of Education that was funded by the European Union with the objective to support academic research groups. The project involved the mapping of the 2005-2006 agendas of selected design courses in Schools of Architecture and Urban Design, located mainly in Europe and the US. The main focus was placed upon studios that touched upon the issue of using computational media in urban interventions. The project's intention was to research those stages of the design process within the selected design courses for which seldom if ever one can find published material.

The first deliverable of the project was a catalogue of the selected design courses, compiling processed information (on course description, instructors and so on) that was initially found published in the academic programs of the respective Schools. As a next step, the project scheduled and carried out interviews with Professors of Architecture mainly from European Schools who accepted the invitation. In reference to the catalogue, for every design course presented in it, the following categories appear regarding the analysis of the course's description: *understanding of the urban space, design theory, design process, design tools and techniques*. The catalogue is open and as such it facilitates communication with the courses' instructors, opening up the way towards monitoring the advancements in special research topics.

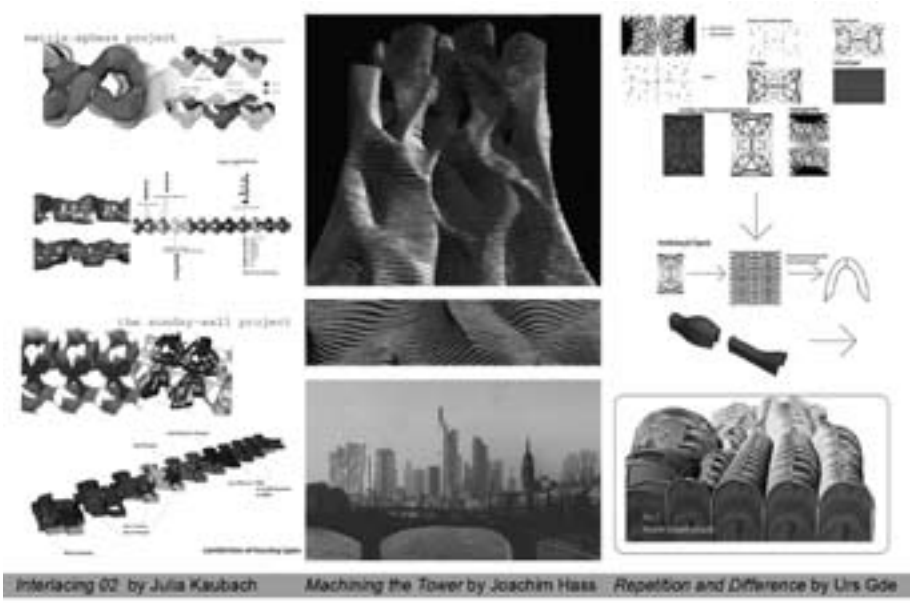
The majority of the instructors responsible for the design courses that participate in the catalogue seem to agree, without this being perceived as a kind of polemic statement, that architecture is no longer referred to a *static aesthetic object*. Many of the recorded design courses employ digital design tools –which are presently part of the standard equipment in most universities and architectural offices as well- in order to process objects, investing that way in the autonomy of architecture. Greg Lynn, who currently runs courses at UCLA, Yale and the University of Applied Arts in Vienna, in his interview to the project made the following statement when asked about his studios: "*I won't give students the context and say figure out what to do…I always say, let's figure what we are going to do and then approach the context with sensitivity.*" *On the use of computational media in the studio, Lynn commented:* "*The digital tool's ability to design with surfaces that have volume within them is one of the ways we use the tool. So we would teach students how to do modeling. Anyway, that was the architectural starting point and then we would go to the context.*"



img 1
Example of student work from Greg Lynn's studios at the University of Applied Arts in Vienna.

Lars Spuybroek, who is a Professor at the University of Kassel, ascribes the insufficiency of urban design to the fact that the recent French-American thought placed its main focus upon the object itself. Moreover, he identifies two directions that planning could take: "*One is nano-urbanism or micro-urbanism and the other is branding…an approach that you develop a strategy that will allow it to be read in multiple ways.*" One very interesting part in Spuybroek's interview was his dream for urbanism and the way he envisions digital media to make this dream come true: "*We always think about strategy and chaos or it is all necessity and order. It is clear that we have to find an in-between solution. This is where computers come into the game. They can process huge amounts of information and still produce coherent systems. My dream is not a mini-urbanism, but actually a mini-urbanism that is part of a much larger urbanism. You would almost have an invisible master-plan that would really work with bottom-up rules. But it would really adapt and grow and change while it's being done…This is my dream for urbanism.*"

After Greg Lynn and Lars Spuybroek, Ben van Berkel was the third one from the generation of architects who invested in diagrammatic architecture (each one of them from his own point of view). In his interview, Van Berkel grows worried about the effect created by the computer architects: "My problem is that computer design became Beaux-Art in the sense that it is becoming too much the same of the same… To be very critical, I like to almost call it spaghetti architecture. It is too much the same. And I try to get a little bit away from it." He also talks about how he tries to teach his students a kind of anti-design: "*It is a contradictory kind of name, the 'design model,' because people think at the beginning that it is about design… It is a kind of new thinking around design… This is a more complex model design, but it is also giving a new kind of control.*" In most of his lectures, as well as in his interview



img 2
Example of student work from Lars Spuybroek's studios at the University of Kassel.

to the project, Van Berkel, who is currently teaching at the Frankfurt Städelschule, refers to the *Mother Model*, a technique that combines more than one programs in one 3d model. Unfortunately, there is no known publication up to now referring to this technique and Van Berkel's mentioning to it was sparing. So, it is difficult to connect this idea with Antonino Saggio's[2] concept of the model, which allows the architect "to start to master, even in the field of planning, a 'Philosophy of the simulation': that is, to make use of the project not only to represent, decide and describe, but as a structure that, from time to time, 'simulates' the behaviour of the building system..." It was pretty vivid during the 2005 ENHSA meeting, that this same point of view fuelled the Design-Construction Continuum [DCC] and the role of the architect as a *master-builder*.[3]

It is important to highlight the fact that the issue of the object-ground division is touched upon by the generation of *digital topographies* that include in their modeling 'data' that would normally be separately diagrammed -the flows of traffic, changes in climate, orientation, existing settlement, demographic trends, and the like. 'Formerly these would be considered by the designer as 'influences' to be taken into account while preparing a 'solution' to the varied problems they posed. Now, however, they can be mapped synthetically as direct topographical information, weighted according to their hierarchical importance, literally transforming the shape of the ground. The resulting 'map,' however hybrid in conception, is now less an icon to be read as standing in for a real territory than a plan for the reconstitution of its topographical form."[4] Many of the design courses in the catalogue, on the one hand, insist upon the relationship between object-environment, redefining that way the object of architecture and extending the discussion beyond the restrictions of viewing the city as

a unified entity. On the other hand, many courses study the city through stratagems that re-establish continua. At this point, one can very well refer to Manuel Gausa's[5] stratagems which constitute a "new *naturartificial* repertoire relating more to *irregular* configurations of differential orders than to the old regular, compact and well ordered volumetrics: 'dynamic evolutions rather than static positions,' 'impure developments rather than basic configurations,' 'open reasoning rather than closed models,' 'processes rather than accidents,' 'topologies rather than typologies,' 'landscapes rather than edifices.'"

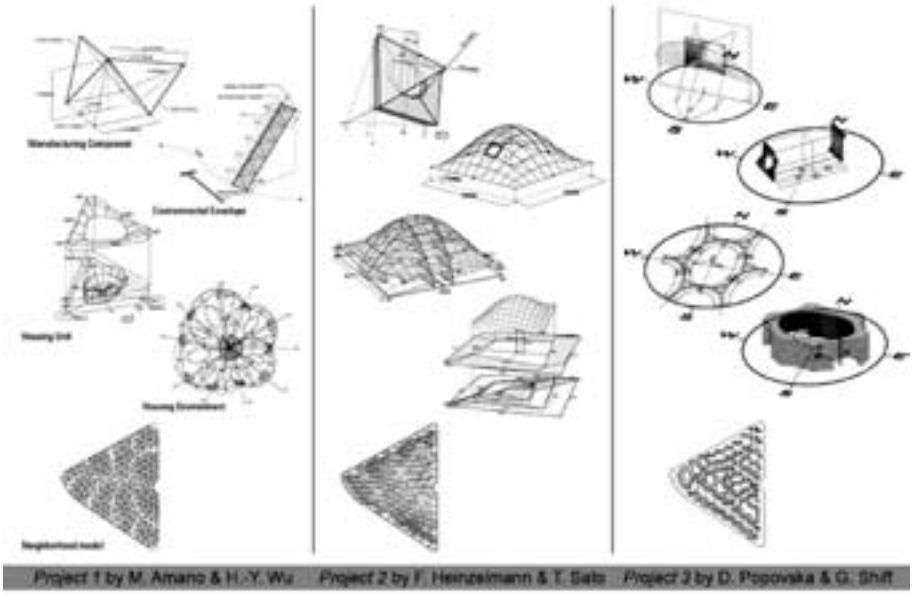
It is interesting how some Schools make a reference back to the ecosystem by forming a hybrid research field called *Landscape Urbanism*, like in the cases of AA[6] and Penn Design School[7] that present very notable performances. In the meantime, the field of *Planning* appears to be hesitant, while conversations over the city spark intense dialogues, like for example in the case of disputation between Edward Soja and Mark Wigley during the *TransUrbanism*[8] symposium organized by V2. In the case of some other American universities, Robert Somel[9] at the School of Architecture in Princeton University questions the idea of the plan as an 'operational device,' while Ed Keller from Columbia University[10] is looking into the recent natural disasters in search of the very issue of his studio. In Europe, Saggio's studio in La Sapienza brings forth the concept of 'crisis' as a 'historical process of transformation': 'from the Industrial Paradigm to an Informational one.' In the course description, Saggio states that: "The case studies and projects can be at a very large territorial scale or at minimum scale of object design. The issue to establish in the project is how Information Technology is crucial in addressing and solving the issue."[11]

There are two interesting examples of European design studios that present a great case against the apportionment of the city, which emerged from approaches that divide the urban landscape in a variety of scales. The first studio is located at the Berlage Institute and its agenda is to promote the 'architecture of performance.' The second one is located at the School of Architecture at TU Delft with an agenda that promotes the 'place generating effect.'

Looking into Berlage's design courses, one will find a design course where Peter Trummer is promoting a technique named: *Associative Design*. In fact, the studio is about a 'parametric design technique' where parameters are used "to create an infinite number of variations. It is based on associative geometry that describes the relationships between various assemblies and constitutes a design object as a mutually linked geometrical construction."[12] Trummer initially collaborated with Bernard Cache[13] who is known for his explorations on parametric techniques in object construction. Berlage's program 'applies associative design to all scales of the design process, from manufacturing components to the scale of urban neighborhoods.' As a response to the typology that promotes non-temporal forms, Trummer claims that he promotes instead the idea of multiplicities, that is the architecture 'of the many': "In my view the challenge for architecture is to develop architectural products that are formulated through the interrelationship of the two main properties which drive variations in architecture, throughout history and today. These properties may be termed 'extensive' and 'intensive'... Such an approach has nothing to do with the design of pre-given forms like typologies. It is concerned, rather, with the expression of material or materialized organization through form."[14]

In his interview to our research project, Trummer further explains: "*Yhe good thing about associativity is that the software, in its core element, is built upon components. So, for example, I begin with a small component. I add it to a bigger one, and then I add those two together with another component in order to build up a chain of associativities between various elements. This chain of associativities allowed me to realize that it is not only about variations of one object, but it is one object contained in another, and then in another and the whole allows us to build up a structure. Like a cell. On each scale you start to discover new ideas. This is the reason I became more interested in using associative design tools -like TopSolid- because they allow me to think through various scales about architectural process… So I found it more interesting to put them as alternatives to master-planning and look into something like housing, where all those scales come together, and moreover where there is a very interesting architectural history in terms of neighborhood making.*" *Trummer applied the aforementioned technique to student projects that dealt with a neighborhood in the outskirts of Madrid. He used as a basis an active strategy that aimed for 'a new living environment with very particular performances.' It should be noted here that Trummer's studio did not place any focus upon social parameters: 'I design a conventional process…but I use computational techniques to force people to produce effects they might not know about.'*

According to the TU Delft philosophy, on the other hand, it is true that the urban landscape has moved away from conventional divisions like *center/periphery, accessibility/mobility, neighborhood/community and culture/society*, so it has to return back to those issues in order to regain an understanding of the possibilities for

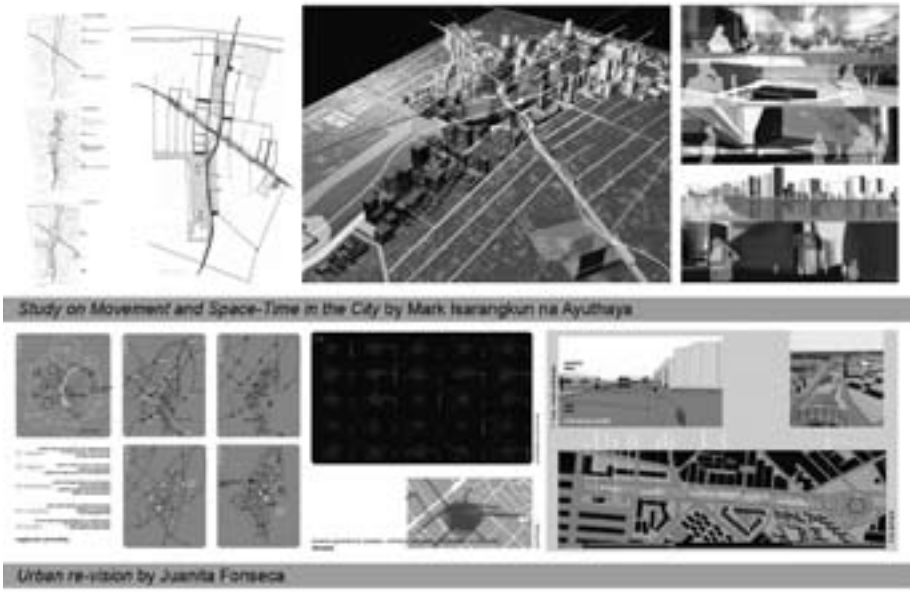


img 4
Example of student work exploring Peter Trummer's Associative design technique at the Berlage Institute.

intervention. Jürgen Rosemann, Professor at TU Delft who embraces the anti-utopian strategies,[15] explained in his interview to our project: "*…we are discussing the idea of space not only as a physical environment but also related to social activities. Sociality and space… a lot of people share this approach that space is not only produced by society, but space is also producing society, in the sense that space forms the conditions for social activities. One field of research is to examine the way those social conditions and activities are related to spatial conditions. An important role in this debate plays Bruno Latour and his ANT. He developed a new idea of a network, where he introduces the so called 'agents' which can be people or an institution… We look into everything that generates movement or is causing movement based on this idea of network… A lot of different actors are doing something but in total they are just generating the environment. It is typical student work to create a framework for such a planning approach. If you want to give a maximum amount of freedom to individual actors then on the other hand you have to provide a framework. Otherwise the city becomes a chaos. So the big question is how you can provide a framework that on the one hand makes an efficient city and on the other gives maximum freedom to the actors.*"

Stephen Read,[16] member of the Spacelab research team in the Department of Architecture at TU Delft, refers to city as a *virtuality* or 'a possible outcome, or set of possible outcomes, to processes of urban becoming.' Read claims that "we see to develop an effective conceptualization of the local in a powerfully globalizing world. To this end we must, we fell, deal with an urban space which is global in its scope. The object is not to develop a dichotomy between the global and the local –which seems in fact to be the dominant position today– but rather to develop a view on how the local is *constructed* or *assembled* in this global-in-scope space. The local, in the view we begin to develop, is not a given, it is an *effect*." Read, who considers the Spacelab approach contradictory to the traditional diagrammatic techniques that froze the city, believes that "the local becomes in fact something other than purely singular or purely multiple. It becomes a *fractional* reality." Spacelab's philosophy supports the fact that "people inhabit simultaneously regions of different scales, related to the different scales of their orientation and movement needs. The movement space of the city will tend to separate out into discrete more or less coherent, networks of pathways, working at these respective scales, through this space. People will shift between these nested regions depending on their immediate movement and orientation needs." Consequently, the escalation of movement from structures supporting high speeds to those hosting lower ones constitutes one of the most important preoccupations of Spacelab.

The aforementioned theoretical approaches played an important role in Delft's conceptual reformation which targets a continuum in its course program regarding scale. As Rosemann explains: "*Actually I have to say that we just re-organized our department. In the past we had different Chairs working on different scales. Now, we are investigating more in Chairs working through the scales because things are too much related. The objective is to define issues but not to divide them through scales.*" According to Rosemann, the Department's objective is not only to foster analysis but moreover to form solutions. Space Syntax analysis is used as an evaluation tool while 3D modeling techniques generate forms and analyze the consequences of a spatial intervention. Along this path, the Department is experimenting with evolutionary



img 5
Example of student work at the Spacelab Research Laboratory at TU Delft.

models (one in co-operation with Ben van Berkel) that have the potential to help the overall research.

