

Expectations|—————

Opening and Welcome Address

Maria Voyatzaki: I wish to extend a warm welcome to all our guests and participants here, today. Welcome to Greece and particularly to Athens on this memorable year! As it is our opening day, many will be gradually arriving as we proceed with the workshop. To begin with, I'd like to welcome you on behalf of various organizations and institutions, starting from the European Association for Architectural Education (EAAE), the European Network of Heads of Schools of Architecture, the National Technical University of Athens and the Aristotle University of Thessaloniki, Greece. As you probably know from the correspondence we exchanged throughout the period of preparation for this meeting, this is the Third Workshop we have held for the third consecutive year, starting in 2001 – 2002 (Thessaloniki) while in 2002 – 2003 it took place in Lyon, Grands Ateliers de l'Isle d'Abeau and, this year, it's back in Greece for the year of the Olympics to welcome you home.

It seems appropriate to give you, at this point, some historical information regarding this initiative, which originated with the creation of Thematic Sub-Networks related to particular subject matters in the area of architectural education, all within the general framework of ENHSA, which is one of the two logos on the correspondence you have been receiving, funded by the European Commission. The principal idea behind this scheme was to create thematic sub-networks in an attempt to ameliorate or improve our educational methods in teaching a specific subject. Therefore, in this framework and through your school participation, as a full member, you have the potential to partake in all the activities related to the Sub-Networks, as is the case with us here representing the Construction Sub-Network.

When we began two years ago in Thessaloniki, our effort then was rather tentative and somewhat instinctive since we did not know each other sufficiently to establish a clear identity and scope, so, in that spirit, we followed some very general principles in order to set up a framework for our meeting. Nevertheless, for the sake of those who did not attend our first meeting and wish to be informed, we did manage to gather 45 members in that first year from the various European schools of Architecture. This figure augmented to 55 last year and increased to 65 members this year.

In terms of content, the first year was somewhat exploratory and the questions dealt with were

related to what we teach (**content**), how we teach (**method**), who teaches (**profiles** and **qualifications** of construction teachers) and to what extent and when we teach what (**timing** and **prioritizing** material taught). Therefore, in the first year we mapped out the different aspects related to construction teaching and, by the end of that first meeting, it appeared that we wanted to explore further the how question. In other words, the participants requested that the next workshop continue along the lines of **methodology**. As a result, last year, with the kind offer of the Grands Ateliers de l'Isle d'Abeau and, more specifically, Denis Grèzes, who is among us today, helped us organize the Second Workshop that had as theme the how question, thus focusing on the **Exercises in the Teaching of Construction**. Basically, members of that workshop shared their thoughts on what they considered to be the key exercises in construction teaching as taught in their schools. In retrospect, although at times we felt that we were running out of steam and wouldn't get very far, the group was determined to move on and demanded a Third Workshop, which is actually the present one, to talk about **future outlook** since we had already talked about the current time in our first year and the general topics of construction teaching and methodology in the second, it seemed apropos to envisage the future. In fact, towards the end of our last workshop, while eliciting proposals from the various participants on what to do next, members such as Ramon Sastre from Vallés intervened by challenging us to consider whether the key exercises presented would still be valid in ten years' time.

Moreover, there were others such as Nadia Hoyet from France who suggested that nowadays we are going through a period of "mutation" where old buildings are starting to "move" and wondered whether we would continue to teach construction in the same way. Surely, there are other issues that come into this equation. Therefore, in response to your request, we are gathered here to discuss the future of construction education. Glancing at the program you have received, you will note that this Workshop has been divided into four sections, for obvious organizational purposes. However, besides the practical aspect, the four sections also correspond to the four reasons we should be rethinking or reassessing the ways we will be teaching construction in the future in light of the following:

1. Contemporary trends in architecture in reference

to the question of mutation, flexibility and, primarily, with the role of computers and digital technology in the generation of form in the architecture of today and tomorrow;

2. The appearance of new or innovative materials that demand new construction methods and, in turn, new ways of perceiving construction;
3. The urgent need to take the environment very seriously when teaching construction today;
4. What we do with what we have that is rare and traditional knowledge, because it's all very well to look ahead, but the question remains, how do we maintain and preserve the knowledge that relates to the past?

Looking through the program, you must have noticed that there is a set of two words relating to the skills and competences a student should gain from his/her education. Also, what are the educational methods and strategies that can ensure these **skills and competences**? We have invited five brilliant keynote speakers, hoping that they will relate each or more than one of them to each topic and discuss the different issues of the relationship between the skills and competences we cultivate in students that will enable them to respond to tomorrow's architecture. Furthermore, since we are all educators of architecture and construction, what are the methods, educational practices or pedagogies we should adopt to ensure these skills and competences? Finally, the Workshop is structured around the keynote speakers followed by brief fifteen-minute presentations of four representative cases expressing how it is felt they relate to each topic. Apart from that, as you all know, what those of you will produce by the end of June in the format of a 3,000 word paper will be published along with this year's proceedings as has been the case in previous years. Many of you are familiar and have already received such publications, but for the sake of those who haven't yet received the previous volumes, they will be up for sale and you can thumb through them.

Before passing the microphone to one of our co-organizers, Spyros Raftopoulos of the National Technical University of Athens, I wanted to say a few things about our future and I'm not referring strictly to this Workshop. As you can all recall, when we last met, we felt that this would be our third and last year, but I can now happily announce, with a reasonable degree of reservation that our contract

may be renewed for an additional three years, so, this should not be seen as our last opportunity as there is more to be invested in this effort!

To sum up, I cordially welcome you again to Athens and wish you all a fruitful meeting and constructive working experience. At this point, I wish to call on Prof. Raftopoulos of the National Technical University of Athens to give his introductory remarks.

Spyros Raftopoulos: Thank you, Maria, for the introduction. It seems that all the essential points have already been mentioned, so on my behalf, I would like to welcome you as the Deputy Head of this School, the National Technical University of Athens, hoping that we will have, within the next few days, as successful a meeting as we have had in the past, both in Lyon and in Thessaloniki, as those who had the good fortune to attend will surely agree. I am also eagerly hoping, even if there is some inkling of doubt, as is usually the case with such matters, that these meetings will have continuity. Such meetings, where we exchange views as "construction educators", as we have been referred to earlier, provide a useful platform for sharing ideas and suitable grounds where we can see what and how things are happening in many countries from East to West, North and South. We can improve, reconsider and adapt our policies in relation to the material and the way we approach construction with our students.

In an effort to return to the down-to-earth particulars, I would like to give you some information about our University, our School and the building hosting us because there is an anti-climax between the space we're in and the deterioration of the exterior. Our school is a very old one, originally established in 1917 and the University itself was founded much earlier. It is the only school based in this campus since the remaining schools are situated in the North-bound campus. Architects, as you know, are somewhat different from the technocrats so we have decided to stay here, close to the happenings of the city. Nevertheless, I should mention that this event is the last one that will be hosted in this building for the next three consecutive years because the contractors are waiting as soon as possible to restore it, so, hopefully, should you visit Athens in three years' time, you will be able to see a shining, brand new building as it was in its original state when it was first built in 1875.

As far as the content of the Workshop, I will not go into any details since Maria has already provided a

considerably adequate description. Perhaps, on a personal note, I wish to add that being an educator from an older generation, having started teaching construction in this School in 1972 as a young architect, I must admit that there has not been much change except for the last few years, especially with the advent of computers and information access for both students and teachers which tend to make us all critically self-evaluate whether we can actually follow the rapid changes that are happening in the world. The reason for mentioning this is that when Maria proposed the title for this conference "Visions", I started considering whether we actually do in fact have visions and what kind of visions can those of us have who have been teaching in a certain way for so long, particularly when taking into account the way of construction, which has not undergone much change over the years. Nevertheless, what is hopeful is that in the audience, I can see quite a few young people of Maria's generation that will be able to provide us with more information about the relevant dramatic changes so that we will be able to convey this through our teaching in the years to come to the new generation of architects for the benefit of all those who wish to persevere in their teaching pursuits. I would like to conclude by once again welcoming you and thanking you for being in Athens. I wish you a successful meeting and also hope that you will find the time during your stay to tour Athens and visit some of our interesting sights.

Maria Voyatzaki: Thank-you, Spyros, and I wish to take this opportunity to thank you and Miltiadis Tzitzas for all your help in organizing this event.

Session 1: The Teaching of Construction and Contemporary Architecture

Chaired by M. Voyatzaki

- *What should be the necessary competences and skills acquired through construction education that allow architecture graduates to be capable of following the contemporary attestations and changing trends of contemporary architecture, the architecture that charms the students of today?*
- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be capable of following the contemporary attestations and changing trends of contemporary architecture, the architecture that charms the students of today?*

The Schools presenting in this session were

Aarhus (Denmark) School of Architecture by Anders Gammelgaard,

School of Architecture, University College Dublin (Ireland) by Elisabeth Shotton,

Genova (Italy), Faculty of Architecture by Fausto Novi and

School of Architecture, DOJC College, Dundee (U.K.) by Christopher Lowry

Please find the respective interventions in the section of articulations.

Debate on presentations and theme

Chris Williams: I'd like to ask Christopher Lowry regarding the point about his bringing outside consultants – engineers such as structural or environmental – to help with the teaching of studio. Perhaps he could give us a few more details of that and particularly on how he finds that the practitioners are able to understand what is needed of them in the design studio.