It would be unfair to assert that the references made in this paper are extensive enough so us to cover the efforts of design courses at Schools of Architecture today to liberate the immanent force of becoming from institutions that define rules and regulations for the profession of architecture with the use of digital design tools and techniques. To these efforts one should also add those that involve the integration of IT in constructions. Even though efforts are located in selected continua, one can assume that a process of convergence regarding views on the future of the city is on the way. At the same time, though, it would be hard to overlook the fact that the market continues to absorb technology or innovation in terms of *fantasmagorie*, a word coined by Walter Benjamin to describe the "the glow surrounding the society that produces commodities."[17] If *fantasmagorie* is an objective of post-modernity, then design studios could avoid the restriction to image consumption and image production by testing their 'simulacra' in informal zones of urban landscapes, the zones that *image-consumers*[18] just pass along.

Notes

1 Brett, Steele "Split Personalities: Diagrammers vs Processors." RESARCH.NET. 07 June 2006 <http://www.resarch.net/20050324.html>
2 Antonino, Saggio. "Give Me a Cord and I Will Build...Construction, Ethics, Geometry and Information Technology." ENHSA.NET. 30 April 2007 <http://www.enhsa.net/con5book.htm>

3 Dimitris, Papalexopoulos. "The Design-Construction Continuum for a non-linear, not-fragmented and non limited in time Design and Construction Continuum." ENHSA.NET. 30 April 2007 <http://www.enhsa.net/con5book.htm>

4 Anthony, Vidler. "Diagrams of Diagrams: Architectural Abstraction and Modern Representation." In *Representations* 72, Fall 2000, pp. 1-20.

5 Manuel, Gausa. "Architecture is [now] Geography." In *Archilab's Earth Buildings*, Thames & Hudson, London, 2003, pp. 240-43.

6 For further information please refer to: M. Mostafavi & C. Najle. (Eds.). *Landscape Urbanism: A Manual for the Machinic Landscape*. AA Publications, London, 2003.

7 For further information please refer to the website of Penn Design School at the University of Pennsylvania <http://www.design.upenn.edu/new/larp/index.php>

8 "*TransUrbanism* is a design strategy that allows cities to organize themselves as complex systems, where small local structures incorporate global flows." Excerpt from Laura, Martz. (Ed.). *TransUrbanism*. V2_Publishing and NAi Publishers, Rotterdam, 2002.

9 For further information please refer to the Design Course "The Plan as Discipline and Event in Architecture and Urbanism" (Arc 569) at <www.princeton.edu/-soa/01sch/sch_frame.html>

10 For further information please refer to the Keller's studio "Abstract machines" at <http://www.arch.columbia.edu/index.php?pageData=59983>

11 For further information please refer to <http://www.arc1.uniroma1.it/saggio/DIDATTICA/Cad/2006/Home2006.html>

12 Peter, Trummer. "On multiplicity population thinking." In *Associative Design II. Neighborhood Models*. Berlage Institute Research Report No 8, 2006, pp 69-82.

13 Please refer to Marie-Ange, Brayer, Frédéric, Migayrou and Fumio Nanjo. (Eds.). *ArchiLab's Urban Experiments: Radical Architecture, Art and the City*. Thames & Hudson, London, 2004, p. 264.

14 Trummer, op.cit.

15 S. Read, J. Rosemann & J. Eldijk. (Eds.). *Future City*. Routledge, London; New York, 2005, pp.3-8.

16 Stephen, Read. "Towards an Urban Space." In St. Read & C. Pinilla. (Eds.). *Visualizing the Invisible: Towards an Urban Space*. Techne Press, Amsterdam, 2006, pp. 6-19.

17 Walter, Benjamin. *Paris Capital du XX siècle*. Cerf, Paris, 1989.

18 Please refer to the comments made by G. Deleuze and F. Guattari on *subjectivation*. In Deleuze, Gilles & Guattari, Félix. *Mille Plateaux*, Paris, Minuit, 1980, p.563.

Tom Frantzen

Just do it
Why Form Study is a separate branch of sport

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Amsterdam
the Netherlands

Until 1989 I played team sport as a catcher of the Nuenen baseball and softball club. I didn't play at the top, but I was at a pretty good level. Then, a persistent back injury prevented my body from keeping up with my sporting ambitions any longer. A year earlier I had already stopped playing hockey, my other sport.. I wasn't a real talent at that either, but by training hard enough I usually managed to make it into the first youth team. I decided to quit when I realised that my desire to play the game to perfection was making it impossible for me to play at all. So a few years ago, when I wanted to take up a sport again, I had the choice of resuming an old sport, where my ambitions could be an obstacle again, or to choose a sport that would be above all else a game for me. I chose soccer, a sport in which I had no skill or pattern of expectations at all. I'm playing my fifth season this year, and by absolute standards I'm still a hopeless player, but I have a lot more fun than I ever got from the sports I was good at.

But now, I discover how the game is to be played by just doing it.

When I was first invited by the Technical University Eindhoven (2003), and later by the Academy of Architecture Amsterdam (2004) to investigate what Morphology can and should mean within the education of an architect, I took up the challenge for the same reason that I now play soccer: I didn't have the faintest idea what Morphology really was or was supposed to be. The lectures in Morphology that I had followed at the Technical University Eindhoven in 1991 did not seem to have left much of an impression. So I just started the research, hoping that insights would arise along the way. At any rate, I had become curious

The research got off on the wrong track. The archives of the Technical University Eindhoven turned out to have practically nothing on the Morphology Department which had played such an important role ever since the setting up of the Faculty of Architecture in the late 1960s. The department was started by Jan Slothouber, who had previously set up the Centre for Cubic Constructions with William Graatsma for DSM.[1] The CCC represented the Netherlands at the Venice Biennale of 1970 with their work based on the possibilities for combining cubes [fig. 1]. When Slothouber and Graatsma left the Faculty of Architecture, Morphology changed from a whole series of interrelated exercises in which the phenomenon of form, and the cube in particular, was studied (re)productively and theoretically into the 8-week set of lectures and seminars on Morphology during the third year of study which I had forgotten in the end.

Various architects of the so called 'Eindhoven School', who had experienced the Slothouber/Graatsma era at first hand, stated that it was precisely their exercises that had trained them as designers. I was flabbergasted at the lack of information about the now extinct department of Morphology within the Faculty of Architecture in Eindhoven!

It was only when I found myself sitting on William Graatsma's sofa that I discovered that the Morphology tradition in Eindhoven was actually a continuation of the Bauhaus tradition that Oskar Schlemmer, Johannes Itten, Paul Klee and Wassily Kandinsky had introduced to the Bauhaus University in Weimar as *Vorkurs* and *Grundlehre*. This course dealt with visual phenomena such as Point, Line and surface [fig. 2], Body and

fig 1

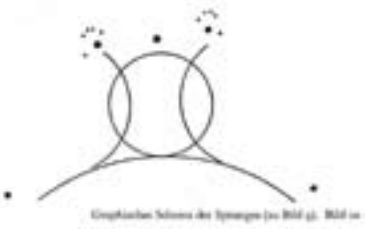


fig 2

Space, Form and Colour, Light and Dark as the necessary basic knowledge required for a successful completion of the rest of the course.[2] Wassily Kandinsky in particular envisaged the ideal of the Gesamtkunstwerk, not only as the product of the artist or architect, but also as a pedagogical principle. In his eyes, the various courses of the study formed an indivisible ideal unity.

The rise of the Nazis curtailed the life of the Bauhaus University. After its foundation in Weimar by Henry van de Velde in 1917, it fled to Dessau in 1925 under Walter Gropius, and was closed down in Berlin in 1933 by Ludwig Mies before his exile to the United States.

The influence on German art and architecture teaching after the Second World War was great, because many former Bauhaus students took up positions in universities and academies, where they reintroduced many of the Bauhaus principles.

However, this was never a glorious comeback. Apart from Max Bill's Hochschulgründung in Ulm, most of what the rest had to offer was a feeble and diluted version of the complex and coherent Bauhaus pedagogy. This was because the total concept was never reintroduced completely. Instead, parts of an indivisible whole were reduced to a few isolated exercises.[3]

The distinction between visual phenomena that was made in the Bauhaus tradition was later followed in the Netherlands by the architecture critic J.J. Vriend in his book *Architectuur als samenspel van ruimte en vorm* [Architecture as interaction between space and form], in which he describes the elements that are decisive for every form of architecture, irrespective of trend or style: 'forms; function; function and ground plan; affect and reason; square and circle; cube and sphere; symmetry and asymmetry; rhythm; sculptural building forms; fantasy and reality; light and shadow; inside and outside; the space between the things; play and material; construction and form'.

The book promises 'to teach comprehension of what is alive in architecture today, as well as in that of yesterday and tomorrow'.[4]

If the study of form in architecture can follow such a simple and clear scheme, why is this scheme no longer to be found in a single architectural course in the Netherlands?

Starting in the 1970s, an important shift has taken place from the (systematic) study of form by the students to the 'freeing' of the students from general ideals of form in order to allow them to develop their own creativity to the full. This is all based on the supposed uniqueness of every (would-be) designer. With the focus that emerged in the 1990s on the "concept", this is the course that the teaching of Morphology has followed. It is not only the content of Morphology that changed as a result; the form of Morphology also changed very clearly at the Academy of Architecture Amsterdam. Although the scale level and choice of subject in Morphology teaching often differ from the design projects, many Morphology assignments looked like mini design projects,[5] which were often evaluated exclusively in terms of their conceptual power. Consequently, the opportunity has been lost to use Morphology to develop specific visual skills on the part of the students.

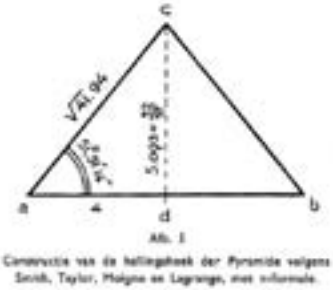
The notion of Morphology is not confined to courses in architecture and art. It is also to be found in primary education in the Netherlands. In 1857 it was laid down by

law that elementary geometry (the study of form) was to be a permanent ingredient of primary school education along with language and mathematics. This Morphology was the brainchild of the Swiss specialist in educational methods Pestalozzi, who assumed that 'all knowledge proceeds on the basis of number, form and word'. Besides mathematics and language, he also propagated a subject in which elementary forms (square, proportions of sections of a line, position of points and lines in relation to one another) were studied. Van Dapperen, a Dutch follower of Pestalozzi, later wrote the textbook on Form Study: *Handleiding voor onderwijzers om volgens eenen geregelden leergang kinderen te leeren opmerken, denken en spreken, toegepast op de zamenstelling der eenvoudigste voorwerpen uit de meetkunde, bekend onder de naam vormleer* [Handbook for teachers to teach children in a systematic way to observe, think and speak, applied to the composition of the simplest geometrical objects, known by the name of Morphology].[6] Replace 'children' by 'architecture students' and 'geometrical' by 'architectural', and you have a handy description of Morphology for a study guide of the Academy of Architecture Amsterdam.

In 1878 a change in the law was intended to abolish the subject, on the grounds that most teachers did not know what Morphology was. The chapter of the dissertation on which I have drawn for this information is entitled '100 years of Morphology: a failure'. Replace 'teachers' by 'architects' and the failure is complete.

Off to Weimar, then, because this town keeps popping up in the literature on Morphology. For instance, the book *Inleiding tot de kennis van symbolische vormen en van de mystiek der bouwkunst* [Introduction to the knowledge of symbolic forms and the mystique in architecture] (1948) by Jan de Boer is riddled with citations from Goethe, who came from Weimar. In spite of, or perhaps because of the fact that this book was evidently written from a religious perspective, it was a revelation to me. What nobody had ever taught me when I was a student is brilliantly described here, such as the various symbolic meanings of the square, the circle, the cross and the triangle. The link between the mathematician and the architecture is established in a simple way.

Mathematics, the knowledge of the absolutely certain, included the knowledge of the genesis of the world, the mystery of the cosmos, the secret of the creation. When this science had been recorded in measure and number, it covered the mathematical field of knowledge of the priest-architect. In proportion, in dimension, in angles of gradients and in design, their buildings speak with certainty and accuracy of an extraordinary astronomical and geometrical knowledge. In the pyramids we observe the memorial that was to bear witness to that knowledge through the centuries.[7] [fig. 3]



Afb. 1
Constructie van de hellingshoek der Pyramide volgens Smith, Taylor, Maigne en Lagrange, met informele.

fig 3

In addition to the widely known architectural qualities listed by Vitruvius — *firmitas* (solidity), *utilitas* (utility) and *venustas* (beauty) — Jan de Boer mentions the role of architecture as medium, as the vocabulary with which the architect can speak. Morphology could be a language course for architecture students in which they learn to

fig 4

read the meaning of architectural symbols, but also learn to make their architecture speak with meaningful combinations.

Once I had arrived in Weimar, I visited the Bauhaus University, which is now back in its original premises [fig. 4]. I was struck by the same sense of astonishment that I had experienced in the basement of the Technical University Eindhoven. The Bauhaus tradition of Morphology is completely invisible in the teaching of architecture and art here. The assignments that count as Morphology are in fact mini design projects, just as they are at in the Academy of Architecture Amsterdam. Professor Burkhart Grashorn was surprised by my quasi-archaeological interest in the courses taught by his predecessors and it was only after I had pressed him further that he went on to describe the relation between the Bauhaus of today and the Bauhaus of then as 'warm but distant'. All the same, some traces could be found. For instance, various design projects made connections with works by Oskar Schlemmer, for instance, for whose dancing figures digital spaces had been designed that were visualised as a video clip with dancers. The role of the earlier Bauhaus professors in this course can best be compared with that of Rem Koolhaas as a phantom professor in practically every architecture course in the Netherlands, and the tradition of the Bauhaus University is invisibly productive.

It is another graduate from the Bauhaus, Peter Jenny, who is one of the few to have successfully continued a tradition of Morphology that is still very much alive. He propagates a kind of visual thinking (*bildnerischen Denkens*) at the ETH in Zurich, and sees it as a necessary supplement to the abstract way of thinking that is commonly found in the academic world. His teaching includes practical activity — making — as

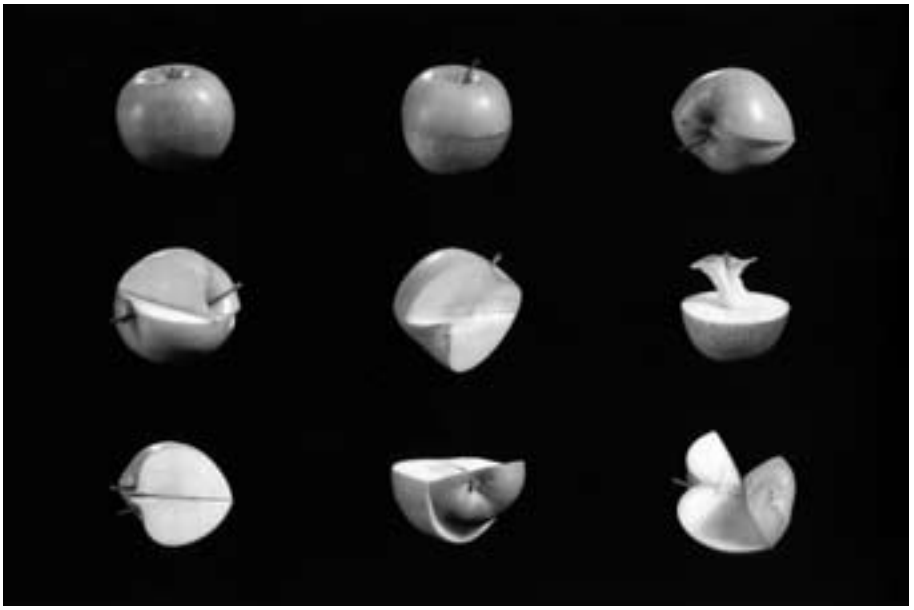


fig 5

a substantial component, and he steers clear of teaching about the symbolic language of architecture (*bildlehren*). He introduces the term dilettantism (*Dilettantismus*)[8] — which goes back to Goethe's era — as a playful strategy that still arrives at the desired result independently of the conventional professional approach.[9] He handles the same concepts as the Bauhaus tradition, but avoids the professional, standard techniques in order to study these phenomena for the purpose of unconventional techniques. For instance, an assignment on the phenomenon of the line may be packaged in the assignment to make a machine that produces linear tracks, before producing an inventory of the tracks produced in this way and (re)presenting them. [fig. 5] He forces students to develop an unprejudiced sensitivity to the way in which forms speak and can best be visualised. But above all, his teaching expresses the pleasure of doing without complications, learning as you play. *Just do it*.

Back to Amsterdam. What about Morphology at the Academy now? Is Morphology about learning technical skills of visualisation (a frequently heard complaint is that students are no longer 'capable'), or are these techniques ways of studying the phenomenon of form and learning to master it?

When seen realistically, the time available for Morphology in the present curriculum is completely inadequate to learn to master a technique properly. Compared, for instance, with the intensive way in which attention was paid to model drawing in traditional art education at the Art Academy in the last century, I consider it virtually impossible to expect students to master a technique in, say, eight afternoons sufficiently to be able to do their own thing with it. Besides, the number of visual skills that are required of an architect today has grown so explosively that you cannot expect more than that a student has applied several techniques for a while to learn

something about the morphological aspects of the future profession. In the light of the present duration of the course, techniques can only be introduced incidentally in the knowledge that the ice will already have been broken for perfecting certain techniques on one's own initiative.

Make it!