Christopher Lowry: Well, I think it's fortunate that we bring in those who we have worked with

professionally in the past, like I've personally done. There is a certain amount of learning in both directions since I need to teach the consultants that come in a little about what exactly we are aiming at. Part of this in the beginning is very much about allowing the students to keep control of the conversation and bring what they want to do with their project as opposed to the consultant coming in and dictating what should be done, which would certainly not be very effective with younger students in particular. I invite the consultants at the end of the year and show them what we're doing and what is involved. We keep them informed, communicate and exchange ideas about the pitch of the particular project as well as take their advice on the program we generate so as to allow the students to learn and enable them to understand the knowledge we want them to develop. So, really it's a two-way learning process.

Chris Williams: We do a similar thing at Bath and we also find that most of the architectural tutors now teaching in the design studio are practitioners, mainly because the full-time staff is by and large researchers, particularly in the case of Bath's History of Architecture. It's actually quite difficult for them to bring into the studio the practical techniques of construction which only practitioners obviously have. I'm just wondering if there are other schools of architecture that are increasingly bringing in not just practitioners in terms of engineers, but architects as well. Even our years are actually run now by outside practitioners largely on the architectural side.

Christopher Lowry: We're certainly not at that stage yet and each of the five years is run by a full-time staff member. However, the teaching teams each year consist of four other colleagues who are part-time, whether practitioners or working for a company. Within our school there is a resource issue as to whether to bring more practitioners in. It's nice to have the control and the freedom to run your year according to the way we want it to be and involve those we want, but there is a cut-off point when money runs out and we can't sustain them.

Chris Williams: We have the same problem, but what tends to happen is that if a full-time staff member retires, he/she is not replaced, but, instead, we bring in two or three part-time practitioners. Whether that will increase or not, I don't know, but it certainly means that the way the school is run has changed significantly over the last few years.

Maria Voyatzaki: I'll comment on what Chris has just said, which is, perhaps, relevant to your conversation on practitioners employed in studio work. I found a book that I'm holding at the moment, which although I wasn't sure I would actually come across any references on construction, I was proved wrong. In the first few lines of the book, Greg Lynn, who, as you know, is a hero among contemporary students, says that construction has made a "shift from the modernist mechanical kit of hearts design and construction technique to a more vital biological model of embryological design and construction." Regarding the point you made about who teaches in the studio, especially in advance studio work, materiality should be an issue as much as the historical and other architectonic issues that are taken very seriously. What I find is that it's the researchers that follow the contemporary trends and that are experimental when inventing new forms as opposed to practitioners, who of course experiment, but in safer ways. Therefore, I see a schism (gap) between the two tendencies and, **it's very difficult to have people who, although can convey to students their experience from practice, which is undoubtedly valuable, do so with limitations since in their effort to play it safe, they do not really transcend the limits of architecture and, effectively, of construction. What was apparent and a common factor that surfaced in the presentations and keynote speech is that architecture and technology should be interlinked in order for both of them to be advanced.** My remark, then, is that it is without question a big dilemma for us educators.

Elisabeth Shotton: I want to comment on question 2. The University College of Dublin has long been staffed by practitioners in the design studio exclusively, almost excluding full-time faculty who tend to be researchers, lecturers and, it's only now, actually, that they're starting to change this around, not by getting rid of the practitioners, but by assigning a full-time member of staff to every year because one of the problems that arises is that there is a lack of consistent ideology and building up of skill level from year to year since the practitioners who run the year are not talking to the other years. Also, they're not talking to the people involved in the rest of the program. Often they don't know these people and there is a schism between what they're teaching in lecture courses and bringing that knowledge into the studio. There is a real friction so they are trying to rebalance that partly through the

work I'm doing, but also partly by bringing back the full-time member of staff. So, there can be more coordinated effort within each year, but also across the entire degree program. There are pros and cons to practitioners and I'm one of those.

Maria Voyatzaki: Elizabeth, I think there is a fear of the new and I'll explain what I mean with an example which is not off the record. One of Neil Leech's frustration teaching at Bath, which he has openly confessed to and this is why I can freely bring it up, being the fresh mind that he is, he was not allowed to run a proper studio in the Diploma part of the School. You all probably know Neil Leech, who is a theoretician, but likes calling himself an architect because he does not want to be left out of teaching design. There are tendencies in schools of architecture and very few of them allow pluralism of approaches when it comes to design. As a Bath graduate, I know that there is a neo-modernist approach to design and less of a digital one there, although I don't know if this has changed since I left. However, on visiting the School's website to see whether they have allowed avant-garde architecture to shine through, I realized that there is still some conservatism and traditionalism in design disguised in the form of neo-modernism. Therefore, it's very difficult to allow changes for fear of the new.

We will hopefully argue in the last session that there is a need to preserve the rare and traditional, but there is also a need for a school of architecture and an educational system to be advanced so as to allow the new to shine. Of course, the comment regarding Bath should not be taken amiss as it was not meant to be a criticism of the School itself in any way. After all, as I've already mentioned, I'm a graduate of Bath.

Christopher Lowry: I agree with what you're saying. Sometimes students are discouraged from practitioners limiting their imagination on the grounds that something cannot be built. On the contrary, students' imaginations should be encouraged. There is a fundamental level that exists regardless of the complexity of a project, whether it's the structure or how it's made, etc. and, that is that they understand where technology "sits" within that and what they have to employ so that there is actually a line before they actually enter the complexity of the program that is important for us to convey to students in order for them to get an understanding of where it actually stands in the scope of things.

Maria Voyatzaki: That's why I read the quote from Greg Lynn because it's very clear that we've made a shift in our approach from the modernist way of thinking about architecture and construction to a post-modern one and, by this, I don't mean the historically defined post-modern movement, but a contemporary way of thinking about architecture. Therefore, we cannot really follow (quoting Greg Lynn)¹ "from an assembly of independent parts, which is a heap-of-parts approach of the modernist movement to the desire for formal variation and uniqueness" that is something that cannot be really ordered in industry in the conventional way that every day architecture happens, either by going to an internet site or flick through a prospectus of the company to come up with kit parts and order what you need over the phone and it comes to the building site in an approach where computed parts can be e-mailed to the company and tailored to your needs. Somehow they have the same generic type and yet they're different in terms of form by being varied and unique.

Ola Wederbrunn: I think it's very important to stress that the educational period is getting shorter and shorter. Ten years ago, the minimal education of an architect was seven years, but, today, it has come down to five years. The situation has changed a lot and there is no time to study things very thoroughly. Some people say that when you come out of a school of architecture you enter reality, which is a difficult thing to hear if you're in a school system. Also, it's important to stress transparency between school and what is not school and see the transparency that things don't work only in one way, but both. As previously mentioned, we get inspirations from offices, etc. and this inspiration goes back to the school and places demands on it. But schools must also put demands on the other reality. Moreover, an architectural school needs to take the responsibility to develop a reality which works, not just within a school setting. This situation also involves transparency between student - teacher and a teaching studio. I believe that the case study for the Master's is good, but it also has to be critical of the other reality so that we can benefit both ways. Finally, it's also essential now that education is shorter that we get students back in school again.

Donal Hickey: I'd like to respond to one of Anders Gamelgard's statements about knowledge base which is getting wider all the time. I haven't been teaching technology for very long and my question is **how do we avoid just teaching students what we know?** I'll try and answer how I see that. I had seven days to prepare for my first lecture at the beginning of this year because somebody had retired and I was put in a dilemma as to *what* to teach and *how* to teach. I remembered seeing Leonardo da Vinci's notebooks and this may refer to some of the things Anders was talking about. Da Vinci was an artist, an architect and a very brilliant thinker. I decided to start my lecture with a quotation from Madrid 8 or it could have been 6 or 16 (I can't actually remember it now and I can't quote it). He talked about the world around him in terms of how he understood it, through mythology and of seeing and trying to understand the nature of things. I suspected that from that attitude came the information or legacy contained in his notebooks, which doesn't really describe technology, but a way of *thinking*. **My way around not affecting students by my own limitations is to try to think like that: to try and teach them to see the world around them simply because I can't teach them every detail or I can't get them to analyze every building, but maybe I can influence them in terms of the way I've learnt, which I hope is useful. I would like to hear about other strategies people use in coping with how to teach with our own limitations.**

Ed Melet: My question is a remark on Anders' presentation. You mentioned Zaha Hadid as an example, but Zaha Hadid, Daniel Libeskind and Koolhaas studied at the AA, where they didn't really bother with building construction. They concentrated on concepts, space and depth. They started designing without all the knowledge we are teaching. Mere building was considered to be banal. The question of course is: can our students design as freely and brilliantly as Hadid, while they have this enormous technical 'burden' we think they ought to know. Knowing all the technical preconditions one, perhaps, will not come up with completely new concepts (architecture, structure, construction) because one fears the technical consequences.

In our school we are trying to teach our students that everything is possible. For every architectural concept, how bizarre and unrealistic it may seem, there are technical solutions. You have to trigger the students to go beyond the known technical solutions,

¹ From the book 'Architectural Laboratories', by Greg Lynn and Hani Rashid, Nai Publishers, Rotterdam 2002

because if otherwise the technique will be a limitation. We teach them that they should not fear technique, or consider technique to be a restriction to their architectural freedom. Instead, and you can see this clearly in the work of Liebeskind, Hadid and Koolhaas, the technique is a means to strengthen the architectural concepts. In Amsterdam we designed exercises in which students have to come up with completely unbuildable architectural concepts and they have to design a structure, installation and building details which are in compliance with this concept and which are technically sound, of course.