If the project component of the course (the P series) stands for 'how do you think up something that at a later stage could become reality through the intervention of others?', then Morphology could stand for 'how do you turn an idea into reality with your own hands?'.

A distinction between Morphology and the project component should be that nothing is *represented* in the Morphology exercises; the only activity is *making*. All the representations that are conventional in the project component, such as drawing panels, scale models and references, are taboo in Morphology as soon as they threaten to be deployed as (re)presentations of what should have been *made*. You think something up and you make it. *Just do it*.

All the same, something often goes wrong here. In many cases it takes a lot more time to think something up than to make it. Perhaps creating by copying can play a role here. When the assignment is to convert an already existing idea into practice, the difficult stage of thinking up a relevant idea can be skipped and all the energy can be thrown into translating an idea into a creation. This sounds like more of a short-cut than it is. Copying has always been important for designers as a reproductive technique, and it already played an important role in education a long time ago. Michelangelo and Leonardo da Vinci, for instance, were trained mainly by copying the masters of their day. The study of originals from the past can be a way of developing a vision of your own with regard to the use of something that was thought up by someone else in the past. Recreating the work of the masters fostered an infallible understanding both of the motives and the techniques behind the creation of the work. This enabled the pupil to rise to the level of the master, and the talented pupil to rise above it. If we look back on the twentieth century, we can see that copying has been transformed from a reproductive technique into one of the important creative techniques of our era. Think of Dada, Surrealism, Pop Art, Hip Hop, House. Think of Picasso, who started to copy Velasquez at the end of his career to add depth to his own work. [fig. 6 & 7]


fig. 6


fig. 7

If prospective designers are encouraged to work with existing ideas, materials or objects, they may come to discover that design is not just about being unique and original (the stifling ideal of the 1970s), but that the way in which links are made between existing facts can lead to unsuspected combinations and thereby to original creations.

I therefore proposed to break the Morphology course down into a series of exercises that are based on the use of existing material as the basis for a creative productive process. As the series grows in complexity, a gradual transition takes places from the study of the formal qualities of existing material to conferring your own form on (existing) material. Both study and creation take place through doing it. I consider the coherence and proper coordination of the series to be of great importance. Morphology is only successful when there is a tradition rooted in the curriculum. This is the lesson of the demise of the Bauhaus pedagogy after the Second World War, the bankruptcy of Morphology at Eindhoven after the departure of Slothouber and Graatsma, or the success of Jenny in Zurich.

Unfortunately, the desire to cultivate a tightly coordinated Morphology tradition in the curriculum will not sound sexy to everyone, above all because Morphology could be seen as the only part of the curriculum where students are still free to play. Regrettably, in my view, free situations at the Academy only too often lead to forced results, particularly to show that the ability to think out of the box has been mastered. It was Friedrich Schiller, a contemporary of Goethe who also came from Weimar, who formulated it as follows: 'a person is only a full person when he can play'.[10] I wholeheartedly agree. Given the fact that the Academy of Architecture no longer just trains students to become qualified architects, landscape architects or urban designers alone, but in my opinion trains them in the first place to become Masters, Academics, people, the academy must always allow scope for the play that is educational necessary.

Simply granting freedom does not automatically lead to a playful, unprejudiced, free (= academic?) mind. 'Play' is something that you have to learn. I owe this insight to an 'incorrect' book about sleep by a US nurse. When my son Lieven was four months old and did not want to go to sleep (a situation that many of us will recognise), my wife came home sheepishly with this book, in the hope that at any rate she would fall asleep reading it. Besides many handy tips that were endlessly repeated, I came across a real eye-opener. The writer claimed that a child has to learn *everything* from its parents and surroundings, including sleep. Still, many young parents think that sleep is something that should come from inside the child itself. This supposition is seldom borne out in real life, the author claims. Many tutors think that freedom is something that should come from inside the students themselves. This supposition is seldom borne out in real life, I would claim.

In my view, the most important educational objective of the new-style Morphology series had to be that students learn to be able to look in an unconventional way at what they are confronted with every day in their professional practice. This applies both to skills, techniques and assignment and to clients. The ability to see through conventions is an essential germ for the formation of a free design mentality that can determine objectives on its own and can develop the corresponding (… new and unknown?) form on the basis of an existing, already known context. Such a designer is a "player".

Notes

1 William Graatsma, *cubische constructies van slothouber en graatsma*, Nuth (drukkerij Rosbeek) 2000, pp. 131-139.
2 Wassily Kandinsky, *Punkt und linie zu Fläche*, Munich (Albert Langen) 1926.
3 R.K. Wick, 'Vorwort' in: Peter Jenny, *Bildkonzepte, das wohlgeordnete Durcheinander*, Zürich (vdf Hochschulverlag AG an der ETH Zürich) 2000, pp. 6-13.
4 Text on jacket of J.J. Vriend, *Architectuur als samenspel van ruimte en vorm*, Amsterdam (Kosmos) 1967.
5 Compare the teaching assignment of the Academy of Architecture for the years 2000-2003.
6 W. Groen, review of the dissertation by E. de Moor, *Van vormleer naar realistische meetkunde*, Utrecht (University of Utrecht) 1999.
7 J. de Boer, in: *Inleiding tot de kennis van symbolische vormen en van de mystiek der bouwkunst*, Amsterdam (Schors) 1948, p. 11.
8 Dilettantism: amateur dabbling (*New Shorter Oxford English Dictionary*).
9 See note 3.
10 F. Schiller, *Über die ästhetische Erziehung des Menschen* [1795]. Stuttgart, 1970, p. 63.
11 B. Holleyer, *Sleep: The Secret of Problem-free Nights*, London (Cassell Illustrated) 2002.

Christos Hadjichristos

Layering in Software, Drawing, Thinking, Designing

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Introduction

Tracing paper has long been used in the organization and handling of design. The layer below may be the grid while the top layer may be the structural system or the configuration of spaces and forms. It could also be that the top layer is a version of what lies below, an attempt, that is, to improve the previous. It could even be that the two or more juxtaposed layers are apparently not connected physically or related conceptually. The goal in this case is to deal with such a realization. Whatever the case, the fact that these sets of information are rendered co-present through layering, creates potentials otherwise nonexistent.

It has been said that before the invention of photography, man could think photographically. It may also be the case that before the appearance of layers as a feature in different CAD software, the human mind begun using layers to organise, process, rearrange or even create information. This paper examines the concept of 'layering' in software, drawing, thinking and designing, using a specific studio project as a case study. It is argued that the abstraction offered by such a thinking framework is still valuable now when, with the development of computer software for design, the trend is towards a more 'realistic' portrayal of the environment which is now seen as 'empty space' with three-dimensional entities occupying specific points in it.

Still, layering seems to continue to be valuable in studying/creating relationships, the essence, that is, of architectural design. Layering is not used here to refer only to the juxtaposition of a number of orthogonal projections. The layering, for example, of a number of digital images and the control the software offers in manipulating the degree of transparency or opacity each has can be used quite creatively in the design process. Qualities, and/or quantities, such as depth, distance, proximity, visibility and time acquire new meanings which can potentially upset more established notions of these and other architectural parameters.

The studio work used as case study involves the first year of architectural education at the University of Cyprus and is based on the research and teaching interests of its studio master who examines the concept of Layering through an interdisciplinary approach which involves architectural teaching and design, visual perception in painting, as well as more philosophical investigations. The specific stage in architectural education offers a unique point of investigation since it coincides with the first introduction of technology as an aid in architectural representation and design.

The case study

During the first semester in the first year, the curriculum of the School of Architecture at the University of Cyprus includes, as two of the six courses required, a visual communications class and a design studio. In the drawing class the students are encouraged to experiment with basic media such as pencils and charcoal of varying thickness and hardness and pens of different widths. The purpose is for each student to develop ways to record observations or ideas in a way that allows and encourages further interaction during the design phase. For the very first exercise this year, the motorcycle of one of the students was brought in and placed in the centre of the stu-

dio. The students sat around it in a circle and were asked to produce a thirty minute sketch of the object. No other instruction was given and no comments were made during the exercise. While most of the students managed to produce more or less respectable drawings, it was observed that the use of the eraser was quite extensive and that parts of the drawing were worked out in detail without a first general sketch of the whole composition. Consequently, the final product in most cases had wrong proportions while the movement expressed in the streamlined shape of the motorcycle was not captured in the drawing.

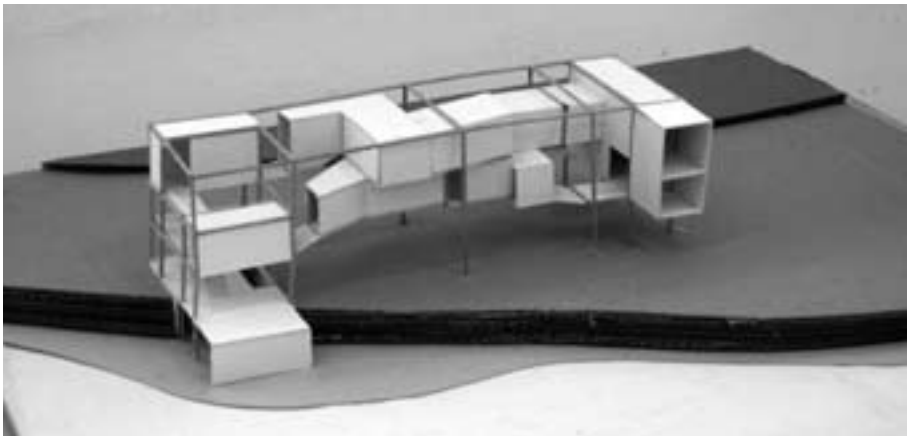
After a quick review, the students were asked to sketch the same object for only thirty seconds while the use of an eraser was prohibited. For the series of exercises that followed, the time was reduced to ten seconds and then five seconds. The new sketches were then discussed. The students themselves begun to see the qualities expressed in the quicker sketches. For the last exercise of the session the motorcycle was sketched once more for thirty minutes hoping that the students would use this technique of layering information in order to gradually build up their composition. It was observed that very few did indeed change the technique they used in the very first sketch.

With more of these exercises during the semester, the limited time allowed for each exercise together with the use of markers and pens helped change the tendency of the students to dwell extensively on a part before configuring the whole. Furthermore, using charcoal as the medium offered another way of looking at the act of sketching and erasing while combining media further developed the skill of the students to work in layers, a skill that can potentially be useful not only in representing, sketching and recording but in designing as well.

For the first year, first semester design studio the project involved a version of a rather common exercise in architecture studios: each student was asked to study the relationships found or expressed in a painting by a local artist and then use them in order to create a new two-dimensional composition. This in turn served as the initial material for the design of a three-dimensional object which in turn inspired an intervention in the urban fabric. The whole process can be seen as a series of layers which may be linked linearly. It could also be that some layers are actually more linked between them than with intermediate layers, creating jumps and discontinuities. It is the juxtaposition of the layers that allows such features to surface. So, while in the drawing class the exercises encouraged a de-layering of an existing object, in the design studio the task was first to delayer the work of art and then create new layers to compose a new entity. Needless to say that the creation of a layer in de-layering as well as in layering, in the previous class as well as in this one, was not carried out in a mechanistic fashion. It was rather more of a process that involved both analytical as well as synthetic activity.

In the second semester design studio of the first year, the students were introduced to a strip of Cyprus. Grouped in teams of four they were required to study a quarter of the strip allocated to them through maps and aerial photographs and bring out information regarding the topography, settlements, the transportation system, vegetation, farming and other activities. The data discovered was used to create different layers which were juxtaposed and relationships, connections or dependencies were searched for. Creating a layer for each type of information allowed for deduc-

First year, first semester design studio



First year, second semester design studio

Visual communication

tions as well as questions to arise. Easy connections to make were between the size of property plots and distance from the settlement core, the river or the type of topography, between vegetation and farming activity with topography and soil type, or between topography and transportation roots. It should be mentioned that the students had not at this stage taken any computer courses yet, some teams did not use the computer at all, while others took advantage of the computer knowledge of some of their members and used AutoCAD and Photoshop.

In the next stage the students visited the area, took photographs, spoke to different people in the area and recorded their observations on or over the layers created in the previous phase. With this enriched knowledge of their region, each team selected a site on which to design a complex of four pavilions. One of the pavilions was for exhibiting paintings, another for sculpture, a third for small treasures or jewellery and a fourth for items with writing (books, engraved stone etc). At this stage the site was assumed to be flat while the program asked for a basement, a ground floor and a mezzanine level. The overall dimensions of each piece were limited to a 10m * 10m *10m cube or to a rectangular version of it 14m* 7m * 10m. The last stage required the grouping of the four pavilions on the site selected by the team in the first stage.

Accompanying each team in its struggle to handle the grouping of the four pavilions allowed for some observations to be made. The first two teams that seemed to have managed to come up with a strategy were the ones that combined a simple, clear and strong observation about the site and an equally convincing argument regarding their pavilions. The first team observed that the hill ridge chosen to place their complex offers a distant view of the pavilions from the highway on the one side and from the village on the other, and that the four pavilions are too different thus discouraging a grouping strategy that uses physical proximity. It was consequently decided to use an axis or route to mediate this grouping, allowing for an indirect relationship to be established between the pavilions. The second team to have a breakthrough was the one with a comparatively flat site near the coast and a main idea which wanted the serene, perfect line of the horizon between the sky and the sea uninterrupted. This combined with the adaptation of a formal vocabulary already expressed in one of the pavilions helped the team move along the design process, fine-tuning the grouped pavilions while other teams were still lost in a labyrinth of equally promising, or not, possibilities.

Both groups that were late in moving forward had a comparatively complex topography and were jumping from one main idea to the other revealing that these ideas were basically forced arbitrarily on the site as well as on the pavilions. The weakness of the main ideas or concepts was partly due to the superficial analysis the team made of their site and of the character of the pavilions.

It should be mentioned that the emphasis at the beginning of the exercise was to work with models rather than drawings, in an effort to encourage the students to study the object three dimensionally. At the scale and complexity of the single pavilion this seemed to help rather than hinder the student who had to deal with a flat site and was not required to collaborate with anybody else. With the first attempts to group the pavilions on the real site and the specific context though, it was becoming clear that the complexity has reached a level that called for a different approach.

And while tracing paper and two-dimensional drawings were of course used throughout the process, at this point the students were asked to start playing more intensively with layers in order to discover/create relationships which they could quickly shift, reject or reinforce. Each team was to create at least forty layers which they should present as an unbound stack in one and a half weeks. The use of computers was allowed for the preparation of the layers at the stage of selecting a site, but the medium promoted for this phase of the grouping stage was only tracing paper and markers. It was clarified that sheets of varying transparency could be used, and that the order between the layers could vary. In the text explaining the exercise, 'layering' was described as follows:

Rather than an outdated methodology, Layering is here considered as a form of abstraction invaluable in Design. Layering is not simply stratification, folding, collage or montage since in this conceptual model

- layers are separated by an in-between space which allows for their co-presence
- each layer may be a pattern, or a composition made up of discrete entities
- each layer potentially extends indefinitely in its plane
- the sequence between layers is not fixed. The observer can bring forth one layer and make others recede.
- no one layer is privileged in any absolute fashion.
- layers can be opaque, translucent or transparent, or may be rendered so as desired
- the observer is not situated outside the configuration but is immersed in it and is part of it. It could be said that the observer is part of the in-between space which partly defines spatially the foremost layer.
- time is part of the configuration, not in any linear sense but in the fact that change is inherent in the configuration
- elements from one layer can 'contaminate' the other
- new layers can be created at will
- layering can be a physical arrangement available to vision, but is predominantly a conceptual frame of mind, an attitude, a disposition.

Each layer in the pack produced by each team was a sketch of an idea, a configuration of solids and voids, or a pattern of flows. These layers were sometimes found one on top of the other, other times pinned up on the board, or simply floating around, travelling between the four students in the group. The order of the layers was continuously changing and with each new arrangement new layers were generated.

What was gradually evolving was the ability to deal with some of the parameters in one level and with other parameters in another, allowing the group to focus, control and eventually stabilize an otherwise chaotic situation.

Discussion

Architectural design is called in to deal with complex situations where the number of parameters involved does not allow for the use of a more positive methodology

but demands a way of doing things that is neither standard nor fixed. It involves acknowledgment of a complex set of relationships that already exist and the development of a proposal which 'comments' on these relationships in an architectural manner. A question thus arises: what kinds of tools are appropriate for each stage of this process? If the development of the composition passes through different stages which actually develop the design into different degrees, then perhaps there are mediums and methods of working which are better for one stage and not so efficient for another.

It could be argued that the more complex a situation gets, the more abstraction is needed in different forms in order to deal with it. Layering information and ideas offers the ability to work with abstraction. One form of abstraction is the reduction in the number of parameters considered in each stage. If an architectural project usually ends up being a three-dimensional entity which begins interacting with time as well, then one way of abstracting is to reduce the dimensions initially considered.

It could also be argued that abstraction is also used in interacting with our environment. The stimuli are enormous yet we manage to sort them out and react efficiently in most cases. Gestalt theory emphasizes the importance of the figure and its relationship with its background. Clearly this involves quite a high degree of abstraction

Layering could be seen as a dynamic form of abstraction. Layering can be taken literally and thus be composed of two dimensional entities. It could also be more abstract and take the form of a strategy, a methodology or a frame of mind. Its usefulness lies in its ability to allow the co-presence of the many rather than give exclusivity to the one. Equally valuable is the fact that it challenges the finality or givenness of something, making its definition blurred, dynamic, alive. Also important is the fact that different layers may have different codes; the shifting between codes or simply the combination of codes or languages may be important for cultivating a more accommodating approach to design and a frame which gives room to the 'other(s)'.