Anders Gammelgaard: Regarding the last question, I would like to present some tasks that demonstrate a way of working where the results are certainly unknown. If there is time, I could do that later on. But, in reference to the previous question about **how to teach beyond our limitations, the first step is to realize that the knowledge we have is extremely limited and the next step is how to go beyond that. The answer, basically, has to do with the role of research. We start by identifying the problem we want to address, we investigate to see if others have already addressed it and if it has, there is no point in going on, but if it hasn't, then we start by developing a method. The method is the key because it can lead us beyond our own imagination and limitations.**

When searching for a method to be used to answer the question we've posed, we don't know where this exploratory process will lead us. This same method can be applied to teach students construction. It's a way of going beyond our limitations. To a large extent **we try to organize the teaching of construction closely to our own research for a couple of reasons. Mainly, it trains the students to develop a method, which is essential for practical purposes since we use the students to do the research we would otherwise have to do ourselves. Therefore, the method is the vehicle which makes us surpass our limits, but the difficulty lies in our giving up existing images.**

Herman Neuckermans: I wanted to react to something Maria said, but due to the dynamics of the discussion, we've moved on to another topic. Nevertheless, I'd like to go back to the issue and reference to Neil Leech, i.e. the issue of the relationship between theory and practice. In my opinion, the education in schools of architecture has shifted from the view of education towards the

profile of the architect and moving more towards education in architecture. As a result of this shift, we will have more and more research in schools of architecture and, due to the research we will have more and more full-time staff. Some of these will be called theoreticians in various areas: philosophy in architecture, rule of tendencies in architecture or construction in architecture. So, I think that in the school of the future, the theoretician has to be part of the studio as well as the practitioner. We need a model of the school where both interact in the studio. Several speakers have mentioned the split in boxes in education and I agree that boxes and walls should be torn down when it comes to education. There is, however, the possibility of having one of these walls where we invite a theoretician into the studio, but not as the sole person running the studio. As in the example of Neil Leech, who is a fantastic theoretician, knows a lot about digital architecture and wrote and edited several books on it, I remember attending one of the study conferences in Bath and from all the examples given there about digital architecture, I think there were two that, indeed, somewhere in time had a link with something that could be build(able): the Roller Coaster Terminal in Yokohama by Foreign Office architects and the bar structures by Mrs. Shea. Theory is interesting, probably, because it's not necessarily (only) about what can be built. But, I know for sure that although ETH Zuerich has a lot of means and personnel to teach CAAD, they have shifted from the education of graduates who are only skilled in digital architecture but who can't build, towards the education of architects who now again are capable of building real buildings. What you aim is linked to the profile of your school. So, in my opinion, theory and practice have to be linked in the studio. **The practitioner will bring the theoretician down to earth and the theoretician can allow those that are in practice -but who sometimes don't have the opportunity / time to keep up with the latest insights regarding architecture - to catch up with the state of the art in theory.**

Maria Voyatzaki: As far as I'm concerned, that which can be built should start from theory and should have a strong theoretical context and content, otherwise it won't produce good architecture. My approach is not an *either / or*, but a *both / and* approach. This, I think, is where we differ in the way we look at things. I don't see this issue as two separate things and this is why Neil Leech does not like calling himself or to be called a theorist -

he's an architect. We're all architects and this is our starting point. Whether our architecture which starts from a theoretical basis actually becomes architecture in the form of a building is a different issue. However, what you have suggested is, I think, another view that digital architecture is unbuildable. Last year, I went to the AA summer show and, despite the fact that the AA is easily, though debatably, considered the most avant-garde architectural school in the world, what was impressive about the work of the students was that the digital projects there had a very strong emphasis on the actual making of what appeared on digital form to actual building. In fact, I believe that with the digital approach, it's much easier to make something because you have the exact coordinates of every single point on a vector, on a surface and much easier than having a Euclidean approach to architecture. **Digital architecture does not divorce theory from architecture and practice in the form of building.**

Herman Neuckermans: Yes, theory and practice *should* go together, not separately. The second thing is that, in my opinion, there is a risk in theory which is not linked to practice since it starts floating from reality. Maybe it has a role in architecture – that's another story, but in terms of design, I don't know. Finally, I also mentioned that from what I had heard from Leach, only two examples could actually be linked to something that could indeed be architecture.

Maria Voyatzaki: Those were student work, I suppose.

Herman Neuckermans: No, it was a foreign office and the Roller Coaster Terminal in Hong Kong.

Chris Williams: You're talking about the Conference 'Digital Tectonics' held in Bath. I think that Neil Leach, David Temple and I spent a long time discussing who we should approach to talk at that Conference. Obviously, all the people we wanted to invite had strong views, some of which were not, perhaps, compatible with each other. It's probably true that it's so theoretical that it does not get involved in building. However, life is too short for all of us, in the sense that you have to go either one way or the other.

You either end up being overly practical or overly theoretical and few of us can bridge that gap. I guess we did our best, but what we also wanted to do, I think, is to aim the conference at people who

were fairly practical. Therefore, the idea was that it should be relatively theoretical, particularly in trying to bring in threads from other areas which most practitioners wouldn't have come across. Certainly, I'm a rather practical person and I'm aware of what you're saying, but I think it's a perennial problem and probably always has been for the past 5,000 years or so.

René Hughes: There is frustration among all participants. We normally refer to construction, but in fact we're talking about architecture. Ole Vanggaard, said, for instance, that it's the architect or the architect practitioner that makes theories. I think that Elizabeth should be proud to have come to this discussion since she's an architect with an architectural studio and she's come down to talk about engineering and construction, not architecture. With all the examples shown on the screen, it seems that there is more of the teaching of architecture than the teaching of construction.

So, there is at least 3 "dangerous" people – Anders, there is another who hasn't spoken yet and Michel Paulin. We remember the exercise presented last year from the Aarhus School of Architecture teachers with the ball in order to teach construction as opposed to practice having a ball stand in the air. We can also remember the exercise with the vegetables that people like myself and Michel Paulin and others use. Perhaps, that's the future! But for the basic construction teacher, it seems that it's not simply because materials, language, image and construction itself that's increasing more and more with computers justification for us to discard all that and start with an innocent view of construction. It's exactly the opposite. **We must put things in order and show all this basic material and its capacity and develop this competence and, on this basis, move ahead.** So, my question to Anders is, when your students pay their hourly quota 60 hrs per year, if you have spent all these hours on these exercises and they don't know what's concrete, steel, zinc, etc., when there is a gap in their concept of structure or stability, when they don't know or have any idea of what regulation is, what do you do at this zero point?

Fausto Novi: I have learnt what I do as a professor in the Faculty of Architecture and from friends in France, at Grenoble, Les Grands Ateliers with Denis Grèzes. I have also learnt from the Spaniards at Barcelona, Thomas Herzog and others. When I went for the first time at the Grands Ateliers, I was surprised to see all those people making things with concrete,

fabric, pyramidal structures, etc. At first, I didn't understand why those people were involved in all those exercises. However, I understood that clearly a year later -that visit was enlightening! **What I do know is that I may have doubts about how to teach architecture or how to teach someone to be an architect, but what is certain is that I must have knowledge of materials (concrete, old, etc) – that's part of my job!** I also know that I'm not alone in teaching architecture in a school and that there are five years or more of teaching in a course. **My job is to pass on to students the concept that technology and construction can be the beginning of design or that every line drafted on a sheet of paper can have a solution.** I don't know how this is successfully internalized or processed at the end of a course of studies because people's brains are complicated!

I conduct several experiments in my teaching from Architecture, starting with materials and small experiments like those carried out in Grenoble, not with concrete, but with cardboard_it's the same method of understanding materials.

I don't know how people like Zaha Hadid can come on the surface, however, in the thesis and final work of students, I see an awful lot of Zaha Hadid, Frank Gehry, Daniel Liebeskind, but I'm not sure they've understood what architecture is, how that architecture is made and we leave these people in the world acting in this manner; this frightens me! I don't know if all this answers your question.

Anders Gammelgaard: The problem we face is that the field of architecture is constantly growing, there is more and more knowledge that we need to pass on to students and, as Ola Wederbrunn mentioned before, in a shorter and shorter time. **That means that the discipline we have to teach is becoming more and more superficial. However, what we can give students should address the difference between skill and attitude.**

In other words we should give them an attitude of training them to think for themselves. This is universal and it has permanence. For example, in one of the studios, we had a teacher who placed a Morris Minor on the table and asked the students to dismantle and reassemble it using a method of their choice. The outcome was unimaginable! They didn't learn anything about design or construction, but by the end of the day they had learnt a way of thinking and in many architectural offices, today, you will find that it's the people who have acquired this mode

of thinking that ultimately become directors. It seems that this is the right approach because we can't just focus on skills; besides, we can't teach all of them since they're constantly increasing.

René Hughes: You started off by saying that there is more and more architecture, but what about construction? Also, you mentioned Zaha Hadid, and Frank Gehry but they don't care much for construction. **Let's say that the idea and working concept is architecture and that afterwards there is the big construction team that tries to build and negotiate in the end, but the point is that this fragmentation is our concern and precisely what we don't want when dealing with construction in school.** It places us in the difficult position of having the architectural side do everything while we have to make *their* ideas stand. If we envisage the future, perhaps you're right in saying that there are dangers in the way things are being done. **After a five-year program, basic things should have been done,** but it seems that these are more on the architectural side and the role of construction is to provide the materials in order to realize the architecture. Fausto's perspective in terms of the sources through which students learn about architecture (materials, images, language, reviews, shapes) leads us to conclude that it's *construction* that provides the material for this concept. Finally, if we let this concept flow freely, then it's not for this construction group to deal with, but for a future group meeting.

Anders Gammelgaard: I think what creates confusion is making the distinction between architecture and construction and it's impossible for me to think of that as two separate entities.

Ed Melet: That's exactly what I wanted to say. There is no difference because **when you're creating architecture, then construction and structure should be integrated into the architectural concept. When doing the details, as an architect, one should be able to translate one's concept into something that ought to be built and can be built.**

We did an experiment during the second year according to the example of our colleague from Genova where we had students photocopy architecture they liked from magazines. We also thought we should introduce new fields so we included in the group of architects a mathematician, a florist, a fashion designer, etc. Their task was to choose a building that could be built by the end of

the day. The frightening outcome was that the architects came up with a fence-kind of form which they said they could not detail accordingly. Consequently, the form had to be adjusted so that it could be detailed. Therefore, when construction becomes limited in architecture, then construction is in danger. Our role, then, is to focus on how to teach construction that will allow our architects to make their ideas stand.

Andreodaki: I'm a Civil Engineer from the National Technical University of Athens, where I teach the course related to bearing structures. I'm very concerned about the question of "how" to teach architects because we make tremendous effort often to no avail. From my point of view, architecture is a three-dimensional art which, like sculpture, has to stand and follow the natural laws. It seems to me that you should not fear other experts or other scientific fields. In fact, all this gives you freedom in your designs and imaginations. The only problem is that architects must communicate with other scientists in a basic language through which they can transmit their ideas. As far as construction education is concerned, I think what should be learnt is the language of bearing structure in order for students to spot their design problems, identify and express them to the civil or mechanical engineers and ask for their technical assistance in an effort to resolve the problems. This can be done only if architects have a clear understanding of what the problem is and what their limits are in realizing or building what they design. So, structural education has to address these questions right from the start through the knowledge of basic sciences, such as Physics, Maths, etc. and afterwards deal with the question of how this knowledge can be used in the studio through certain examples. This, of course, is a very difficult process and our problem is to find the best possible means of delivering this to our students. I'm afraid what I've heard so far does not answer this question. Also, **if we say that architecture is a 3-D art, I would add that it's multi-dimensional. If we imagined a structure moving, there would be a parameter of time, such as in the case of an earthquake. Therefore, the more we know, the more we can imagine freely.** The problem is time, but to be an architect, one needs to be mature, so the educational period in architecture must be long, not as short as a 3-year course and, ideally, with few students.

Ola Wederbrunn: I agree that this education has to be long and without beginning nor end. Through

our teaching we meet students, people in their workplace and we are uncertain about many things and it's very important to stay uncertain. When we meet students, we are uncertain about what they want; on the other hand, students are uncertain about what they can do, so, we have to mingle or merge. In Denmark we have a long tradition of working with projects. We start with a project on the first day of the semester and we continue working exclusively on this single project for the rest of the semester. We've been doing this for ages! Also, the courses, in the past, were taken when necessary not because they were compulsory. Now things have changed due to the shorter time we have to educate as well as the fact that we need to have the entire new ECTS (European Credit Transfer System) points, etc., which we didn't have then. Before, all we had to concentrate on was the project, so, we tried to develop all the knowledge related to it. Construction was, of course, very important in this struggle to complete a project. Just thinking about what the construction would be was an uncertainty in itself because you would rarely be faced with actually building the design project. At the end of the year, when students exhibit their designs, there are hundreds of them and it's a good exercise to go around the room and ask the students to consider whether each of the projects could actually be built. Surely, the students' ability to discern is ultimately essential and we should ensure that. Students, on completion, should be able to communicate with different kinds of people. But, what is the role of the architect? Are we just builders of houses, buildings, etc. or are we designers? In the past, architects used to make letters according to tradition, but, today, an architect might go into Nanotechnology – that would be quite a different kind of science for consultation! **Also, traditional housing construction might be something we may move away from and approach another construction reality on the computer, in which case we won't need Newton or 9.1 to worry about. So, there are different kinds of sciences and tools to be used.** As a result, we have a great responsibility at school to face and screen all the possibilities that are made available for constructing realities and mirror them both ways.

Ramon Sastre: I'm from the Vallés School of Architecture in Barcelona. I'd like to reflect on three points we've discussed during our first session today on construction and contemporary architecture. I think that **this afternoon we've looked at construction as a means of solving problems in**

architecture more than as a generator of architecture. So, if we see it from this point of view, even if not solely, we can understand that there is new, contemporary architecture. Consequently, as teachers of construction, we have to change because we must teach or give our students the means of creating or generating this new architecture and not to solve it. In our school, we have ten years of experience with studios being taught by professors of design studio in association with other professors from other departments. For example, in construction, we participate in the third, fifth and tenth studio. So, when we arrive at these studios (I'm using the idea from my colleague, here), rather than demanding from our students to demonstrate what they've learned, **we have to ensure or check whether we ourselves have given these students the means to propose an architectural design which takes construction into consideration or seen from the point of view of construction.** Therefore, if we find that sometimes their projects are not good, then, it might be our fault! In fact, design teachers are always to blame because in such cases, it means that they have not passed on to the students the way of thinking that can generate architecture through construction. The other point refers to the issue of practitioners. We talk about practitioners in general, as if they were all the same, but this is not true. We have practitioners in construction, studios, in the design studios, but they come from very different studios in the profession. They may work in small settings, in teams of two or in very big design offices. So, the term "practitioners" has wide connotations. We must narrow it down, otherwise, we're merely referring to full-time professors and practitioners, as if there were only two possibilities.

Lucien Denissen: I'm from Henry van de Velde, Antwerp. I would like to make three comments regarding the debate. The first is about what someone said earlier that an exercise should start at the beginning and go right up to the end. In general, among the themes in construction, it's impossible for every exercise to be carried out right to the end. It normally isn't. In fact, we can agree that many exercises stop at what is sketched and not at the construction phase. Of course, this is quite dangerous, but there is also the risk that in view of the curriculum some students will never reach the end. The second point is that in terms of how to teach, **the link between construction and design depends also on the kind of students we wish to**

deliver after five years. There are some who will go into practice, but others won't. The reality is that if everyone does, I'm afraid there won't be any work for them. Some go into administration, others in theoretical orientation or whatever. Because we don't always know their future orientation, they should be exposed to the various possibilities and have some knowledge about what others are involved in, so that one going into practice will also know about theory, while one going into administration will be aware of the difficulties involved in practicing. I think we should cover both and link construction to design. Therefore, a minimum of construction should be made compulsory for everyone, even those in design. The third point concerns what Fausto Novi mentioned about the difficulties in design. Some reference was made to fashion and, I agree, that students should react to what they see around them. As an example, you mentioned sustainability and I will come back to this point tomorrow. However, in general terms, it's true that in good architecture and sustainability, if you follow the right principles, the outcome is really relevant. From what I've understood, I think what you meant was that the real danger lies in students thinking that they have to come up with something spectacular when it comes to architecture and sustainability. This overreaction is the real danger.

Donal Hickey: I've been thinking about what people have been saying, particularly the engineer who talked about the length of education and how it actually operates. There were also comments about methodology, and the fact that students have to know a certain amount before leaving college. Maybe, this stems from two things. I'll use an analogy about fishing to make things easier. **The old saying, give a man a fish and you'll feed him for a day, give him a bigger fish and you'll feed him for a bit longer, but teach him how to fish and he'll sustain himself. Perhaps in the beginning, we may have to give students fish, but we also have to teach them how to fish.** As a teacher, I'm very interested in other people, but I'm only interested in fishermen, not people who only carry fish. The engineer who spoke earlier, I'd love to speak to her; An artist, I'd like to speak to him too; A sculptor or the man who puts the nail on a piece of timber, I'd want to speak to them too. **If we can feed our students with fish at the beginning and teach them how to fish as well, then they can go out and find other people who know this skill.**

Anders Gammelgaard: And, in that way, they'll be

interested in going fishing on their own. I'd like to comment on what Ed Melet said previously. Often, on examining student projects, we're faced with the task of having to make these projects buildable. **I think that's the worse thing that can happen. It's a "killer" to ask students to design projects that must be buildable instead of asking them to produce architecture. We should ask them to deal with architectural problems and, in doing so, the solutions in matters of construction will come about.** This is a situation that we see very often where students come with projects that are almost finished and then we have to think construction into it, but it's far too late. This is so because in some departments they have been asked to make architecture which stops them from dealing with architectural problems that could develop the project also in terms of construction.

Vangelis Evangelinos: I'd like to introduce to our discussion some parameters that haven't been brought up yet. The number of students you have to teach construction to is of paramount importance. If you have as large a number as we have, and we are not as fortunate as some of you are to select students, it's obvious that you will have to oversimplify not only your teaching methods, but the experimental and theoretical work that you put forward to your students. I think this should be included in the discussion along with the thoughts of everybody, if we expect to find a solution that will apply to all schools of architecture in Europe.