The claim that layering is part of the apparatus used naturally or otherwise by the human mind to cope with the complexity of its environment could be questioned. What cannot be questioned is the fact that layering has been a tool at the disposal of the architect since the appearance of a drawing material with some degree of transparency, and that it continues to be an important tool through the use of computer software. What can and perhaps should be a topic for discussion is how different is the Layering used in design in the two cases. An even more important question is: what would it mean to loose this and other tools for abstraction and replace it with technological tools that offer us simulations of the real, the virtual or the imaginary? Would it reduce our ability to theorize? After all, theory could be seen as one form of abstraction. In other words would it render the architect more of a craftsman who knows how to carry out a task but cannot consciously account for what he/she is doing, instead of a designer who attempts to reflect and, at least to some degree, understand the processes which he/she initiates, participates or challenges?

Debate on the papers of Session 4

Chair:

Antonino Saggio

Universita di Roma
La Sapienza School of Architecture
Rome, Italy

Vana Tentokali, Thessaloniki, Greece
I appreciated all the presentations we listened to, but I have a question for the last speaker. I am not too enthusiastic about your approach and your results. My question is, where are you coming from, in terms of your last statement? All this stuff must have come from somewhere, although I suppose you will deny it.

Christos Hadjichristos, Nicosia, Cyprus
I am sorry?

Vana Tentokali, Thessaloniki, Greece
What is the theoretical background on which you have based your approach?

Christos Hadjichristos, Nicosia, Cyprus
I have been talking about the theory that I have based my thinking on. I am not a perfect teacher, so I cannot really consciously pinpoint every stage in the evolution of my thinking. I think that painting has been an important factor in the way I think. I was a painter before I was anything else, so that has had a strong impact on me; but of course I have been reading and of course I have been exposed to philosophy and critical theory and so on, and I am aware of the issues that are important in some other areas. I am not an expert in philosophy, but I do know that there are some debates that are going on. Again, I cannot pinpoint one, but perhaps what I am doing or what came out is a layering itself of all those things. So I do not know exactly how to answer your question.

Vana Tentokali, Thessaloniki, Greece
I think you have done so from the beginning of your presentation. You declared that your idea of layering came from your experience in painting; and now when you explained it a second time I thought that this must be the starting point of your theoretical departure, so that you can have these artistic results. Thank you.

Antonino Saggio, Rome, Italy
Other questions or comments? All right, then, I will close the session and we will resume shortly with the Keynote Lecture by Neil Leach.

Maria Voyatzaki, Thessaloniki, Greece
Good afternoon, everyone. Last but not least is a typical British expression – I will not say Anglo-Saxon to get Neil all wound-up. Our next keynote speaker is Neil Leach with whom we have a long history. We invited him to speak in Hania back in 2003 and now we are back together to hear his recent views on the pedagogy of what we call contemporary architectural education. Thank you for accepting our invitation, Neil. The floor is yours..

Keynote Lecture

Neil Leach

Digital Morphogenesis

Dessau Institute of Architecture
Germany

Neil Leach *teaches at the Dessau Institute of Architecture in Germany, Southern California Institute of Architecture in Los Angeles, and the London Consortium in London. He has also taught at the Architectural Association, Cornell University, Columbia GSAPP, University of Bath and University of Nottingham. He is the author of Camouflage (MIT Press, 2006), Forget Heidegger (Paideia, 2006), China (Map Office, 2004), Millennium Culture (Ellipsis, 1999) and The Anaesthetics of Architecture (MIT Press, 1999); co-author of Mars Pants: Covert Histories, Temporal Distortions, Animated Lives (Architecture Foundation, 2000); editor of Designing for a Digital World (Wiley, 2002), The Hieroglyphics of Space: Reading and Experiencing the Modern Metropolis (Routledge, 2002), Architecture and Revolution: Contemporary Perspectives on Central and Eastern Europe (Routledge, 1999), and Rethinking Architecture: A Reader in Cultural Theory (Routledge, 1997); co-editor of Emerging Talents, Emerging Technologies: Architects (China Architecture and Building Press, 2006), Emerging Talents, Emerging Technologies: Students (China Architecture and Building Press, 2006), Fast Forward>>, Hot Spots, Brain Cells (Map Office, 2004) and Digital Tectonics (Wiley, 2004); and co-translator of Leon Battista Alberti, On the Art of Building in Ten Books (MIT Press, 1988).*

The term 'morphogenesis' is fast becoming one of the new buzz-words in progressive architectural circles.[1] Used initially in the realm of biological sciences, the term refers to the logic of form generation and pattern making in an organism through processes of growth and differentiation. More recently it has been appropriated within architectural circles to designate an approach to design that seeks to challenge the hegemony of top-down processes of form making, and replace it with bottom-up logic of form-finding.[2] The emphasis is therefore on material performance over appearance, and on processes over representation.[3]

What we need to recognise, then, is that there might be an apparent formal similarity between the 'non-standard' forms of architects such as Frank Gehry and other more contemporary architects such as Foreign Office Architects with an increasing interest in morphogenetic questions such as performativity and form-finding, but there is an enormous difference in terms of design methodology. For Gehry represents a more traditional, 'postmodern' approach towards design, where the architect is perceived as the genius creator who imposes form on the world in a top-down process, and the primary role of the structural engineer is to make possible the fabrication of the designs of the master-architect, as close as possible to his/her initial poetic expression. Meanwhile the more contemporary architects operating within the new morphogenetic paradigm can be seen more as the controllers of processes, who facilitate the emergence of bottom-up form-finding processes that generate structural formations.

The difference, then, lies in the emphasis on form-finding over form-making, on bottom-up over top-down processes, and on formation rather than form. Indeed the term 'form' itself should be relegated to a subsidiary position to the term 'formation'. Meanwhile 'formation' must be recognized as being linked to the terms, 'information' and 'performance'. When architecture is 'informed' by performative considerations it becomes less a consideration of form in and off itself, and more a discourse of material formations. In other words, 'form' must be 'informed' by considerations of 'performative' principles to subscribe to a logic of material 'formation'.

However, the logic of morphogenesis in architecture is not limited to questions of design methodology. It extends also into an ethical arena. If we can find forms that operate more efficiently, then we can use fewer materials, and help to preserve the world's resources. As such it can be taken not only as a critique of the scenography of post-modernism, but also as an ethical argument about the environment. For environmentalism is not limited to more efficient environmental control of buildings, but also encompasses the reduction of resources used in their construction.

Material Computation

Biology provides one of the major sources of inspiration for research into morphogenesis in architecture. Nature operates largely through a logic of optimisation, and can therefore offer important lessons for architects. Biomimetics – the study of what we can learn by replicating the mechanisms of nature - has therefore emerged as an important field of research. It is not simply that nature can inspire products such as Velcro or recent fabrics used in the manufacture of swimwear, that are based on the hydrodynamic properties of shark's skin. Rather nature itself can teach us important

lessons about the efficiency of certain structural organisations. Following on from the early experimentation of Antonio Gaudi, Frei Otto has become a champion of observing the behaviour of certain structures in nature, and re-applying their principles through analogue modelling. Thus spiders webs and soap bubbles can provide deep insights into the behaviour of form-finding lightweight structures.

These observations come under the heading of material computation. They offer us analogue forms of computation which – despite the apparent crudeness of the modeling process - are actually highly sophisticated means of understanding structural performance. To describe them as a form of computation is not to undermine the role of digital computation. Rather it is to recognize that computation is everywhere in nature. Computation – a term derived from the latin, 'computare', to 'think together' – refers to any system where individual components are working together. But it is equally important to recognise that digital computation has its limitations. Digital computation necessarily involves the reduction of the world to a limited set of data which can be simulated digitally, but it can never replicate the complexity of a system such as a soap-bubble, whose internal structural computation involves an intricate balance between highly complex surface material organizations and differential atmospheric pressures.

A number of contemporary architects have re-examined the work of Antonio Gaudi and Frei Otto, and found in it sources of inspiration for the new morphogenetic generation of form-finding research, often coupling the lessons of their analogue experimentation with more contemporary digital techniques. Mark Goulthorpe describes his work as a form of 'post-Gaudian praxis', while Mark Burry, as architectural consultant for the completion of Gaudi's Sagrada Familia church, has been exploring digital techniques for understanding the logic of Gaudi's own highly sophisticated understanding of natural forces. Meanwhile Lars Spuybroek has performed a number of analogue experimentations inspired by the work of Frei Otto, as a point of departure for some innovative design work, that also depends on more recent software developments within the digital realm.[4]

This work points towards a new 'performative turn' in architecture, a renewed interest in the principles of structural performance, and in collaborating more empathetically with certain progressive structural engineers. But this concern for performance may extend beyond structural engineering to embrace other constructional discourses, such as environmental, economic, landscaping or indeed programmatic concerns. In short, what it amounts to is a 'folding' of architecture into the other disciplines that define the building industry.[5]

Digital Computation

Not surprisingly for an age dominated by the computer, this interest in material computation has been matched by an interest in digital computation. Increasingly the performative turn that we have witnessed within architectural design culture is being explored through new digital techniques. These extend from the manipulation and use of form-generating programmes from L-Systems to cellular automata, genetic algorithms and multi-agent systems that have been used by progressive designers to

breed a new generation of forms, to the use of the computer to understand, test out and evaluate already designed structures.

The seemingly paradoxical use of the immaterial domain of the computer to understand the material properties of architecture has spawned a new term in architecture, 'digital tectonics'. In other words the old opposition between the highly material world of the tectonic, and the immaterial world of the digital has broken down. What we have instead is a new tectonics of the digital or 'digital tectonics'.[6]

A certain genealogy can be detected in the use of the computer in architecture. What distinguishes this new digital paradigm from early uses of the computer in the architectural arena, is that it reinterprets the computer not simply as a sophisticated drafting tool – an extension, in other words, of the possibilities of the previous paradigm of ink on tracing paper logic – but also as a device that might become part of the design process itself. With this we see a development in the very nature of the architect from the demiurgic 'form-giver', who in Alberti's terms, 'imagined in the mind, and realized though construction', to the architect as the controller of generative processes, where the final appearance is a product not of the architect's imagination alone, but of the generative capacities of computer programmes. It is not that the architect here is any less imaginative. Rather the architectural imagination has been displaced into a different arena – into the imaginative use of various processes.[7]

But even within the logic of digital tectonics there is a certain genealogy of development. Computational methodology had first been used as a means of testing and thereby verifying and supporting the initial designs of the architect. The objective here was simply to use the computer to make the designs of the architect realizable. The only significant contribution to the design process occurred when findings of this process influenced the original design and forced minor amendments to that design. Examples here would include the use of software to test out the acoustic performance of the Greater London Authority building by Foster and Associates.[8] Occasionally, also, a more precise structural definition of a loosely formulated architectural concept could be made by the computer. Examples here would include the use of algorithms to define form of the glass canopy to the British Library on the part of Chris Williams, and 'dynamic relaxation technique' to define the precise vectorial layout of the mullion system.[9]

A second generation of computational methodology, however, can be detected in the work of Kristina Shea, whose eifForm programme serves to generate structural forms. in a stochastic, non-monotonic method using a process of structural shape annealing.[10] The 'designer' merely establishes certain defining coordinates, and then unleashes the programme which eventually 'crystallizes' and resolves itself into a certain configuration. Each configuration is a structural form which will support itself against gravity and other prescribed loadings, and yet each configuration thrown up by the program is different. Such is the logic of a bottom-up, stochastic method.

It is programmes such as this that reveal the true potential of digital realm in influencing the process of design itself, by opening up fields of possibilities. The computer, then, emerges not only as a prosthetic device that extends the range of the architectural imagination, but also – much like a calculator – as a tool of optimisation, that offers a more rigorous means of searching out possible options than

what could be described as the pseudo-computational logic that often dominates contemporary practice.

New Theoretical Paradigms

This interest in digital production has also prompted a broad shift in theoretical concerns. If the 1980s and 1990s were characterized by an interest in literary theory and continental philosophy - from the structuralist logic that informed the early postmodernist quest for semiological concerns in writers from Charles Jencks to Robert Venturi to the poststructuralist enquiries into meaning in the work of Jacques Derrida that informed the work of Peter Eisenmann and others - the first decade of the 21st century can be characterized by an increasing interest in scientific discourses. It is as though the dominant logic of today has become one of technology and material behaviour. As such, one can detect a waning of interest in literary theories and literary-based philosophies, and an increase in interest in scientific thinking and in philosophies informed by scientific thinking and an understanding of material processes. So it is that just as the work of Jacques Derrida is fading in popularity, that of Gilles Deleuze is becoming increasingly popular. Indeed it has been through the work of secondary commentators on Deleuze, such as Manuel Delanda, that the relevance of Deleuze's material philosophies has been championed within architectural circles.[11] To some extent this can be read as a highly positive development within architectural circles in that the domains of science and technology, for so longer neglected at the expense of history and theory and treated as largely positivistic domains, have now been re-appropriated and recognized as offering a highly relevant and rich domain of intellectual enquiry.

But it is not just materialist philosophies that have seized the imagination of architectural theorists. So too, scientific thinking itself has begun to find its place in the architectural curriculum, from the early observations of D'Arcy Thompson on growth and form to more recent theories – such as 'emergence', popularized by Steven Johnson, and Stephen Wolfram's discourse of 'A New Kind of Science', both of which deal with complexity emerging from a simple set of initial rules.[12]

If we add to these the developing interest in computational methodology – the possibility of scripting, parametric modeling, and performance-based generative techniques such as multi-agent systems or genetic algorithms – we can begin to define a broad shift that is beginning to appear in certain progressive schools of architecture, which extends into the design studio itself.

The Problem with Beauty

What this interest in morphogenesis begins to demarcate, then, is a new paradigm in architectural thinking, which privileges process over representation, and performance over appearance. At least, that is how this approach is presented. What soon becomes evident, however, is that the postmodern concern for appearances has not disappeared totally. For the guilty secret that always seems to haunt this new performative turn

is that these new techniques are ultimately concerned primarily with the production of a new generation of architectural forms. A brief glance at the exquisitely beautiful images selected at the two editions of *Architectural Design* devoted to morphogenesis would seem to confirm this suspicion. It as though the images of natural morphogenetic processes have been selected largely on the basis of aesthetic criteria. This same suspicion also comes to haunt the architectural forms produced in the name of morphogenesis. In other words, the discourse of performativity and form-finding often appears as little more than a masquerade for the generation of new forms, based on proliferating systems or mutating fields, that can easily be generated with the use of new digital tools.[13]

Behind the morphogenetic concern for process and structure, then, there seems to lurk a paradoxical concern for appearance and ornamentation. It is perhaps to nature itself that we should turn for an example of how we might address this paradox. Greg Lynn, in his defence of the use of ornament in architecture, cites the example of how the surface patterning on animal skins – as with a zebra or a leopard, for example – always corresponds in some sense to the armature of bones and muscles beneath, so that the pattern will vary at points of performative intensity, as at hip or shoulder joints: 'Decoration. . . is not applied but is intrinsic to the shape and mathematics of the surface, and in this way the ornament accentuates the formal qualities of the surface; like the pattern of an animal that intricately responds to the shape and structure of an animal's form.'[14] Lynn articulates this in terms of the corrugations or corduroy-like patterning developed in his use of CNC milling machines. These surface patternings, for Lynn, should always bear some relation to structural concerns.

In the context of debates about ornamentation, Lynn would always hold that ornamentation must in some sense 'invite' structuration and vice versa. Inevitably this would imply an understanding of ornament beyond the simple post-Ruskinian sense of the term as applied decoration. Indeed, we should go back to a more complex understanding of ornament, as was articulated by Leon Battista Alberti. 'In the whole art of building,' he notes, 'the column is the principle ornament without any doubt.'[15] Yet, for Alberti, the column was always to be seen as a structural element – a part of a wall: 'A row of columns is nothing other than a wall that has been pierced in several places by openings.'[16] From this we can detect that, for Alberti at least, ornament is always structural, and structure always ornamental.[17]

Hence there is something to be said for approaching the whole question of morphogenesis in a more dialectical manner. For we should recognise that performance and appearance, like aesthetics and function, or ornament and structure, should ultimately be linked. The one presupposes and anticipates the other. The one bears the imprint of the other; the one compliments the other. Beauty must never be ignored.[18]

The ideal way, then, in which to read the designs being produced today under the aegis of the morphogenesis – these performance-based designs whose beauty is somehow never fully acknowledged by their designers – is to recognise performance within appearance, but so too appearance within performance; the aesthetic within the functional, but so too the functional within the aesthetic; the structural within the ornamental, but so too the ornamental within the structural.

Perhaps the real contribution of this new paradigmatic shift in architecture is not

to privilege performance over appearance, but rather to overcome the false distinction inherited through postmodernism and reinforced to some extent by contemporary methods of construction that privilege the façade and conceal the underlying structural logic of a building, that appearance should be divorced from performance, that aesthetics should be divorced from function, that ornament should be divorced from structure.