Ed Melet: In reference to what Anders said, the buildable part is proof that our students could translate the concept into construction. So the buildable is not a limiting factor, but it shouldn't be only a form in the specific design. I agree with Herman Neuckermans that a lot of digital architecture is only about form and not about how to make it. We don't want this type of exercise. We want an exercise to make a new kind of form because we have new participants in the design studio, but these new forms have to be translated into new kinds of details. So, the translation between architectural concepts and details is a parallel session.

Spyros Raftopoulos: Can we go back to basics because I think we're going round in circles in our discussion about certain things? Perhaps we should start talking about what sort of architects we want to educate in our schools, not just as teachers of construction, but as schools. **What sort of mentality**

are we cultivating in our students? Is it that of the grand designers who, possibly, when in practice will use others of potentially inferior qualifications to draw up the details or to build? Or are we trying to cultivate the mentality of a comprehensive sort of image of the architect as the designer, but also as the person who constructs and details the building? Although my reaction may sound provocative, in a way, I believe it's an issue that needs to be clarified within ourselves, because, even though we are construction teachers, we are, nevertheless, part of schools of architecture. We educate architects and not construction people. So, in that sense, I think the idea that's repeatedly come up, which is practiced in our school, is that of the studio comprised in a comprehensive way. The studio is comprised of people, what we would call designers, but also construction teachers as a group. This is so especially in the latter phase of their studies, always hoping that we are going to produce architects that look at architecture holistically and who will practise without trying to fragment or separate theory from practice. It seems to me that we have already been through this matter in some of our other workshops where we discovered that some schools (in Barcelona, Aarhus, etc.) adopt the same policy. The fear we may have relates to the kind of self criticism I referred to earlier, which is, that the availability of information the students have presently often puts us in a position where we cannot provide answers to certain matters. Students, also, very often look at the examples of the so-called famous architects, superficially, and come round with projects that, to a certain extent, are copied from the famous prima donnas of architecture and who, from their drawing boards, ask us to find solutions. It's quite understandable that very often we cannot give answers to these queries.

The danger in this exercise is that they don't design consciously, whether drawing on paper or designing digitally, which is actually the means of the future. I'm afraid that personally, like many of my generation, I don't know much about the latter. Nevertheless, we should not look upon it in a negative way since our students will have to live with that. This intervention was simply a matter of raising questions and if we can provide some answers, I would be very happy to hear them.

Ola Wederbrunn: Another fundamental thing that needs to be discussed is the issue of whether we are, in fact, *teaching* students and *what* are we

teaching at architectural schools. Moreover, what are we learning? What is the role of the architectural school? Is it to produce a certain amount of graduates every year? I know that this session is about how to develop skills and competencies for graduates, but who are the graduates? Graduates also entail teachers' sustained and renewed interest in what they're teaching and an ability to mitigate that to not just the school of architecture, but to professionals and non-professionals as well. The responsibility of the school is an extremely important element to discuss for the teaching of construction, in light of the fact that construction can be so many different things. For example, one of the aims of this discussion could revolve around the various tools we use, whether computers, bio-technology or construction language or building wooden houses or those made of stones piled one on top of another – what kind of construction are we talking about? The role of the school of architecture is to teach and learn to gather and assemble construction and to think about this not only in terms of tools, but through methodology. Gathering this information and mitigating it is extremely important. Therefore, it's not just a question of teaching so many students; let's say, for example, 200 this year, with results that can be shown to the government in an effort to request funding for more students (e.g. 220) the following year. This is a poor example of how to make a market economy, which could potentially destroy architectural thinking.

Christopher Lowry: I'd just like to pick up on the point regarding what type of architect we want to create. For myself, I'll have to bring it back to first principles because it's a question of showing students what to expect from an architectural education so that they can understand from the start what they're actually involved in. I find, more often than not, that students who wall paper and paste their projects with something they have seen from glossy magazines, but who don't really appreciate what they are involved with, are, perhaps, students that are after some qualification as opposed to an education. I think I like Donald's analogy about the fisherman because I believe that teaching is a two-way process since the answers or knowledge that we have is not exhaustive, but an on-going process of learning. In fact, I wouldn't be a bit surprised if, sometimes, while as a fisherman you teach someone how to fish, that person teaches you something as well. I find students, especially in the earlier years, have actually been unconta-

minated, if I can use the term, by the "technology that won't work" or our warnings of "Maybe you should do it this way _ the technology won't work." Despite this, they have jams of ideas that I think we should encourage. **I believe it's dangerous to say "You can't do that because we aren't sure we have the technology to actually realize it."** Even if they don't get to the point of actualizing it, they still have to learn or understand that they learn from mistakes and that they are on an educational journey or path that is inexhaustible. Therefore, I think I'll be careful about saying "what kind of architect we actually want to produce". It seems that we all have to find our own place in deciding what it is that we want to equip our students with. I would agree with Anders **that one of the things to cultivate and equip them with is a searching mind – a mind that wants to investigate and discover – then, they'll eventually find their place if an education is what students are really after!** Of relevance, of course, is the question of student numbers and contact time, which is becoming more and more diluted, all of which have an impact. This is where a venue such as this is fantastic because it gives us the opportunity to collectively direct our attention to such factors as how to make that more efficient, how we can disseminate what we have more effectively so as to maximize student ability to manage time and learn from it.

Dimitris Papalexopoulos: This is a nice, quiet discussion, wouldn't you agree? I believe it's the quietness before the storm, at least I hope so. **When we talk about construction, we must bear in mind that construction means technology, and it's technology that has revolutionized our times. So, in this sense we can say that it's the quietness before the storm.**

Marianna Tsvetcova: Six years ago we conducted an experiment where we explored student opinion about construction education. We found that there was no interest in our area, on the part of students, so, we decided to research this further. From our findings, it was clear that what the Bulgarian students wanted was to receive "realistic" education and make "realistic" projects. Consequently, in view of these results, we changed our program and educate our students in more practical aspects, such as materials and new technology. Our students, now, make realistic projects from the situation at hand through the details. As a result, for the past few years, the number of students in our Construction Department has risen to 50% as compared to

students in other faculties. We stimulate our students in the third phase of our education with new lectures and these lectures change every year. These lectures are also given, not from teachers in the Department, but from guest firms that we invite to present their technologies and materials. These firms also arrange various contests for students to participate in. Perhaps, all these features have contributed to the increase in student interest in this education. I think that this was a very successful experiment, which is not based only on my opinion, but of my colleagues as well.

Erik Geens: Regarding Anders' presentation, I liked very much his point about setting limits about going further and further and would even stress this point. However, I have a problem with, or perhaps, I may not have clearly understood whether the knowledge referred to is based on research or prime knowledge. This type of knowledge can be obtained by asking students to learn on their own, but I'm afraid that this would be too time-consuming. Also, we have heard that there is a need for a common language or vocabulary. Even if we teach an architect-designer, he still has to communicate with the structural engineer and other consultants. So, I'm wondering, *where, when* and *how* can that basic, essential vocabulary knowledge be built up as a foundation so that it's not just talk, but a real research-based, critical approach to the problem?

When this methodological and basic knowledge is available, then we have nothing to fear and I don't think that a conversation between architect-designer and an architect practitioner is a problem. On the other hand, I had a bit of a problem with Christopher's presentation where he mentioned that external consultants / engineers come in to consult and, as someone else added, to provide solutions to certain problems. But, I'm somewhat ambivalent about this, even if I were to understand your point better. If the student is expected to find a solution that goes beyond the limits and the consultant is there to provide or confirm an easy solution, then you defeat the purpose of the exercise.

Therefore, I think it's very important that a common vocabulary and common knowledge base is given within a limited teaching period, but on the other hand, it's tremendously important that, in a positive way, you try to postpone the "defeat" (failure) for the student. Whether it's a wooden, plastic or stone building, it really doesn't matter as long as the method and vocabulary is there.

Herman Neuckermans: In reference to different things that have been said here, I think that there is no single definition of what architecture is or a single definition of the role of construction in architecture and, thus, I think we can try to explain to ourselves why we take this or that position. In fact, I think that in Europe, schools will advertise their profiles, which can be determined by the teachers or a strong figure within a school or government, etc. This means that in some countries, the architects you deliver will be able to solve construction problems while in other countries their schools may have a different profile. However, those who will survive will be the ones that advertise a profile for which, I regret to say, there is a market! Thus, if, as Maria says, AA is an avant-garde school, then, yes, as long as it can stand, it will survive; the same applies for the Bartlett, which has such a profile. My school and probably many other schools, but others may have a different one. **I hope that this will emerge and become visible to students so that after the Bachelor, they can choose and say that they will go to a particular school because it fits the image they have of architecture.** I repeat that there isn't one truth about architecture: it's always value based. It has been value based and will continue to be, and the schools have to advertise the values they stand for.