Digital Favelas by Guilherme Ressel.
This project is scripted using a formal vocabulary derived from the logic of actual favelas and algorithms that evaluate the topography and existing amenities in the surrounding area to generate a pattern of spontaneous urban growth. The design is continuously tested by artificial intelligence that simulates pedestrian movements generating a self-organizing process of urban landscape formation.

URBANOIDS, Budapest by Krassimir Krastev and Fabiano Friedrich.
This project for urban renewal is generated by two interconnected processes, a multi-agent system that simulates pedestrian flow, and a genetic algorithm that breeds optimal profiles for the buildings based on Space Syntax logic of visibilities and sun path studies.

Bone Beam by Ismat Hossain, Noor Abid Hassan, and Slobodan Velevski
This project seeks to replicate the process of development of a bone, using cellular automata and an iterative process of shape annealing responding to varying intensities of external loading. The result is a beam with internal structure replicating that of a bone.

eifForm installation, Amsterdam by Kristina Shea with Neil Leach and Spela Videcnik.

Notes

1 Morphogenesis is derived from the Greek terms, 'morphe' (shape/form) and 'genesis' (creation).

2 On this see Michael Hensel, Achim Menges, Michael Weinstock (eds.), *Emergence: Morphogenetic Design Strategies*, London: Wiley, July 2004; Michael Hensel, Achim Menges, Michael Weinstock (eds.), *Techniques and Technologies in Morphogenetic Design*, London: Wiley, March 2006.

3 As Achim Menges comments: 'Architecture as a material practice is mainly based on design approaches that are characterised by a hierarchical relationship that prioritises the generation of form over its subsequent materialisation. Equipped with representational tools intended for explicit, scalar geometric descriptions, the architect creates a scheme through a range of design criteria that leave the inherent morphological and material capacities of the employed material systems largely unconsidered. Ways of materialisation, production and construction are strategised and devised as top-down engineered, material solutions only after defining the shape of the building and the location of tectonic elements. . . An alternative morphological approach to architectural design entails unfolding morphological complexity and performative capacity from material constituents without differentiating between formation and materialisation processes.' Achim Menges, 'Polymorphism' in Hensel, Menges, Weinstock (eds.), *Techniques and Technologies in Morphogenetic Design*, p. 79.

4 See Mark Burry, 'Virtually Gaudi'; Mark Goulthorpe, 'Gaudi's Hanging Presence'; Lars Spuybroek, 'Softoffice' in Neil Leach, David Turnbull and Chris Williams (eds.), *Digital Tectonics*, London: Wiley, 2004.

5 As Alejandro Zaera-Polo and Farshid Moussavi comment, their interest is to recognise the other disciplines in the building industry not simply as offering a service that should be treated as an afterthought in the design process, but rather an important range of design considerations that should be embraced and incorporated into the early stages of the design process itself. Farshid Moussavi and Alejandro Zaera Polo (Foreign Office Architects), 'Rollercoaster Construction' in Neil Leach (ed.), *Designing for a Digital World*, London: Wiley, 2002, pp. 80-87.

6 On this see 'Introduction' in 'Design by Algorithm' in Neil Leach, David Turnbull and Chris Williams (eds.), *Digital Tectonics*, London: Wiley, 2004, pp. 4-12.

7 On this see Manuel Delanda, 'Deleuze and the Use of the Genetic Algorithm in Architecture' in Neil Leach (ed.), *Designing for a Digital World*, London: Wiley, 2003, pp. 117-120.

8 On this see Michael Weinstock and Nikolaos Stathopoulos, 'Advanced Simulation in Design' in Hensel, Menges, Weinstock (eds.), *Techniques and Technologies in Morphogenetic Design*, p. 56.

9 On this see Chris Williams, 'Design by Algorithm' in Leach, Turnbull and Williams (eds.), *Digital Tectonics*, pp. 78-85.

10 Annealing refers to the method of heating and cooling metals. The eifForm program simulates this process, so that the eventual form 'crystallises'. The process is stochastic because it contains a random element to the search process, which is controlled to allow for exploration of concepts that are initially worse than the current design. It is therefore also non-monotonic, in that it is constantly under revision, often negating previous developments. For a discussion of the eifForm program see Kristina Shea, 'Creating Synthesis Partners' in *Architectural Design*, no. 72, pp. 42-45.

11 See Manuel Delanda, *War in the Age of Intelligent Machines*, New York: Zone Books, 1992; *A Thousand Years of Nonlinear History*, New York: Zone Books/Swerve Editions, 1997; *Intensive Science and Virtual Philosophy*, New York and London: Continuum, 2002.

12 D'Arcy Wentworth Thompson, *On Growth and Form*, New York: Dover Publications, 1992; Steven Johnson, Emergence: *The Connected Lives of Ants, Brains, Cities and Software*, London: Penguin, 2001; Stephen Wolfram, *A New Kind of Science*, London: Wolfram Media, 2002. On Emergence, see also Eric Bonabeau, Marco Dorigo and Guy Theraulaz, *Swarm Intelligence: From Natural to Artificial Systems,* New York and Oxford: Oxford University Press, 1999; John Holland, *Emergence: From Chaos to Order,* Oxford: OUP, 1998.

13 This somewhat disingenuous outlook echoes in part the criticism of ornament on the part of Adolf Loos. Architecture, for Loos, is a question of function and not art, and in his famous essay, 'Ornament and Crime', he launches a tirade against ornament as some form of decadent excess. Yet the very sumptuousness of his own architecture suggests that ornament was still a primary concern for him.

14 'The Structure of Ornament' in *Digital Tectonics*, p. 65.

15 Leon Battista Alberti, *On the Art of Building in Ten Books*, Neil Leach, Joseph Rykwert, Robert Tavernor (trans.), Camb, MA: MIT Press, 1988, p. 183.

16 Alberti, *On the Art of Building in Ten Books*, p. 25.

17 Here I need to question my own translation of Alberti's treatise on architecture, *de re aedificatoria*, on the subject of ornament: 'Ornament may be defined as a form of auxiliary light and supplement to beauty. From this it follows, I believe, that beauty is some inherent property, to be found suffused all through the body of that which may be called beautiful; whereas ornament, rather than being inherent, has the character of something attached or additional.' (Alberti, *On the Art of Building in Ten Books*, p. 156.) Joseph Rykwert and I translated the Latin word 'impactum' as meaning 'attached'. On subsequent reflection – supported by the views of the Italian translator of the same work, Giovanni Orlandi – I would suggest that this word should be translated as 'embedded' or 'locked into', as in the case of impacted teeth. If so, the entire sentence would need revision. Ornament, for Alberti, is therefore not attached, but integral to structural form.

18 For a contemporary theory of beauty and its social role as a mechanism of connectivity, see Leach, *Camouflage*, Camb., MA: MIT Press, 2006.

Debate on the keynote of Neil Leach

Chair:

Maria Voyatzaki

Aristotle University of Thessaloniki
School of Architecture
Thessaloniki, Greece

Maria Voyatzaki, Thessaloniki, Greece
Thank you, Neil. I am sure there will be plenty of questions for you.

Vana Tentokali, Thessaloniki, Greece
Thank you very much for the huge spectrum of the architectural paradigm of morphogenesis you gave us. I will explain firstly the starting point of my departure so that I can be clear when I ask you the question that will follow. The starting point of my departure is that in order to understand the reality you have first to describe it. In order to describe it, you have to find if a certain kind of perspective is possible. If it is a philosophical perspective, and if it stems from Deleuze, as you mentioned, how can you describe this architectural paradigm of morphogenesis based on the nomadic that Deleuze talks about? Let us consider what nomadic might mean. I understand nomadic to mean not something that moves like an object or a subject, but that moves like an idea. Keeping this in mind, and thinking of other notions or concepts that were introduced by Deleuze, such as fold, and let us take first what fold means for this kind of transformation within the architectural paradigm of morphogenesis, what can you say in terms of the description of this paradigm? Do you think that this is a literal transformation? I mean, fold does not mean a literal fold; it is not something that is literally folded. My own perspective is that it is very easy for most of these projects to perceive a kind of literal transformation or literal translation, if I may use that term: what is your own perspective, philosophically speaking? Starting from Deleuze, of course, because you mentioned him. Do you believe that the translation of fold is literal or not?

Neil Leach, London, United Kingdom
I think that is a very interesting question, and I would say that I think a lot of philosophers have suffered in some way from that kind of appropriation, especially Derrida, whose main discourse is a discourse against appropriation. I find it astonishing how his work has been appropriated according to a certain stylistic sort of world. Another example is how the work of Martin Heidegger has been appropriated by someone like Dalmon Maysly and turned into something that is a long way away from his thinking. But that has always been the way, taking a philosopher and creating an aesthetic that has nothing to do with his work. Now, I think the danger with Deleuze's work is precisely that people pick up on certain concepts that he treats, such as the Baroque or indeed the fold, and literally trying to materialise those things; but that is not what I am talking about. For me, as I think I mentioned the other day, Deleuze is someone who talks about ways of thinking and not about forms. And I think that the crucial way of thinking he was talking about was the Gothic spirit, which he contrasts to the Romanesque or the Classical: in other words, thinking about things in terms of forces and flows versus imposing a sort of aesthetic template on the world that might be said to derive from Vitruvius' understanding of proportion. That is the kind of dialogue we find for ourselves – not that you can separate them, because they kind of fold into one another. So I am not talking about folding literally. Now the folding, I think, basically comes from the manipulation you can do with certain software programmes, especially Maya; and that is another question, how it expresses itself. And I think that in many ways there is a danger that Maya has come to dominate things; but that

is not what I am talking about in terms of Deleuze. I am referring to the systems of thinking, the reforming of architecture, and the forming of an approach towards architecture. So I would never want to take a literal term that seems to talk about an architectural form and apply it in those ways. Another thing I would stress is the fact that even if we are talking about structural performance we have to look at how that falls into appearance. And it is strange, I think, in many ways that the kind of logic that is coming out of, say, the N-TECH group in the AA, which is based totally on structural performance, is actually looking for an aesthetic. Then there is the work of Rem Koolhaas, for example, who tries to justify things in objective terms, in terms of diagrams and processes and so on, but in the end, as Peter Eisenman pointed out, wants to produce a beautiful form. So I think that there is a problematic kind of question of what lies behind all this in terms of an aesthetic agenda. And I will be the first to criticise it, because my book Camouflage is written precisely about this question as well. But what I want to do is simply to try to focus on what I see as a kind of shift that is inspired by some ideas from Deleuze, that is articulated through De Landa's work and that is setting a new agenda. And I think that what De Landa actually does is to appropriate a small section of Deleuze – I mean, vis-à-vis Guattari – and to focus mainly on a kind of scientific logic, a kind of performance logic of that. And to see that actually it may be necessary, in a post-modern world that is too dominated by images and commodities, to try to find another logic to celebrate right now in order to redress the balance. So it is more of a strategic logic to try and pick up something from Deleuze's thinking about processes, about forces and flows, and use that to challenge the new ways of thinking. So it is not about forms, it is about ways of thinking.

Vana Tentokali, Thessaloniki, Greece
I have the impression that your answer is somewhat defensive, because you started talking about Derrida and Heidegger. I will persist in asking you about Deleuzian thought and how this thought is translated in the paradigm you showed us. My question right now is whether, based on your own perspective at least, I have a right to name it. Only you, of course, have the right to name your own perspective, and of course I respect that absolutely; but I insist on asking you if you give yourself the right to use this sentence, for instance, the one you mentioned by Eisenman, about looking for the beauty of the form, after all this?

Neil Leach, London, United Kingdom
That is such a good question: I would not want to give anything away. No, actually, what I find interesting (and I really do think that your question is a very interesting one) is that I was talking to Serenati about these things, and he said that he was not interested in engineering; he was interested in engineering in order to get beyond engineering. I think there is a kind of dialectical process at work. My book Camouflage is precisely about the problem of beauty which you have in architecture. It started off as an essay about Rem Koolhaas, where the letters A and O appear in the word 'camouflage', trying to look at this kind of repression of anyone addressing the question of beauty, of which I am, naturally, as guilty about as anyone else. I think that the problem of beauty and how we understand beauty exists in architectural culture from

Vitruvius onwards. If you look at the kind of terminology used to describe beauty in Vitruvius, it is all about moral terms, of appropriateness, of becoming, and so on; and then we move into the 20th century and another allegory is used to explain beauty, that has to do with the revolutionary, the democratic, and so on. There are all these strange logics that architects hide behind in order to address the question of beauty; and I do not know how to answer your question except to say that I think that you are absolutely right, there is a problem there, and I am as guilty as everyone else because in the end I am absolutely obsessed with beauty in a certain sort of way. But I think probably the issue ultimately is not necessarily to see it as one versus the other, but to see a healthier way in which these questions can be bounced against the post-modern background, where people were very superficially concerned only with ornamentation and aesthetic concerns as against questions of performance. I think deconstruction is an example of that. I think deconstruction in architecture is highly post-modern, and does not address any of these questions.

Rivka Oxman, Haifa, Israel
Thank you for a beautiful lecture. It was so informative, and really the whole scope of the field was revealed, and it was really very enjoyable. Anyhow, I have a question or a comment, just so that I can hear your approach. Many of the ideas that were already there twenty years or more ago, are appearing, for example, in association with the computer field: for example, AI technique styles and genetic algorithms were there and were used in certain areas. So it is very interesting to see how they are reused – they are not reinvented, they are reused now. One of the reasons for this, I think, is perhaps the fact that technologies, graphic digital technologies especially, have developed so far. I remember that when we were doing some experiments that were probably like Urs's and other's, in the same kind of research community, we did not have the possibility to have this graphical media attached to the genetic algorithm. Even when Christine O'Shea presented her work in Portugal, and actually here in Lisbon, in 1998, it was all about a grammar and taking her programme and putting it in a new context, and it was very interesting. But I think that AI and other computational fields should deserve some kind of recognition.
The other thing I wanted to mention was regarding a shifting paradigm. I think it was Kuhn who said with regard to paradigm shift that you really recognise when the paradigm shift is there only looking backwards; so we never can predict a paradigm shift, but only reflect and look backwards on what has happened.

Neil Leach, London, United Kingdom
Just a couple of comments on that. Firstly, I was taught in Cambridge where everybody was reading Heidegger and nobody was talking to the Martin Centre, a research centre, no one was talking to the engineering group, nobody knew that Christine O'Shea was sitting in a building next door behind the School of Architecture; and what happened is that basically they started producing generations of architects that were unemployable because they could not use computation methodology. And what actually was a source of inspiration for me was when the Cambridge school came to London and started preaching to people in London about how they should be doing things, and I was so incensed that I set up two conferences for the RIBA think-tank building

studies group to look at this question. I just think that one has to be open-minded about these things – critical, but open-minded to possibilities – because I think that architectural culture can be very conservative sometimes, and I think that education establishments can be very conservative. And I think that what is pushing things ahead right now are people like KPF, where Neri was working, or indeed SON, where Tobias Finn works. They are the ones that are pushing things forward, and recognising that is a vital part of what we should be doing. And if we want to make students employable right now we should be teaching them scripting, we should be teaching them KATIA, we should be teaching them generative components, and so on.

Then in terms of the issue of a paradigm shift, actually I am not that keen, I am somewhat nervous, about using this term. I think that in the end it is more to do with what Foucault would call a kind of epistemia, a kind of savoir body of knowledge, how you look at the same things in a different way. In other words, a paradigm shift could be the result of how, having followed a kind of Newtonian model of physics, you shift to an Einsteinian model, where if you reconfigure things in the same way it does not just have to do with a different set of preoccupations. I am not so sure I would use the term paradigm shift myself, but for sure there are things that are changing. I think that mutation is fundamental to human operations, which is why I would like to use the term mutants to describe the kids today, the students we are teaching. So there is a change for sure, but I am not sure it is a paradigm shift, as such.

Saeed Arida, Cambridge, U.S.A.
Thank you. Neil, I really liked that experimental spirit you showed in the project. I just have one question about you being a famous theoretician and educator and curator, and I think you play a very important role in presenting a coherent picture of what this shift is, whatever one chooses to call it. I think that what one thinks of as progressive plays a really important role in how one collects this data, this material. So, my question is: how do you define what is progressive? Because what struck me at the end of your speech was what you said about Columbia and Mark Whitley, that it is not progressive. For me it is more progressive than what some other people are doing, because at least he is trying to take the school away from ten years of, for me, meaningless digital stuff, because I think that they do not really understand what digital technology is. And what struck me also is that even the AI people are now kind of clueless about the computer and what it does, and they are kind of stuck at a wall that they cannot get past. Even Chomsky, or Marvin Minsky, who has this new book called The Emotion Machine and tries to go beyond the numbers and the Turing machine. Mark Wigley, on the other hand, is trying to establish this C-lab or something in collaboration with Volume Magazine and AMO and such, trying to engage again with culture and stuff and to move beyond the numbers. So I am really curious to know how you define progressive.

Neil Leach, London, United Kingdom
That is a really good point. I mean, to be honest, you cannot just flick through a catalogue and look at forms and make a judgement on that, because, actually, what I am talking about is precisely getting beyond forms themselves. I also think that there is actually something very conservative about the way a lot of people use computation methodology. I mean, just scripting when you are using no kind

of performance criteria is just producing forms in a very, very old-fashioned sort of way, and to my mind that is why I teach theory. But I also teach design, because for me it is important for theorists to be involved in design and also for designers to be reflecting in a theoretical kind of way. And I think that it is important to the notion of criticality to bring that in, and I think that that is possibly what Mark Wigley is teaching. I have not taught at Columbia for a while, so I do not know what his basis is; but the idea of traditional critical theory is to question things, not just to see something new as being good in itself. So I think you are right, I should not be commenting on certain forms and just very sort of superficially saying those things, and in any case that catalogue depended on who had collated the material for those particular schools.

Saeed Arida, Cambridge, U.S.A.
How do you define progressiveness? What would you say being progressive means?

Neil Leach, London, United Kingdom
Being progressive? I think in a nutshell it means being open-minded to the potentialities that are presenting themselves today in a critical fashion.

Saeed Arida, Cambridge, U.S.A.
And if we look at AI, which is kind of the model that shows us what computation is about and referring back to Chomsky and Marvin Minsky and all those people, you kind of feel that the field is stuck. Even at M.I.T. there is no new research being done, and it seems like the field is diminishing. So we can see already that the limits of the Turing machine are in front of us. And in architecture, now, because we are so new to it, and not being very critical, we call that progressiveness. For me, I think that we have only to look at AI to see that we need to find something, some system, where one plus one does not equal two; that the creative process has something more than the Turing machine.

Neil Leach, London, United Kingdom
I think that the fetishisation the computer is potentially very dangerous. There is a form of material computation in the world as such, but it is infinitely more sophisticated than the kinds of things that we can do digitally. I am reminded of a comment that Cristiano Ceccato often makes. Cristiano was one of John Fraser's graduates from the AA who went and did a degree at the Imperial College of Computation and now works at Gehry Technologies, and he if anyone knows about how you can use these techniques, and he just had a baby and he said that there is something way more impressive about how nature itself operates than any of this digital stuff. But that was a nice question, thank you.

Closing Session

Chair:

Maria Voyatzaki
Aristotle University of Thessaloniki
School of Architecture
Thessaloniki, Greece

Maria Voyatzaki, Thessaloniki, Greece

With great relief, after a long two and a half days, we have come to the beginning of the end; and since this is the beginning of the end, we probably should start from the beginning. I say we, although I have not shared my thoughts with the others, since we have no time to do that. So I will begin by giving my own thoughts before passing the microphone to the other people who worked so hard for this to happen. As a Greek I have an infatuation with plain words, and using this epilogue, or επίλογος, as an apology, or απολογία, which I hope will not become a monologue, a μονόλογος, I will try to grapple with the title, which we so struggled to come up with, so that we can all recap on what we have come here for. Teaching and Experimenting were the first two keywords of this title. With hindsight I would say they are probably synonymous, or a tautologous grammatical phenomenon or structure. That is because no one teaches us how to teach; therefore, when we teach we experiment. So when we say teaching and experimenting, it is like saying teaching and teaching or experimenting and experimenting. That is a point of criticism that Kas Oosterhuis comes to resolve, asking me what this is all about. And when I start giving Kas and Ilona the title, they tell me that they do not experiment, they do projects. Then comes the realisation that we have a puzzle with missing pieces that we have to try to fill in during these two and a half days. Then along comes Constantin Spiridonidis, with the reassurance that there is no problem, because we no longer teach on the basis of problem-solving: the premise on which we base our educational activity, pedagogy and teaching is the project. So there is no missing element any more because those two have answered the question.

Then one can tackle the second part, that speaks of "Advances in Technology and Changes in Pedagogy'. One could say after our discussions here that this is all about societal changes rather than advances in technology, and that the contemporary digital era is what accommodates these societal changes. Whether it is means, tools, operations or systems that we have been going on about for the past two and half days, which I will not get into because that is a long discussion in itself, I will say that our job, since as educators we work with intuition and we experiment in what we do, is, as it has been all along, to sense the societal changes of our time and see where we stand. And I feel that the digital era is about information flow. We are in an age where we have to deal with complexity much more than at any other time, because of the speed that the digital era has imposed on the flow of information; therefore, teaching architectural design is about teaching the complexity of how to manage information. We are thus in a situation where we, along with the students and not before the students and for the students, search for, generate, use and manage information. Design and the building that comes from the design is a system of information that flows in it, be it a process or a product. In this multifaceted, multi-layered situation we experience seamless flows of information; we borrow, as we have always borrowed, from other sciences; but we look at things, as Neil Leach mentioned a minute ago, in different ways. We have different Derridian ways of reading information in different ways, and we still borrow, as we will continue to borrow, from the Cartesian, Euclidian, non-Euclidian, up to the five dimensions that are Marcus Novac's premises. Maths has always been used as a premise for architecture but it has been used differently; as an attitude or a problem-solving activity in the 70s to current situations where we

find computations and numbers, the use of revolutionary geometry, and where we end up using once more, after years and years, from different starting points, D'Arcy Thompson's "On Growth and Form" as a diachronic literature.

Going back to when we put the call together, I want to mention that we have a very fancy editor of our newssheet, who goes into detail and scrutinises every single word of it, and we are very pleased to have her. In the EAAE newssheet you received there is a very carefully written piece of information, and she got back to me and asked if I wanted it proof-read, and we said OK, since we are all foreigners apart from Sean Hanna, so we would have some guarantee that the English is good; and Anne-Elizabeth Toft got back to us and said she would have it proof-read. So she found a native speaker who is not an architect, and got back to us again and told us there were problems in the text, that we used both 'lab' and 'laboratory' and we had to choose. That was very interesting, because it has a lot to do with the relationship that we have developed since last November working on this particular workshop, for we agreed on this distinction when we were putting the call together, because it reflects certain connotations: lab, meaning digital era, meaning 2007 operations, as opposed to modern movement laboratories with white outfits and designers looking like psychiatrists. So we got back to the editor and told her to leave it, we mean "lab" and "laboratory".

Last but not least, I want to refer to what I deem to be a very healthy confrontation between two very powerful women in our group, Professor Rivka Oxman and Professor Vana Tentokali, with regard to students, when Rivka mentioned something about looking down at students. I found this a very interesting episode indeed, and as my last comment I want to say that I think we should look at it the other way round as well. Looking at the presentations that the students have given over the last two and half days, it occurred to me that instead of us looking down at the students and lowering the level in order to communicate with them and not get too high up and lofty, perhaps we should be raising the standards to make them look up to us. We should try to be up to date and to understand what is going on. We must open our eyes and realise that these things are not new to everyone; they are being done and they are being done by people like Kas. What Kas says is not new; it is new to everyone else but it is not new to him. So we have got to open our eyes and realise that there is something going on here that is different and we have to look at it.

So, I will give the floor alphabetically to the members of the committee to give their comments and accounts of the workshop, beginning with Oliver Fritz. Oliver?

Oliver Fritz, Vaduz, Liechtenstein

Thank you, Maria. I want to begin by saying that I have the feeling that while we have heard many different opinions, there are some points that fit together. We also heard, from Antonino, that there are some paradigms, some new paradigms, some changes. We saw many projects made with digital processes, and I have the feeling that we have to realise that something really has changed. I think that the main change is the speed of everything. Everything has changed very fast. Ten and twenty years ago, we would realise that something had changed ten years before, and now things change every year. Take, for example, the mobile phone. It is a new thing, only ten, twenty years old, and now every one has a mobile phone and everyone is

accessible all the time, and this is a totally new thing. In this room there must be five or ten thousand processors, and that is a totally new thing. There are so many changes, and the technology also changes faster and faster. That means that it makes no sense to teach only the technology of today, because tomorrow it will be out-dated. Similarly, there is little point in teaching a particular software; it makes more sense to give an overview of technologies and the possibilities these technologies open up. Or you start to experiment, because with experiments, in my opinion, you start as a student to think by yourself and you learn how you can learn. I think there is a very interesting difference between learning from books and learning by doing. This, I think, is the main point of many of the projects we saw here, where students learn by doing, by trying out the material, whether analog or digital it does not matter. That was something we saw in many projects, and that is what to me is the most important thing.

Sean Hanna, London, United Kingdom
I am a bit hesitant to try to sum up, because there is a lot here that I would not be doing justice to; it is very complex. Instead, I will go back to some of the key words, particularly from the first day, and some of the key notions that were reflected, things like 'non-standard' and 'diversity'; and I will try to relate those to teaching. We have seen, I think, a lot of standards; but perhaps they are no longer standards of form, but standards of process and standards of methodology. In my view parametric design as a technology is a really good example of this. It is something that people always try to explain as something that allows us to defer our decisions; but in fact in making a parametric model you have to be very, very precise, and you have to set a standard right at the beginning that you then follow, and while you can change its dimensions you have to keep it as a standard all the way through. This, I think, is the kind of thing that we are seeing in some of the more high-tech studios that we have seen; also, particularly in the unit system that we have in a lot of schools, there are very definite standards, probably of process and methodology. And I think that one of the initial thoughts in ranking the initial call for proposals was that a few of us expected that strict methodologies might have been a bit of a thing of the past, and what we might see in a lot of the papers was something along the lines of performance being the driver for education. I know, Neil Leach mentioned performance a few times. We expected, at least, I know I certainly expected, a lot of papers having to do with optimisation and goals. But in fact it has been a bit of a surprise to see that this is not the case, that there are so many very strong methodologies set up; but it seems to me that the strict sort of method allows for a lot of experimentation within its constraints, and with experimentation you get a lot of surprises, not just from the students' point of view but also as teachers – we are just as surprised by the outcomes as the students are. A lot of people have said this better than I have, I think, but we may perhaps be moving away from a sort of ideal of traditional design being the starting point of a complex problem that we are trying to solve, a complex sort of classical studio project, architectural project, when we work towards something with some kind of predefined aesthetic goal. We may perhaps be moving towards something that is more along the lines of a research model, where we start off with a definite process, perhaps a scientific or some other method, but the

search is completely open-ended and none of us really knows what to expect. That, I suppose, somehow reflects what Oliver was saying about the speed of technology and the speed of experimentation.

That is why I do not want to try to sum up, even though this closing session is probably meant as some sort of conclusion where we draw some message out of the whole thing. But I just want to leave it at that and enjoy the complexity of what we have seen.

Johannes Käferstein, Vaduz, Liechtenstein
At the end of the session yesterday I took the opportunity to ask a question. It was basically a rhetorical question, which I left open; and, speaking for myself, I feel I got some answers. The question I put to the room was whether we were experimenting with the tool or we were experimenting with the subject itself. My view is that we are experimenting with the subject as well, not only in communication and the flow of information but also in construction, in materiality and also in space. But I think that we have to be tough on ourselves, because experimenting as we are doing it in our world is something that we should see as a privilege; it is not something that everyone can do. As Per Olaf said, we are all very well fed. So again I repeat, experimenting, the way I see it, is a privilege and a responsibility. We have this privilege and this responsibility and I think we should really try to focus on what we are doing, but at the same time to enjoy it, because I feel that it offers real possibilities of enjoying and working. We have also seen a lot of shape, a lot of forms and objects; but there is much more to architecture than that. I mentioned that we can experiment with construction and materials in very modern and high-tech ways, and I think Fabio Gramazio and Matthias Kohler showed a fantastic example of it this morning.

One thing that emerged very clearly from Neil's approach is interdisciplinarity. I think we have to work with other people, with other people who know different things. This, it seems to me, is how we can focus. We cannot just generate things that have or that might have an aesthetic value. This, I think, is one of our big responsibilities; and one of the things in the European context that all our schools are working within in their curricula is precisely this interdisciplinarity.

One last comment. Neil raised an interesting question when he remarked that in all schools all over the world projects seem to be quite similar; and it made me wonder where place comes in, for as you know there is a very traditional discussion about place. I don't know how to answer that, and he is not here now, but in the projects we saw from the different schools today, where people were working together with engineers, things really seemed to come together but somehow the place was not the same. On one hand we are building in Beijing and Shanghai, on the other we are building in Lisbon and Zurich and Berlin, and it all does look very similar. So that was a question I wanted to put to you: where is this place?

Dimitris Papalexopoulos, Athens, Greece
Thank you very much. To my way of thinking there is good news and bad news. Let us start with the good news. It was certainly a very rich conference, and very well timed in relation to what is happening in education and information technology and in relation to information technology and architecture in general. After twenty years

of experience it is time that big advances, new technologies, are incorporated, with whatever difficulties, into the curricula of schools of architecture. I have the feeling – let us just say that I am totally wrong – that it is also the moment we most clearly see an institutionalisation of the new: that is, a weakening of the critical dimension and the appearance of rigid protocols of thinking and doing inside and outside the schools. Is this, you may be asking yourselves, the good news or the bad news? It could be either: we observe ambivalence, you see. There was an ambivalence between what Neil said and how he replied to the questions. Another piece of good news is that this is the moment when we have a third revolution within the change of the famous paradigm, in that we have passed from the computer to the network and now to the ambient intelligence. It is a time when we no longer talk about architectural objects, or teaching architectural objects, but we are interested in particles on all scales; so we have something like a third change inside the big change. On the first day Constantin raised the question of new ways of teaching related to digital tools, and that was also Per Olaf's proposition when we talk about tools, processes and products. I think that this conference has tackled the very difficult question of tools in a very rich way. What is a tool? A tool is a device that catalyses relations; it is something that builds relations and something that changes relations. In that light I think that we can clearly position all the papers we had in this conference; I started to do that, but did not finish. It is very interesting that we have changes, not in the thinking, but in the relations between the participants, in the design construction process, in the teaching process, in the relations between the design construction process and the connectivities they refer to, in the relations between teaching and the professional design construction process, and in the relations between teaching and the connectivities. This is a very, very interesting matrix, which could lead us to some kind of new play. The so-called tool manipulates information, of course; but I think that as relations are changing the tool is changing too, and this in my view is the main problem facing us teachers who use this famous digital tool. We are teaching with an evolving tool, a tool that does not even evolve by itself but under the impact of our input. Ultimately, then, what we have to teach is change; we have to teach students to react to change rapidly, and also to be participants in change; we have to teach them not to be afraid of change. I will stop here with this thought, that we have to teach them how to react to change; the change that we provoke, and that we demand of students to provoke. We cannot be innocent and demand students not to be.

Antonino Saggio, Rome, Italy
As usual, I have prepared some images for you, so that you will not be disappointed this time. First of all, very briefly, we are lucky to have a built world with a multiplicity of choices, a multiplicity of points of view; and we are not as interested as we used to be decades ago in being right. What we are interested in is to be in projects, and projects are individual points of view. But we must be clear about what we intend and what we do not intend, so for me this problem of the paradigm shift that I mentioned yesterday is absolutely critical. I do not aspire to convince anyone, but I have to make my point; and, in order for there to be some kind of relationship here, you have first to understand what my point is, and then you may refuse and build your own.

From my point of view, the question I asked yesterday was purely rhetorical. It is twenty-seven years since Alvin Toffler wrote his fundamental book, The Third Wave. Toffler's point is, I think, perfectly familiar: that we are in a completely different age of humanity, because production systems are based on the value of information. Information is in everything; it is the element that increases economic value. This is old news, and from my point of view it is absolutely a given that we are in a different moment in the history of humanity.

The second concept, again pretty straightforward for me, is science; and in this case to some extent we can certainly see pedagogy as part of that, which at a certain point tried to adapt, tried to change a bit in order to respond to circumstances. But that is not always possible. There are moments when jumps must be made, and this is basically what this point is about. Now, when I was commenting on the different pedagogical systems that have been shown in the presentations yesterday, what I noticed was that the pedagogical systems that we focused on represented important shifts in their times, shifts that were made in order to respond to major shifts in society and major shifts in the economic way of building value. We do not understand anything about the burning of the Polytechnic if we do not understand what happened at that moment of modernisation, of political, economical and industrial revolution, and so on. We do not understand anything about the Bauhaus pedagogy if we do not understand what was happening at that time. So this is a key point in what we are discussing; from my point of view, what is really interesting is not only the experimenting, the teaching and the way of being updated that Dino talked about, which is fascinating, of course, but it is not the core. The core for me is the changes in pedagogy. This is what I am really interested in, and this as I see it is what our round table is about.

Now, just one small thing. It is not an accident that I call my book series IT Revolution in Architecture; these things are consistent. We believe that there is a paradigmatic shift in the old society and that architecture has to be revolutionised. That is why we called it IT Revolution in Architecture back in 1997. We have done 31 books in this series, as some of you know; these are the last seven, which are available, unfortunately, only in Italian. Anyway, let us try to build what from my point of view, because this is a chance for sharing ideas, could be this new pedagogy in a moment of cultural shift and paradigmatic shift, because of the relevance of information technology. This, then, is the second part of the talk. I am interested in understanding what kind of new pedagogy we can imagine, because we have to imagine it first, in order to make the shift that, I think, is a fact. I do not know how many of you were in Venice with us, but in Venice we built an important piece of this, all together; and I assume that this is in some way a continuation of the discussion we had in Venice. You may remember that I showed this image in Venice as an example of a very hierarchical approach to something that needs a much more deductive, iterative and spiral approach in teaching and in other things that we discuss, such as the relevance of information as Maria beautifully put it in the beginning, and other issues.