Anders Gammelgaard: There are tendencies in the world that you can't struggle against. One example is that in our city, within the last two years, the School of Engineering has been interested in collaborating with the School of Architecture. The reason for this is surely not a sentimental one, but because they've realized that a great number of the engineering problems that have been solved have been dealt with in India and China. This means that **we can't compete with straightforward engineering problems, so, the only way they see for the future is to train their students to be innovative. This is their rationale for seeking cooperation. A fact we can't deny is that our world is changing in that direction. We cannot produce architectural candidates whose knowledge can be assured for the future, but we can train them into a way of thinking that will keep them "fishing".**

Session 2: The Teaching of Construction and the New Materials and Techniques

Chaired by Herman Neuckermans

- *What should be the necessary competences and skills acquired through construction education that allow architecture graduates to be capable of following the rapid development of the building industry in producing new materials and new construction methods respectively?*
- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be capable of following the rapid development of the building industry in producing new materials and new construction methods respectively?*

The Schools presenting in this session were

Versailles Paris (France) School of Architecture by Nadia Hoyet,

Royal Academy of Architecture, Copenhagen, (Denmark) by Ola Wedebrunn and Ole Vangaard

Aarhus (Denmark) School of Architecture by Karl Christiansen

Grands Ateliers de l'Isle d'Abeau, (France) by Denis Grèzes

Please find the respective interventions in the section of articulations.

Debate on presentations and theme

Herman Neuckermans: We will now proceed to the Question and Discussion Period related to the thematic presentations from Session 2, which you've just heard. For the sake of facilitating this discussion, I propose that we start by asking the more general questions addressed to the team first and then go

on to the various individual questions or remarks you wish to make. So, are there any general questions related to the themes proposed?

Jerzy Gorski: This is not exactly a question to the panel, but some general comments.

I liked the idea of teaching construction in a conceptual way, which means that the general problems should be taught. I want to illustrate this idea through an example that also came up in yesterday's discussion. Students now have ample opportunity to get information easily via the Internet, contacts from firms and an additional two sources, the first being magazines of architecture, where students see the forms without, perhaps, analyzing the value of the architecture. This, of course, is one extreme. The other extreme is the libraries of details and technical information coming directly from the manufacturers. Normally, students ask for the names of manufacturers and their immediate response is "We'll find the information on the Internet." Also, in technical magazines, they are provided with CDs on all this information. Another area is regulations and norms and to get to this source all they have to do is click and obtain all the information they want. It seems that they can get around this field very easily, but they are lost in getting the "real" information, meaning that they go about it unconsciously. Consequently, **our role is to fill this gap between the architectural concept and the technical details through a conceptual way of teaching construction and the architectural studio as well.** This, in fact, means that we must somehow teach the basics so that they know why they're looking for technical information. When I think back of my earlier teaching days, the amount of materials, then, was limited and we were a source of technical information for students. **Nowadays, because of this enormous amount of new materials, details and information, there isn't sufficient time to cover everything.** Personally, as a way of dealing with this information overload and easy access, I found I had to reduce the amount of technical information and return to basics, i.e. understanding how a building works, understanding the connection between elements, etc. I have no easy answers, but our team is in the process of changing our way of teaching. I like the Danish attitude of teaching and believe that if students understand basics and are aware of what is important in their concepts, then they can look for details that are easily available. In fact, students have often handed in ready-made details which

they obtain from such libraries, but the problem is that they don't know what to do with the details.

Herman Neuckermans: Thank you. Is there anybody that would like to respond or react to the statement made?

Ola Wederbrunn: This attitude of changing the educational process is right, but regarding the bulk of information which is easily accessible, we must remember that one has to "digest" the information one gets and, before even getting it, one has to have schooling. The role of the school is not just to give information, as this can be obtained elsewhere, as we've already mentioned. **Therefore, our role is more to show students how to "digest" it and provide a forum for discussing the information, which can be done at various levels.** There is pedagogy in Denmark on how to teach young children so that they are no longer being taught as a whole class, but rather in small groups of different sizes. This idea can apply to architectural schools as well so that we can provide an open forum rather than a class where we teach and learn architecture. This kind of openness should exist in an architectural school. Today we face a lot of students who work on their own at home with their computers and stations, where they can go on line to schools and exchange information through chat lines. In our school the students are very fortunate to have each their own table and lamp, etc. However, you have to get them in different groups, seminar groups and smaller teaching groups and define these kinds of groups where discussions can be held, including a large project where many participate or the individual project at the end of the year as is done at the Academy in Copenhagen, where we have the intensive three months.

Marcel Heistercamp: I'm from the School of Architecture in Gent, Brussels. There seems to be a missing link in your discussion – the link of the relations between design and surrounding elements – the landscape. We only see the design of an object, but what about the other important factors or elements?

Cyrille Simonnet: I think there is a gap between what was said about the facility with which we obtain information (Internet, etc) and the technique. As a way of bridging this gap, there is something called a project, but a quality project, since a project is a "conduit d'anticipation" involving a kind of anticipatory response or means of expectation. Now, in schools

of architecture, the main object of the project is the town, generic town, landscape, etc. Also, I foresee another gap coming, which can be observed in many schools, i.e. that in architectural studios and architectural workshops, the main interests revolve around the very important questions of town development, landscape, patrimony, etc. to the detriment of construction; so that the question of construction is being totally ignored by many architects and this neglect presents a real problem. Therefore, as far as I'm concerned, I foresee a further fragmentation coming.

Ole Vanggaard: The question related to landscape made me think that as a structural engineer, I have a different view. Structures, nowadays, are getting so large that you have these huge projects of transportation where the issue of structure and landscape emerge. So, I see a great need for a structural-landscape conception, something that is moving and changing and also related to what the computer could do. When I see these schemes round the world being done, then I feel that this concept needs a structural answer which has not been provided yet. But, I suppose the question asked was more environmental in nature, which I really didn't comment on.

Ola Wederbrunn: On the environmental aspect, Mies van der Rohe said that "God is in the detail." I don't know if we have to be religious about this, but surely you have to relate the environmental aspects to objects in a context. The contextualization of a project is very important. Therefore, it's essential to stress that culture and sustainability go together and, this aspect of teaching has to be developed as well as the technological aspect and, this needs to be seen in the details of construction and materials.

Marcel Heistercamp: In the teaching of design, we don't see this relationship—that's the problem! Models and drawings are never made in a context.

Ola Wederbrunn: I'd like to answer by saying that in the "sawing project", of course, we were not involved in the timber industry, but the students who took part in this project started with wood and wanted to make wood, so they thought about trees and how to cut down trees to make pieces of wood. Finally they had to think about how they could make tectonic out of the pieces of wood. So the student tries to follow the project by working manually and quite intensively right through to the construction phase. Therefore, from material to construction,

contextualization with the landscape (forest) was part of the aim. Of course, I'm simply referring to this particular project as an example, but there are many students in the Architectural Department and there are many ways in which this can be done. I very much agree with you that contextualization should be brought into the discussion and that material and technology have to do with a greater contextualization -- that of the environment.

Herman Neuckermans: Yes, I agree with Marcel Heistercamp's remark that as far as the relationship between objects and surroundings is concerned, it was not really visible or apparent in our presentations with respect to the objects we designed. So, he has a point; although I'm not sure if it was intended to be a constructive suggestion or simply a critique. Would you like to expand on this and share some ideas on how this could be done?

Marcel Heistercamp: I think we have to start with the environment. Study the conditions: the air, water, land, rocks, mountains, etc. and a discussion about these objects in their relation to the landscape is more important than merely making a drawing about the forces of an object.

Herman Neuckermans: Since we have another session coming up devoted to "Construction and the Environment" and your remarks would be highly relevant there, I would suggest we "stick" to the program at hand.

Donal Hickey: Where do new materials come from? Are they pure innovations corrupted by the time they make it to the construction industry? Do "smart" materials and systems divorce us from our senses?

Maria Voyatzaki: I'd answer that by asking "What materials?" Also, again, I wish to refer to the point I made yesterday from Greg Lynn's and Hani Rashid's book 'Architectural Laboratories' some notes on the book, which I started quoting to you yesterday. To adequately answer your questions, we would have to re-define "materials". For example, if I think back of the materials I learned as a student, the "Modernist Movement" at the time used and talked about metal, glass, concrete and such techniques as cutting, welding, joining, pouring concrete, etc. However, if you go through the contemporary, avant-garde books of architecture and the new paradigm that does talk about materials, you'll come across such terms as glass fiber, raising panels, vacuum formed PETG, plastic composites and techniques such as bolt hammered aluminum, high-pressure water jet

cutting, multidensity fiberboards, fiber plastic rotor molding and, of course, the popular term "nanotechnology" even if we don't know what it means. A very recent book, which you probably already know, edited by Toshiko Mori from Harvard, based on experiments she did with her students entitled "immaterial/ultramaterial" talks about the new experiments that schools conduct in their experimentation for forum to change the genetic code of known materials or even computerize the characteristics they desire their forms to have when they are materialized through a material. Therefore, I think, we have to make a distinction since we live in a changing world. Ed van Hinte will tell us a bit more about this topic this evening. After all, we're amateurs in this particular aspect and he's probably laughing with what I'm saying. Nevertheless, we should be aware of the fact that when talking about materials other than the ones we're familiar with, which of course entail different techniques for producing and assembling parts, we will need to answer questions such as Donal's with the question, "What materials? since this is not the "palette" we've been familiar with for years.

Donal Hickey: There are "smart" materials. There are very "smart" materials. There are exceptionally "smart" materials. (Interruption by Ed van Hinte)

Ed van Hinte: Sorry, I'd just like to specify that "smart" can also be defined in terms of how you apply a material. For example, sand can be extremely smart. So it's far more complicated than merely defining the material itself as being "smart". You cannot just talk about the material. I'm often asked "Can you tell us what material is sustainable?" to which I answer, "Styrofoam in the sea", or other, because that can be sustainable too.