Now let us come to Oliver. There is a very beautiful movie that was made very recently, in Italian; I do not know if it is going to be translated into English: I hope so, but it will probably share the same fate as my seven books. The title of the movie

is 100 Names and it starts with a very dramatic scene. What you see in this picture is a library – the library next to the Borromini ? in northern portal/Porto – where a professor kills one hundred volumes, one hundred big names, where, in other words, a teacher destroys one hundred very precious books, and this act sets off a whole complex regeneration in his experience. You may ask why I am showing this to you, or why I think this is important; and the answer is because, if we have to change pedagogy, we have to decide very clearly what we do not want anymore. The first act of creation is to be sure of what we do not want anymore; because we cannot imagine anything, we must refuse first. All creation is preceded by rejection. Do not panic, I am not saying that it is books that must necessarily be rejected: it is the rejection itself that is important. And presumably we still remember that we are in some way involved with the creation of the architect and of the tools; probably not the same type of architecture however. So now we have to try to build a new model of pedagogy, a new system – I mean, I have to try to build my own: I do not presume to be sharing it with you, but you are free to take notes.

OK. What was the architectural model that we were facing in architectural education, at least in the large majority of schools around the world? The idea basically that you can chop knowledge. You can separate different aspects of making architecture, of planning, and then you can basically build knowledge by chopping that. How? My school works like that and I see many other schools that do so as well: there is the science of construction, there is city planning, there is the history of restoration, there is drawing. Around that kind of system you build knowledge, you build power, you build a way of transmitting knowledge. That is the basic model and I am sure that it is used in 80-85% of schools around the world in one manner or another. So how do we change this? How do we destroy this? Because we have to destroy it – at least, if I have to imagine, I have to destroy this. Why I have to destroy it is a long story, and it is something we discussed in Venice quite extensively. As we also discussed the loss of the idea of functionality, we discussed multidisciplinarity and interdisciplinarity, we discussed the disappearance of fixed knowledge and the importance of the Internet – because the Internet is one of the greatest things that ever happened to humanity as a way to access knowledge and information through a completely different process. So this, plus the paradigm shift, plus the fact that we build value in completely different ways, draws me to the point where I have to destroy that. Destroying, of course, is a tough act, and that is why we put the book here, your book – it has become Oliver's book from now on, I will let you take all the responsibility of this.

Now, if I had the power, I would do it this way: I would formalise something based on cycles. I do not know if these cycles would be organised by years, by decades, by weeks, or by hours. I do not know, but basically there would be these five fundamental cycles. Today, how you read, how you look for knowledge and how you formalise questions are the absolutely primary aspects of a new pedagogy, particularly the ability to formalise questions. How to formalise questions is a very, very important point, and I particularly appreciate the presentation of the young person from this school on that topic, because it is clearly important that this action, the ability to formalise questions, is absolutely fundamental to the new approach. Knowledge is no longer something static that can be found consolidated in books. Knowledge is there. The

way Google is moving forward every day, every second, it is basically the receptacle of the knowledge of all humanity. The problem is not that the knowledge is not there, the problem is how to access this knowledge. And what Neil Leach said about knowing Chinese to get the best thing is very interesting from that point of view and from that perspective. So that is something that should be taught. The second thing is how to create processes and deal with complexity; and this idea extends from the idea of programming to the idea of gaming that is as another series of actions that I think is very important to incorporate and include in the formalisation of a new pedagogy. Then, third, is how to formulate hypotheses. This is an intellectual step considerably higher than the previous two: how to develop hypotheses and develop a continuous spiral hypothesis-testing process that is concentrated in a domain of possible definitions and solutions. That is basically the cyclical approach of tests and hypothesis tests that is in my view the base of modern thinking and what we are interested in here. Then, a fourth thing we need to teach is how to build in reality. This is absolutely fundamental for architects, and we had two very good examples of that process here: the Gramazio-Kohler approach, that moves in this digital paradigm but comes from a hard Swiss tradition and history of construction understanding, and the quite different approach exemplified by Kas Oosterhuis, who directly addresses issues of incorporating the digital idea in a new phase of construction, because interactivity is something that from our world of computers moves into the realm of reality, and that is a fundamental action. Finally, the fifth, and extremely difficult, thing we have to teach is how to evaluate processes, how to evaluate results, how to interact with the actors, how to develop a critical innovative thinking.

On this basis or something like it we can start to rethink a way to approach changes in pedagogy, if this is the issue. Probably, of course, none of us will have the possibility to put this dream into action, or perhaps some of you will have some pieces of these ideas, but in any case I felt this was a nice occasion to share these ideas with you.

Constantin Spiridonidis, Thessaloniki, Greece
I am afraid that after Nino Saggio's intervention I have to close my notes and reformulate what I had prepared to say, in order to give continuity to the discussion he started. So I ask you to forgive me if the presentation of my thoughts is not as structured as it should be.

First of all I would like to say that I completely agree with the proposal to put pedagogy at the centre of this discussion. I strongly believe that the discussion about architectural pedagogy is purely and very profoundly a discussion about architecture, and one that can reveal very interesting values, aspects and ideas about what architecture is. A debate about the education of architects is a very significant debate, because it is inevitably articulated with the contemporary debate on architecture. That is the first point I wanted to make.

The second is the thesis, or hypothesis, that to educate someone (I am trying to avoid the word teach after the discussion we had with Kas yesterday) is a project. That endeavouring to transmit knowledge and to achieve a knowledge base in someone else is a perfect project. As we are both architects and teachers, our main objective is to teach students how to make projects. But we know perfectly well that the way

that we teach our students how to make projects is strongly related to the way that we understand architecture. It therefore follows that different understandings of architecture imply different ways of teaching a project. Over the years, then, we have had different ways of understanding or defining architecture, and as a consequence we have totally different pedagogies and totally different ways of teaching project. Maria has already mentioned the white coats of the laboratory teachers of the 50s.

Before that, it was the atelier. After that we had laboratories where the teachers had abandoned their white coats for grey-green jackets, jeans and yellow-orange shoes, for this was the period when the laboratory was a social laboratory, or perhaps it would be more accurate to say a political laboratory. Then the studio appeared, and all the talk was of the studio; and now, finally, we have labs, and all the talk is of labs. We all, of course, realise that inside this room totally different teaching practices have taken and are taking place, because they are based on totally different understandings of architecture. Therefore, different ways of teaching project, different pedagogies are strongly related to our different ways of thinking about architecture. Every time we have a shift in the understanding of architecture we have, by definition, whether we choose to or not, different teaching approaches, different pedagogies.

The third thesis/hypothesis I want to discuss is not a purely pedagogical one. In the early 70s, or a little before, there was an obvious and very significant change in pedagogy as science and pedagogy as practice. It was a major shift from education defined as a problem-solving activity to education defined as a project. This shift is very significant; and it will probably be interesting to go a little bit deeper into what it involved, because I feel that this will be helpful in the discussion that Antonino initiated with such passion. The words 'problem' and 'project', of Greek and Latin origin respectively, have similar etymologies. I will begin with the Greek for obvious reasons.

The word 'problem' comes from the Greek noun *probleima*, which is derived from the verb *proballein*, meaning to throw forward, from the prefix pro-, forward, and the verb *ballein*, to throw. The family of words derived from the root verb, ballein, to throw, includes *hyperballein*, meaning to throw beyond, to throw far away, to look far away and to throw there; the resulting English noun is 'hyperbole'. The English word 'parable' derives from *paraballein*, meaning to throw alongside, that is to say to throw something into an existing context. Then there are the words *symballein*, meaning to throw together, or compare, from which we get the word '*symbol*', and the word *diaballein*, to throw across, which has come down into English as 'devil', which signifies an obstacle that exists or something that I overcome. From this investigation of the word 'problem' derivatives, we can understand that we are speaking about concepts describing the act of doing in architecture: we have to look ahead, there has to be a meaning to doing that, we are acting in a context and we have to overcome some obstacles. This was the approach until the 1960s.

Moving on now to the etymology of the word project, the interesting thing is that the Latin root *projicere* (the French and English forms come from the past participle, projectum) means exactly the same thing with the word 'problem', that is to say 'to throw ahead'. We have the same basic etymological origin, but there is a very interesting difference in the derivatives: subject, object, trajectory,... Indeed, when we are speaking about a project, we have by definition or by necessity to speak about a

subject. There cannot be a project without a subject, and there cannot be a project without an object; nor can there be a project without a trajectory or without what in French we call the surjet, that is to say the additional meaning.

What is interesting in comparing these two definitions is that the person, the subject, appears only in the second case. Whereas in the first we have a rational approach, to throw ahead, in the second we have a more subjective, a more human-centered approach; and as we move towards the present, this logic of doing a (architectural) project –because the project is not something that belongs to architecture exclusively– presumes a completely different conception of the human being. Because we have this different conception of human beings we have completely different definitions of architecture. If we are discussing today the changes in pedagogy it is because we are experiencing this shift. I completely agree with Nino that we are experiencing a very significant paradigm shift, which is accompanied by a shift in the pedagogical paradigm, which is different from the pedagogical paradigms that are already in place. We have to accommodate critically this new paradigm, which is already applied in many schools of architecture.

Let us try to see which are the main structural differences occurred because of that shift from a problem-solving understanding to a project based understanding of architectural education. In the first case we are trying to teach our students knowledge whereas in the second we try to teach our students skills. That is, we are trying to teach them not only what they have to know, but chiefly what they will be able to do by knowing what we are trying to give them as knowledge. And this is a profound change in the domain of pedagogy, because if you start to think of a curriculum in terms not of what we have to teach and learn, as in Neil's presentation, but on the contrary of what the students will be able to do when they finish the educational cycle, then we must think about completely different ways of organising the curriculum, organising our classrooms, how we have to develop our teaching approaches, methods, strategies, objectives, etc.

There is an interesting point to notice in this new approach, with regard to competences. A competence that a graduate from a school of architecture will have is not something very precise. It is a description, but not a very precise one. It is a virtual condition. It is something that could be developed, but we never know what its final form will be. So if we want to define the competences that our students must have when they graduate, it means that we have to define virtually something that could be developed in a way that we cannot exactly foresee. That is to say, we project something like the DNA of the profile of the architect, and we leave it open, and we create in our schools the framework, the environment, within which this DNA will be developed. This DNA, in other words, is a parametric condition – because that is exactly what parametric is, many parameters working together. We will influence some of these parameters, but it is the students with their different strategies, different understandings, etc., who will have to develop them. It is not possible to preview the profile from the beginning; all we can do is preview something common, while at the same time we are assuring something different. This is an interesting representation of the aspirations of contemporary architecture, which is generated, imitating this DNA condition, which is not visible from the very beginning and there are many internal and external parameters that we have to define in order to

achieve the generation of the form. In the case of curriculum the competences are the parameters to be defined.

We are confronting this very significant change and it is our task as schools of architecture to consider it now, not tomorrow; to think about what we have to do in order to move towards a more parametric conception of our curricula and at the same time in order to move from mass production in our educational system to mass customisation. And I say today and not tomorrow, because this new approach has already begun to be institutionalised, as Dimitri mentioned; and of course this institutionalisation is killing the spirit of the new, but at the same time it is provoking another new situation. But we have to react immediately. We have to do something, because if we as schools of architecture or as architects do not, then someone else will do so in our place; and in such a case it would be an imposition that I am sure that would not be as thoughtful as it would if it emerged from our experiences. This is why I invite you to continue this debate. Not only in order to see how many truths exist in this room, because we had the experience to follow at least forty different truths through the presentations, but mainly to find the way to reconcile all those differences into something that will not be prescriptive but will foster our creativity. To speak about the project and more specifically about the educational project is not something easy to pin down and discuss, because a project is always conceived and discussed in absentia, so to speak. The moment that it is realised it disappears. This, then, is why I think that we have to intensify our efforts and, I hope, be able to continue this discussion at another time and place. Thank you very much.

Maria Voyatzaki, Thessaloniki, Greece
Thank you, Constantin. We will now hear some comments from the floor before we close. Let us start with Hernan Marchant and hear a Chilean reaction.

Hernan Marchant, Santiago, Chile
First of all I would like to thank everyone. I think it has been a wonderful exchange. I would like to thank Dino and Maria and the other members of the panel, and especially Joaquim and all our Portuguese friends. I was trying to think about what happened here, what in reality we have and we do not have in this process. I agree with the idea that it is a matter of teaching an architecture; and if we look at what we all presented here, I could see that teaching is a little bit outside the frame, and that mainly there were proposals about architecture. I was trying to discover what we can do to change that. The problem is that we are dealing with two things that are constantly changing: architecture is changing and education is changing; and education has many complicated things to solve, and now I realise that we were mainly talking about a word, tools. But the word 'tools' is chiefly applied to certain tools that develop forms and work with some software, etc., that go in one direction. I think that when we have a problem to solve or when we have to understand something, it is not a tool that we need: it is a toolbox, which is not the same thing. To have a toolbox means to have a set of tools that are oriented in one direction. When we are working with mechanics, we need one kind of toolbox; when we are working with wood, we need another kind of toolbox; but in this case we are working at the same time with education and architecture, so we must build the categories of tools

that we need. I think there is a problem if we are only developing one main tool instead of many. It is like a chain: if a chain has one weak link, it will break and ruin the rest. If we develop only one big tool, we are going to be in trouble. I think that everyone here has used software. The first thing you do when you open a file is to go to Tools, where you find a set: the word processor is one kind of set, drawing software is another set, and so on. So I think that what we have to do first is in a certain way what Nino is trying to do, to establish and to categorise the different elements that we need to develop with the new technologies to build the new tools to make different kinds of things: to make evaluations, to build knowledge, to draw and to make forms – there are many, many elements. We have to categorise them; and I think that we have to find the way to build the tools for each one of those categories. Thank you.

Saeed Arida, Cambridge, U.S.A.
I will just also try to explain what is happening. It is a big question, and I know I am really young, as some people have pointed out. I want to address what is happening in the educational, pedagogical framework that is happening at my school (MIT). I think that up until 1994 and the arrival of affordable digital computing, the design process was very mysterious. There was always the relationship between the master and the apprentice, which was always a kind of mystic relationship that was impossible to define or know; and then suddenly with the arrival of affordable digital tools, software tools, animation tools, students felt that they had a chance to use these explicit systems to produce something. So it is not really any more about the relationship between the professor and the student; the process has changed. I think the whole issue involved in architectural knowledge, the whole issue of Deleuze brought to architectural discourse, is like when Greg Lynn, in 1994, was brought by Bernard Tschumi to Columbia to do the Paperless Studio. And then Deleuze existed at the same time as Foucault, although the architectural audience was unaware of it, and always in his texts he talked about processes and material processes and Manuel De Landa and how history is produced: there is no human consciousness; it is all these material processes that interact. So Greg Lynn, I think, felt at this point that this is also kind of like Deleuze's philosophies referring to material processes; so he adopted that text, and now suddenly everybody is talking about Deleuze because it kind of fits the architectural framework. And this goes back to the idea of architectural knowledge being made up of fragments of something, so we appropriate certain things. So I think that the missing thing always in architectural education is that we always try to avoid explaining what the creative process is; and I think that the students feel this also. There is always this break now between teachers and students, because the students know more tools than the teacher; and I think that the teachers are always overwhelmed by what the students know, and they cannot catch up because the sheer number of tools is incredible. So I think that what is missing is just trying to understand what the creative process is about. As Louis Kahn famously said, the architect's life begins at 50; and this is the failure of architectural education, in that it takes us maybe thirty years to learn what architecture is. It is perhaps the failure of education that we cannot compress this into three or four years and graduate students that can really design very well. Basically, the missing part is the creative process.

Neil Leach, London, United Kingdom
I am a bit confused here, because actually the person that brought up tools is Deleuze, right? And he says that theory is a box of tools. I think that the problem is that in architecture people talk about forms in a very objective way, and I think these objective processes with which we engage with the material world are crucial questions, and that is what Deleuze talks about. And I think he opens this up as a possibility, not of form, but of ways of thinking about form and the critical tools that can be deployed in a certain way. And I think that what has been lacking are the tools that are required to critique the formal processes. And that is why I think Deleuze is so useful, because he opens up that possibility.

Darren Dean, Kingston, United Kingdom
I just wanted to say something about the language the panel used to sum up what has taken place here over the last three days, because I think certain terms were fed back to us. I heard the panel mention methods, processes, standards, performance, speed, tools, optimisation, richness, institutionalisation or not of the new, change, multiplicity of points of view, collaboration, which I guess on one level can be summed up as controlling information. Now without placing myself in this other category, something else came out that is summed up in your title. We heard about mediation, we heard about mixed reality, we heard about acts of making that were digital and physical, we heard about metaphysical geometry, we heard about content, ideas, meaning, reading the city, emotions, description, interpretation, site specificity, place, context, haptic space, the topographic, co-presence, the agora, and a great one, triggering inventiveness. Now what this reminds me of is Kafka's The Trial. The German word for trial is der Prozess, the process, and the book tells the story of a man caught up in a bureaucratic process that has no end and no meaning. And I am wondering whether this conference has actually thrown up a divide between those that think that the answer lies in processes, and the processes have been around for a long time, and those who look for meaning; and I am wondering how one resolves that conflict between process-driven architecture and the notion that architecture can also be meaningful or have some end.

Antonino Saggio, Rome, Italy
Is this your project?

Darren Dean, Kingston, United Kingdom
Or it could be a conference. I do not think it is just a case of having forty different presentations, because I think there are certain themes.

Antonino Saggio, Rome, Italy
You are saying that there is a truth, while basically everything that Dino was explaining was that the way you posed the question is perfectly fine and it is your duty to answer it. I mean that the relationship between commitment, process, project and meaning, in the end becomes a personal story. It is our personal story. We are in a phase of liberation. In this part of the world it is incredible: we can address these issues individually, whereas the whole story or the whole process of humanity up to

yesterday was dominated by answers, ideologies, structures of thinking. So that is your project, and you have the tool to do it. And I have the same project and I can do it completely differently.

Darren Dean, Kingston, United Kingdom
I just wondered whether the search for something is not embedded in the word pedagogy, because does that little bit of it, agog, not mean to discover or to search? I am wondering what that search is for and where that process actually ends. I am thinking of this as a kind of lengthy discussion about the meaning of the word pedagogy, which also means a search or a discovery of something. The point I am trying to make here is that there seem to be some people in the room or who came to this conference that were concerned with meaning and some that were purely driven by process. And I suppose, given that that is what your conference has thrown up, that my question is: what do you think of it?

Christos Hadjichristos, Nicosia, Cyprus
Yes, I think I can say something related to that. Talking about processes we are talking about understanding, how things develop, how things are worked out when it comes to complexitrations. Cultures are those kinds of processes. I think one of the debates that is rolling around the room is whether we are just one culture, just another culture, or whether we are studying cultures. And I think resolving this can help the question just posed by Darren Dean. Meaning, and I am referring to Antonino Saggio, is something personal; it may be nomadic, it may be developed by a group, it may be personal. But I think that if we develop forms that address meaningful groups in a meaningful way, then which groups are we addressing? Are we educating people to address specific groups? Or are we educating people to develop the way through processes to manage to see how the cultures develop and what cultures need and then to act as designers, as experts. And I think that was a question about whether the schools of architecture that were presented have developed a similar language. It appears to me that the answer is yes, because they seem to be addressing more the formal aspect, and they are addressing their own meaningful content in their own culture; and as architects I think we are still caught up in this problem, that we are a culture. Instead of studying culture and cultural processes, in which case Deleuze could become someone we could really learn from, we are basically acting as a culture and a very conservative culture at that. So I think the shift would be to use the tools we have to study processes through the information that we have. It could be easier, through computers, but instead of doing that the danger is that we just create another cultural language that has meaning only for a few.

Maria Voyatzaki, Thessaloniki, Greece
Thank you. Do we have any further comments?

Sean Hanna, London, United Kingdom
I do not know if this will go any way towards answering that question, but it is just an analogy or a metaphor that I had in mind. Thinking about the analog and the digital, not in the electronic or computational sense, but in relation to teaching, I

was just speculating about how Japanese calligraphy is taught. I don't know how many of you know much about Japanese calligraphy, but there are several styles, and there is one that is very, very fluid, as far as the individual characters are concerned – a bit like my scrawling handwriting that is on the verge of being illegible, except that all the letters, all the characters, actually make a lot of sense. The individual characters are sort of digital in that sense, and the layers of meaning that go into the quality of the brushstroke correspond to the analog; and I was just thinking that in terms of what we are teaching there is a whole lot within architecture, within the discipline, that we can state explicitly as our pedagogical goals, and that is along the lines of how you make a character, and there are a whole lot of other things that are far too complex to teach a student in, say, three years, that really do take thirty years of experience of actually doing architecture, just as it takes lots of experience in making those brushstrokes to actually come to terms with it. So I think if we wanted to come to any sort of idea of what meaning might be here, we might say that there are certain things we can agree on: these digital characters, certain pedagogical goals we might have; but there is also a whole series of other things that I think we should not even try to define, that we should just leave completely open as a matter of accepting that this is going to change and is going to be something that is going to take on far more complexity. I do not know if that is an answer to the question of meaning you raised, but it is a concrete image that occurred to me that I thought might shed some light on it.

So I just wanted to express that we do not think that there should be any agreement, I mean in some sense there is no agreement and no consensus, even up here.

Kas Oosterhuis, Delft, Netherlands

I always try to look at things from a very practical point of view, and thinking about meaning is a kind of practice for me also, giving meaning to things. And practically speaking, I would say that meaning is just a boundary condition. The meaning of life? It begins here and ends there. Thus, the meaning of the process is very much in the cage in which the process is taking place. For example, if you populate a surface, where does the surface begin and where does it stop? In other words, it is actually the boundary condition that gives meaning and that actually positions that process somewhere. That is something that I have heard nothing about at all; and, being more practical, how we address this in our own work is actually that we do populate surfaces, we do run processes, we do intervene in processes, but we also put boundaries to them, and boundaries are also very much a top-down process. Let me use for example the concept of power lines and empowering something to put a boundary to something. So it is very much empowering certain gestures or certain ideas to give meaning to otherwise more fluid and distributive processes; and that, I think, is, speaking from practice, very much a daily task. You must demarcate: this is where it starts, this is where it ends. And in practice you also have time: this is my deadline; and you also have a client who gives you a commission which you have to perform in a certain amount of time, and that is also very important. In education you do projects; and especially when you come to products, you also realise that time is a very important factor. And when you are starting on such a process, seen in time,

you need, exactly as Dino said, to throw forward a point in space and that will give direction to what you are doing, so that time is also seen as a boundary condition. That was just a small observation on the discussion.

Per Olaf Fjeld, Oslo, Norway
I want to follow up on the last comment in a very particular way, because I do think that there is a creative link here that it is perhaps important to at least introduce. After hearing all the speeches I do think that it is very much developing into a situation where the relationship between what we have called tools and the process is the content. I have not heard any other type of content except the relationship between the tool and the process and what they offer together. In that sense we have tools that within themselves have their own strategy and we have tools that work in a different way. It is very interesting, then, at least the way I read it now, that the different types of strategy are now our content. In other words, we have different types of strategy but we have no other content except that which lies in the strategy that we choose. In that, there is also the individual act.
What is very interesting for me within the idea of teaching, the relationship between the virtual (so-called) and the real, is the capacity of the virtual to take on the real. In that there are, I think, many different types of creative links that will be the challenge of this relationship between student and teacher. Because it is not necessarily all the models that we have seen that in themselves offer a very strong architectural capacity: they do not, in other words, necessarily have a strong capacity to transform into architecture. I am referring to all the resistant forces or limitations that architecture after all has. In that link there are two ways of moving (there are probably many ways, but for the moment I am taking two). In a pedagogical creative process you either say that the virtual object has a capacity to transform into architecture, that it has that potential, or you look upon the virtual object more as an inspiration towards another type of inspiration for what will then be the final architectural project. There are, then, two different ways of going on, and one can then clearly see that these will generate two different capacities in this link between the virtual and the physical. And I do think that link will continue to be a challenge for every one of us.

Neil Leach, London, United Kingdom
A very brief comment. I do not see a relation between meaning and process. I do not understand that. I do not see the opposition in that. When you seek meaning not as a noun but as a verb, finding meaning and so on, it is a process in itself. Just as identity is never static, it is always dynamic, always fluid, so meaning is also always a dynamic notion. I think you have to sort of see it as a part of a process of finding meaning, and I think that Kas's point maybe was precisely that, that out of the process of making architecture you find meaning and so on. So I do not necessarily see any opposition between the two.

Dimitris Papalexopoulos, Athens, Greece
I am a little bit afraid of what Nino said about the free individual. There is a very interesting article, written by Katrine Julliard in the 70s or 80s, about technology and architecture, entitled Enfin libres et unis. We are not talking about the individual.

That is a political position, talking about an individual collaborating in collectivities, free collectivities, fluid collectivities that change, identity collectivities, but collectivities with boundaries, with targets, changing targets, fluid targets; but we are absolutely not talking about the individual. I think that is certain. We are talking about smart mobs, we are talking about people in the street, we are talking about crowds, we are talking about collaborating agents and particles, but we are not talking about free isolated people. That does not exist, and I do not believe it has ever existed. Thank you.

Urs Hirschberg, Graz, Austria
I want to bring another term into this discussion. It is actually something that came up in a little anecdote in this morning's presentation by Fabio and Matthias, and it is the word trust. The story was that because Fabio and Matthias had this experience of knowing how to code, etc., they had this credibility with their industry partner so that he would trust them to actually use their machine, thereby saving a lot in the budget and thus actually making the project possible. I think that the word 'trust' is something that we should try to endow our students with when they come out of our schools. So I think that it is essential that conferences like this one happen, and also that they are about education, because if we are in this paradigm shift – and I am absolutely certain that we are in one that is going from the architecture of the industrial age to the architecture of the information age, and this is happening as we speak so it is not something that we have a choice about – the question is how we as a profession position ourselves within it. So it does make a big difference where we come from, whether we go to industry and say here is something that I would like to do although I really do not know how it works, or whether we can tell industry to be assured because we know about that because we have done enough experimentation during our studies, we have done enough collaborating with other partners in an interdisciplinary way, so that we do actually inspire this trust in the way we present ourselves as architects to the partners that we need in getting things built. I do not think there is an easy answer to that. As Oliver said, we have to redefine things, because they change so quickly. There is no tested recipe for getting to that, we are leaping into the unknown; but I think that as educators in this field we have to have an awareness that there is a big responsibility, and there is a necessity of a very high degree of professionalism if you want to survive this paradigm shift in a way that in the end architecture as a discipline wins and is not just pulled under by the other conflicting interests that are also there.

Kas Oosterhuis, Delft, Netherlands
I want to jump onto that because it is very much the same experience that I had in practice, so I represent the voice of practice now. Just to give you an example: for the Web of North Holland that we did there was half a million euro for the building and half a million euro for the interior. We were commissioned as architects to do the exterior, and another group was commissioned to do the interior as media designers. We got a contract hundreds of pages long completely based on mistrust, because architects are definitely mistrusted on the basis that they have no expertise whatsoever, they just talk about things, and they are not responsible for what they make. The media

designer had a one-page contract for the same amount of money, because the client trusted that this group had the knowledge to perform the job. So I agree completely with what Urs is saying, because what we have to do is become experts, we have to able to have full control of everything we do, be fully responsible for what we do, before we attempt to gain that trust again. Then you work like an artist: the client tells the artist: you have this bag of money, make me your piece; and he trusts the artist to perform his job well. This is a position that in my view it is very important to imagine and to regain – or to gain, because I am not so sure that we ever had that position, the position where people really respect what we are doing.

Constantin Spiridonidis, Thessaloniki, Greece
If I may just say, for architects to be trusted it is necessary that they have the appropriate competences.

Vana Tentokali, Thessaloniki, Greece
Two short comments. The first comment is addressed to Dino's view that we should also give priority to the pedagogical perspective and not to knowledge as such. To this I would like to add one more argument, which comes again from Deleuze. Deleuze says that knowledge is no longer depicted or represented as a tree with branches and leaves: on the contrary, knowledge is a reason that does not have a voice of support; it is slippery, and if it is slippery you cannot catch and hold onto it. The second comment I would like to make refers to Dimitri's proposal or wish when he stated that we no longer talk about individuals but about collectivities. I am afraid that I do not agree, because there is another word that could be more apt to the discussions in these sessions and which seems to me to be more Deleuzian. It actually is a Deleuzian word, and one which I could say that even Derrida would agree with: the word is difference.

Dimitris Papalexopoulos, Athens, Greece
Agreed.

Rivka Oxman, Haifa, Israel
In order to be able to discuss the debate we need to share the same ideology, and I think our ideologies are different. When you look upon architectural schools and what they were in the past and what they are trying to be today, in the past it was very clear that the responsibility of architectural schools was to educate professionals, and going back even to the Italiescent school run by Frank Laudry, the best way to gain knowledge and skill was to work with some professional, some great architect, some master, from whom you could get or kind of inherit knowledge and skill, and that was very well accepted. It is only lately that we draw in university, so actually school in a university framework is a quite new conception; and then we have started, for example in my university, to expect people to win Nobel prizes: well, we say that in architecture the only Nobel prize you may win is the Nobel prize for peace. Some schools emphasise the theoretical contribution that comes with theoretical research and some schools emphasise professional education: this, I think, was made very clear in the discussion we heard, so really educating and teaching very much depends on the ideological framework of your school or on your own thinking. So we have to define what we want: what profile do we want, what are the

goals of our teaching, what kind of students do we want to produce. And it is good that we have variety. Not everyone should have an academic goal; not everyone should have a professional goal; but we should maintain, I believe, these categories, professional, research, theory and practice, because that is how the modern world works.

Joaquim Braizinha, Lisbon, Portugal
Thank you Maria. I would like to make a reflection on our emblem, which has the attributes of the architect, the compass, the square and the sketch book, and which projects, in the search that Constantin defined, an idea that is organised over a single Platonic solid, a cylinder, which is perhaps looking to an idea projected in the sky. Our angels today look to a screen, as Tiago told us; they narcissistically look to screens where transformations appear over transformations, in exhibitions of effects. I think that we are dangerously passing from a Platonic world to an Aristotelian world. A Platonic world that has in fact finished, leaving us in an Aristotelian world where the metamorphosis is the rule, the metamorphosis of everything, of every circumstance, of every moment; and what we lose are the references. The Platonic world was very well organised with precise references, but our world has lost the references. And if our aliases, Tiago's aliases passed through the screen to see what we lost as architects or angels, I do not know, what we lost on the way, maybe we will find behind the screen a lot of garbage, maybe compasses, squares and sketches, but maybe there are also a lot of archetypal references that architects have always used and that today have no more place in this world of swift transformations, metamorphosis over metamorphosis. And I suppose that this is very dangerous. I know that our students will arrive today in the university without their tools, to use that word; they no longer carry their tools with them; they do not know them; and maybe if we want in fact to enter into the Aristotelian world of the metamorphosis, we must teach them – this is after all a pedagogic situation – or reveal to them the old archetypes, the old paradigms that sustained our world. We cannot allow the lost definitiveness of our references or we will lose our name, our reference, our identity.

Christian Fröhlich, Graz, Austria
Just a general comment. I do not know how many students are in this room – I know there is one from Graz and there are some from Lisbon, and they have done a wonderful job as supporters. But do you think that if students were taking part in this workshop they would be reassured that their decision to study architecture was a good one, that their teachers are all very cool and have brilliant ideas with which to inspire them? Of course there is a little provocation in that question, but I did not get the impression that all of us expressed that motivation. It looks to me that every one of us has easy rules for how to teach architecture and just a few have to do with the others. So it is hard to start a discussion if the content is that big. So maybe the question is whether you are satisfied with the workshop?

Constantin Spiridonidis, Thessaloniki, Greece
There is no answer to this question. I suppose it tends to become a rhetoric one because from the very beginning you know that there is no answer. But I think that the useful thing that arises from this generality is that it is not possible to define a

very precise question; so one answer would be that we did very well to keep it general. On the other hand, if we asked a very precise question then half of you would not be here so we would lose this richness of exchange that we had the possibility to have; so again, I would say, we did well to keep it general. That would be my first response to your question.

Christian Fröhlich, Graz, Austria
The topics were quite precise I would say: advances in technology and changes in pedagogy. So the question is how much did we talk about the advances in technology and the changes in pedagogy?

Maria Voyatzaki, Thessaloniki, Greece
I think I should explain how we came about this title. If you separate the pieces as I did but without making the connections that I made then you missed the point because it is not about two separate things, it is about how these advances in technology influence the way we teach architecture. So we are not here to talk about advances in technology; in fact that would appeal more, but it would be addressed to system engineers and computer scientists and then architects would be a very small percentage perhaps. It would be completely different. I do not think that we talked about advances in technology per se (thankfully, I would add), but we talked about them within the context of architectural education. Therefore, the plain answer, which could be taken of course as me blowing our trumpet, is that we are happy and we are happy because you are all here even though Lisbon is a very attractive city, so in a way that is our proof.
We have one last comment.

Vladimir Milenkovic, Belgrade, Serbia
It is of course easier to talk in relation to what other people have said and I was thinking specifically of something that Susan Ewing was saying yesterday, that the students who are thinking are not those who are making. That is also something that I have seen in my experience and I would just like to say that although the students that are thinking are not making, they are really the ones that are the best. So that was something that I just wanted to say at the end. Thank you.

Maria Voyatzaki, Thessaloniki, Greece
Thank you. We should bring this meeting to a close. What I am about to say may sound very formal but it is meant wholeheartedly. I am speaking on behalf of the organising and reviewing committee, as part of a broader organisation of the daughter and mother that is the ENHSA and the EAAE, as a council member but also as part of the two committees, when I express my deepest gratitude. First of all, I would like to thank the students that have been so warm, hospitable and helpful to all of us all these days under the resourceful leadership of Joaquim, who has embraced this and has done his best to make us feel at home. So thank you very much Christina, Miguel, and all you students (Pedro Freire, Ana Filipa Carvalho, João Frazão, Nicola Gaspar, Martina Georgieva, Rui Martins, Liana Magalhães, Bruno Pereira, Angela Rodrigues, Ségio Zabumba) for making this happen. I would also like to thank all the keynote

speakers. Judging by the work that you have shown us it is pretty clear that you have left behind huge commitments, serious stuff; I expect you have even lost money to be here with us because, as Kas said, projects run with time boundary conditions. So thank you so much for taking the time to be with us. Because that is another thing: they have not left us, they have been with us all along making comments and interesting interventions. The same goes for Joaquim; in our experience he is the first head of school, organising an event in his school, who has been with us all along and has not only come for the beginning and the end. And last but not least let me express our thanks to all of you, from Oslo to Cyprus and from Massachusetts to Haifa, for being with us all along and making this happen. Thank you very much.

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