Donal Hickey: Let me finish clarifying what I meant. There are materials that are relatively transient in terms of their capacity to change, but there are materials that in terms of process, physical properties and qualities have medium-term longevity as far as usefulness is concerned. There are materials that are ultimately malleable in terms of the way their physical properties operate, the way we think about them and how useful they are. That's what I meant by the "smart" "very smart" and "exceptionally smart" materials.

Ola Wederbrunn: In reference to Maria's remark, we're not talking about such materials as stone, glass, wood. In fact, it's not even necessary to refer

to those. However, what is necessary is to talk about whether the material is hard or soft, so that experiencing the material is part and parcel of the material itself. In this way, we manage to change our perspective of things from the view of what they are to what they do by simply experiencing them. Therefore, we're not looking at numbers or quantity of material, i.e. we're not trying to say, for example, there are 155, 248 materials, but that there are different ways of experiencing them.

Ole Vanggaard: As an engineer, I think that when architects talk about "smart" materials, smart gimmicks, they might also be referring to the lovely machines. In a way, I think we're forgetting that all these things have undergone a certain kind of development, technical development. However, from history we know that this type of development lacks or does not go into architecture and, therefore, of any architectural value, unless the architect strives to derive or find an architectural concept from it in the form of material concept. It's precisely for this reason that we can use the example from the Modernists. Although it took a century for technology to develop, it wasn't until later when some architects formed the Modernist Movement that they actually managed to use the available technology in architecture. So, in this case, it seems we're also on a hitch of technology which is there and, I think, **what is far more interesting to see is what the architectural content of these "smart" materials is.** But, I guess, it's always funny to look at strange things! I have no answers and, presumably, no structural answer, but I believe we need a conceptual way of talking about this concept. So, what is the concept in "smart" material? How can we formulate concepts about them?

Maria Voyatzaki: I'd like to challenge the debate by making a distinction and I'm wondering whether you'll agree. It follows a kind of chronological order. To my mind, the so called traditional materials such as masonry, glass, concrete, wood or timber, steel, metal, etc. had certain properties, and knowing their properties, for example, whether they could undergo tension, compression etc. when we designed something, bearing in mind the potential of the materials in terms of loads, we would then choose a suitable material. Or, vice versa, knowing these properties, we would design something appropriate to the materials. The second step was, I think, a kind of modernist / logical or rational approach to materials. Then there was some experimentation in transcending these properties of material, an

attempt to go beyond what they could actually offer, which resulted in structural glass, for example.

So we moved from the phase where glass was fragile and sensitive to the point where by laminating glass it could bear loads. Today, we can say that the paradigm has changed altogether and, with such new structures, it seems that we want to pre-define the properties of materials and then design according to the best material of our choice or needs. This is a very avant-garde paradigm, but, I think, this is the phase we're going through. In fact it's what Ed van Hinte describes in his introduction in a book he will present this evening, which is like reading "A Guide to the Galaxy" where you imagine what it's going to be like in 10 years' time. It's a kind of analogy similar to what the Internet was to us 20 years ago or even 10. It was unknown territory and no-one could imagine what we would be doing with the Internet! Along the same line, this could be true for materials as well. So, we basically prescribe what we want the properties to be, make new materials and come up with a new list. I must admit that I understand about 30% of the list of recent materials I read to you earlier. I don't think we know what these new materials are and this, I feel, is where there is food for thought and a broad field for research to be undertaken in the future, especially in education.

Michel Paulin: I'm from the School of Architecture in Lyon. I agree with what Maria has just said, but **I think the problem is not new or old materials, but rather the problem lies in the processing or mining of materials. If we look at the history of architecture or art, we can readily observe that each historical period began with an archaic one followed by the classical and Baroque. This cycle is the same each time and I believe we're going through the Baroque phase. The archaic period represents the setting up of principles, aesthetics, and means of building while in the classical one you try to expose as clearly as possible these principles.** Mies van der Rohe is the best example of the modern style. It's not so much the concept or principle which is essential, but the effect and perception together with the whole enjoyment of building – the game of building. When I consider this very room we're in right now it's typically Baroque. Look at this particular column, is it all of stone or brick covered with marble or is it just paint on imitation marble? All this is not important, but what is important is the result of the finished product in that particular period, which in the case of this building is the end of the 19th century. When

I said that this was a God blessed period I said so because we have a single "one-way" thinking mode. We showed last night the large historical survey where all the pictures were a reenactment of this kind of approach, the classical one where the main value was what the material choice was based on, but not the effect. Even in the extension of the British Museum there is a structural grid and the main value is the structural principle, not the form. This morning, we saw the sketches made by Frank O. Gehry for the Guggenheim Museum.

The approach was completely Baroque, only the effect was sought after by Gehry. He's not at all concerned with construction. He says that he wants a kind of shape; he doesn't know exactly which one, he'll try by modeling, sketching or whatever means and he wants the skin like that of a fish and if someone can give him the proper material, fine. In the end, it was covered with stainless steel, but it could have been any other material. **For those of us in charge of teaching construction, we need a change of attitude, a different approach because, as Nadia Hoyet said earlier, we have to teach on the basis of a performance check list, and this is a radical change from the way we originally designed. We have to learn to tell students how to establish this check list very firmly and how to assess the process. That's a radical change of ethics for us and very difficult, especially for me, who is close to retiring.** Moreover, it presents a problem to the younger staff members too. In the discussion, there is clearly a gap between the two approaches and it's clearly a gap of ethics or culture, not a technical one.

Herman Neuckermans: So, I'm sure we'll hear more about the performance-based approach, but for now, Miltiadis Tzitzas will take the floor.

Miltiadis Tzitzas: Thank you. Regarding the remark previously made about the fact that choice of materials is irrelevant or does not really matter, I wish to say that what I actually learned in this School as a student and what my colleagues and I try to convey to students is to learn to respect materials in terms of what they are and to show respect in the manner in which we use them. Whatever materials we use to form or materialize the architectural idea we have in mind, we must take into consideration that some materials are used for the structure, others for the purpose of creating the exterior envelope, etc. A distinction between how we use these materials and show our respect for them reflects

good, quality architecture. I will give you an example to demonstrate what I mean. I've been to Copenhagen several times as it is a place I like very much. Apart from our Danish colleagues, I hope others have also been to Copenhagen, and, if you have, you will know that there is a complex of buildings that houses the royal family. You go through a huge portico, like this one here, for instance, with two magnificent columns, very much like the ones in this room, but on approaching them one notices that the material of the columns has deteriorated and that the material is not stone, but wood. This, of course, is understandable when one considers that, in Denmark, the land is flat and marble and stone are not available. However, the use of the material itself simulating a portico column was kind of shocking to me. I felt terribly disappointed with that and I should add that it was the only disappointment! Nevertheless, what struck me was their willingness to use a form familiar with the icon we have. This big column, here, is made of marble and is a supporting column, not a decorative one like the column you see at the corner, which is painted; that's different. Naturally, this doesn't mean that one doesn't use marble for other purposes. Another point I wish to make refers to the Café Georges at the Pompidou Center, which as mentioned this morning is made of new material that in fact is not so new, as commented earlier. Actually, when visiting the place, I went to the lavatory and I remember worrying about not being able to find my way around because of its peculiar shape. In fact, I started wondering what the toilets would be like, but, fortunately they were quite conventional. So, there you see new material used in a very conventional space.

Anders Gammelgaard: I'd like to go back to Maria's comment on the development of the Internet and new materials. As you said, nobody could have foreseen the development of the Internet, even Bill Gates was surprised at the rapid growth. He also said that in the future, already today, the development of materials would be the development of concept. We will simply define what we want the new material to do or how it should perform and then design it. However, this development will not be so rapid, in fact, because if we take a material like wood, for example, which is a very old-fashioned material that should have been taken out of production a long time ago, we realize that it's still being widely used. Why do we continue using it when, today, we have so many new materials that

perform much better than wood? I think, it has to do with the fact that it's so strongly related to our culture. We have stored in our memories all kinds of familiar associations and shapes related to the term "wood".

However, if we consider another material like plastic, developed around the '20s when we saw the first plastic products, it's not until today that we have become very familiar with this material. **Therefore, it takes an extremely long time before a material is adopted for architectural use. Then, we can go to one of the new materials such as polyamide carbonate and no images come to our minds because we have no conception of the material. So it seems that the human factor slows down the introduction or acceptance of new materials.**

When we see modern buildings, today, where new materials are used, we feel like aliens walking in them and the first thing that we tend to do as architects is to try and find out what they're made of. It makes us terribly uneasy if we have difficulty figuring this out! So, this whole view of the future in terms of material development and implementation moving at a fast pace is a notion that I don't really believe. In 30 or 40 years, we'll probably still be using the old-fashioned material that I love so much-- wood.

Herman Neuckermans: Of course, there are traditional materials, but in teaching, I think we should make a distinction between our knowledge of materials and the direction where architecture is evolving, whether it's the whole avant-garde trend or whatever one may call it. Also, I think students should know what is still there. I can guarantee that most students in their fresher year don't know what some of these materials are, even the traditional ones such as wood. So, I think that this material knowledge should be part of the teaching, and in understanding such things, new problems can emerge from it because, let's take as an example a very traditional material, glass, and you've already mentioned the structure of glass a bit, but how many students should know the difference between hardened glass and laminated glass before even going into the actual use of these materials? I remember that I asked students of architecture at a conference some years ago, in the presence of Pierre von Meiss, what is glass made of? Well, I was proven right, because they not only didn't know what glass was, but cement as well, despite the fact that they might have had courses on them. Therefore, it's not simply a question of making distinctions, but we must also not skip or overlook teaching the

traditional materials, taking this information for granted as given, because for students these materials are yet to be discovered.

Maria Voyatzaki: I'd like to answer by repeating what I said yesterday that there is the fear of the new. When we talk about kevlar, we don't bring it up because we want to rule out of construction timber or concrete, etc. New and old in respect to everything we've discussed throughout the Workshop are not mutually exclusive. What, in fact, we're saying is that there is a new world out there and we have to look at it. We're certainly not suggesting that the old paradigm should be discarded and replaced by the new because there's no other way of building! We've learned about the Internet in the last ten years, but it was used over fifty years ago as a means of communication in military services, universities, etc. This story can be compared to the way kevlar is used in building, nowadays, to a minimal degree and, in much the same way, plastic was unknown when we were born, but now it's part of our everyday life as well as being widely used in buildings. So, we would have to dismiss the idea that this developmental process is lengthy because fifty years is not a long time. Kevlar will be commonly used, as far as I can foresee, by the time our grandchildren will be constructing buildings, and it doesn't have to be this particular product. It's merely an example.

Michalis Limenitakis: I'm from the Clermont Ferrand School of Architecture. I'd like to add that it's not just a matter or question of materials, but the main distinction is about architects and engineers. An architect designs space with materials that have meaning or that carry a message, whereas an engineer knows the materials without the awareness of the symbolic meaning. So, our question as producers of built space with meaning that is occupied and used by others is, how do you, engineers, give us the tools to manipulate and create new meaning through these new materials?

Herman Neuckermans: Thank you. I'd like to give the floor to those who have been patiently waiting for their turn for some time.

Nadia Hoyet: I'd like to continue with what Michel Paulin mentioned earlier. I think we have lived in an industrial era. We are now at the beginning of the era of communications and information so the main objects will not be industrial products or materials, but information. This fact influences our way of conceptualizing; we must be able to have all the

right choices and in huge quantities – that’s the deal! But that’s a problem because we have difficulty prioritizing and putting things in the right order in the hierarchy of products made available. We are in the process of searching for new ways, but we have yet to find them.

Ola Wederbrunn: The world is always changing and we have to cope with the changes. If we understood the myths, we could convey the message to others who don’t. If we know how to read, then we can read a book, but there are people in the world who don’t know this skill of reading. If one can read, then the book becomes the means of constructing one’s reality. The poetry of the words make you think about construction. There is an architect in Dallas, Marcus Novak, who has been writing and, I think, is researching this. I think it’s very important to stress that we have to maintain the relation between what we’re navigating through, whether it’s the poetry, the book we’re reading or the text we understand, if we’re lucky enough to be reading. So, what do we educate our students in? Do we educate our architects to build houses of wood, plastic, etc. or do we educate them to be able to set up a website for Amazon, for example, in order for them to construct things on the computer? Actually, it would be interesting to elaborate on how to make programs because, as we’ve heard yesterday and from Karl today, constructing programs is a way of constructing too. This will also include material properties and the properties will be the materials themselves. Therefore, this discussion can flow in this direction and it’s apparent that we really need to deal with this computerized reality in terms of construction and materiality.

René Hughes: I wish to comment in reference to the notion of "concept" that stemmed from the presentation of Ole, the Engineer and Ola, the Architect. (By the way, the relationship between the last letter of your first names and your chosen profession respectively is an interesting coincidence. In fact, we can almost say that you were born to be Engineer and Architect and here you are sitting side by side with one another, just as engineers and architects should!) However, to get back to the point, I’d like to respond to our colleague from Warsaw about the Internet and the problem with information processing and materials, etc. I think that "concept" derives from architecture, but it can also be found in construction. A concept deals with something that doesn’t exist – it’s purely the term of an architect – the concept of a building, idea etc., it’s an

abstraction that leads a project right through to its realization, and it helps us in the field of construction to know that this notion exists. For example, in the area of material, we make various associations related to the details of the material itself and we need to keep these concepts in mind. If we take glass, for instance, we associate with it the concept behind the material. I believe that the best thing we can teach our students is precisely this type of conceptual knowledge. It’s possible for us to adopt the manner in which the architects use the notion of concept in our construction field in order to produce a good line. We can talk about laminated material, but we can’t associate this to wood, for example, because wood is mainly fiber and processing will turn it into small pieces or turn it into aluminum extruded or laminated with resin. Along the same vein, concrete can’t be laminated either because concrete is a chemical reaction. Therefore, the concept of concrete is basic and self-explanatory. Also, I recognize the controversy that Paulin introduced with the Baroque reference, which arises when you transfer the concept of one material to another in an attempt to experiment. For example, with steel, which can, of course, be laminated, you can cast or pour the steel in the same way you do with concrete, but it’s irrational and totally experimental! As a rule, we should use the same architectural tool, the conceptual notion, as a guide to our construction teaching.

Herman Neuckermans: I agree with your definition of concept, but I wouldn’t say that it’s the prerogative of the architect exclusively. Designers as well as people who are capable of perceiving also use this term. For example if you talk to a computer scientist, he / she will ask you to explain your conceptual framework if he / she is to develop something for you. The converse is also true, i.e. if we were to do something for the computer scientist, then we would readily see that his / her conceptual system is quite different from ours. So, we all function within a conceptual framework.

Michel Paulin: The question of information and communications is very important and we must be cautious not to confuse the two terms as they are two separate entities. Information about materials today is "hyper" or ultra developed. However, I wonder if the flow of information is really rooted in the personal culture of individuals - I have my doubts!

We have two problems to confront when teaching: to instill this personal culture in our students and to improve knowledge and

information. Moreover, I believe that it may not be possible to efficiently and correctly utilize this bulk or large body of information without the presence of, at least, a minimal amount of personal culture. For example, with regards to new materials or plastics, we try even if minimally, at the Grands Ateliers to search for this personal culture. Of course, this is extremely difficult because we don't use this kind of knowledge daily; in fact, it's difficult enough just naming each plastic correctly, even if we are more or less specialized. We have developed a small training program called "From Objects to Molecule and Feedback from Molecule to Objects" The first is a blind test, just like that of a wine tester. We start by cutting into small pieces various kinds of plastics and the students are blindfolded and asked to identify the individual types by such strategies as tasting, touching, smelling, scratching, cutting, firing, etc. We have a series of tasks that are meant to improve step by step the kinds of properties and distinguish the kind of effects extracted or derived from the pieces as well as identify them. If the student manages to identify the kinds of plastics, then he/she can go on to the information provided on the Internet or CD ROMs to learn more about how these materials are made. In the subsequent program, we start with a pool of properties and ask them to design something using this pool.

Ole Vanggaard: I'd like to refer to the comments made on the "concept" issue. As mentioned, there are concepts at many different levels, but the notion of concept was brought up here mainly as a tool that can be used between the architectural idea and technological content. For example, a young student may say that she is not satisfied with the types of glass available and wish for an alternative solution. However, we must remember that the concept is about glass and so we start a discussion on the basis of what this concept is. Then, one can argue that the technology related to the particular glass is wrong because it's brittle and, as a result, we continue our discussion looking for ways of dealing with this particular feature. We may consider combining the material with something smooth in order to eliminate the roughness which could be potentially dangerous in a structure, etc. Reflecting on this, the student may decide that the idea is a good one and ask about how to proceed. The point is that we are all initiators and try our best in developing and creating things. We know that we shouldn't put all the force at the corners or triangulate, but make 3-inch corners to ensure that

the plate action is in the object. This is how we begin developing something, but that's because you put forth the concept of what is desired (e.g. purely glass – it's impossible, so this sets up a forum for us to work in). Therefore, we should regard the **concept** as a **tool** which can help us in our teaching, particularly with older students, because it can be a worthwhile means for you to enter into a dialogue with them whose language can be developed, and once we develop this language, it can be very useful.

Maria Voyatzaki: I think we're again referring to existing knowledge in the example you gave advising a student about triangulation, etc. That's the case where you have the answer off the cuff based on existing knowledge. However, I'd like to make a reference to a recently published book by Cecil Belmont called "Informal". You probably already know the author, who is a Structural Engineer working for Ove Arup and Partners. This is a very interesting case as he also works with Liebeskind and Koolhaas among other very well-known architects. A running thread throughout Belmont's book is that invention and experimentation are hugely attributed to the duty and task of a structural engineer. In fact, what he actually mentions in his book is that he's the one who prompted Koolhaas in the Rotterdam Kunsthall to go beyond the grid, which is existing knowledge that we are all aware of. We have rules of thumb which we use to deal with the problems our students encounter. However, he suggests that experimentation either in material or structural systems has to go all the way. This is how we can innovate if we want to go beyond the existing body of knowledge in architecture. This is the reason he called his book "Informal" because he challenges the existing formal patterns or modes of thinking and of conceiving architecture, structure and materials.

Ed Melet: I'd like to comment on what Maria said as well as what was previously mentioned. Indeed Cecil Belmont proposed an offbeat kind of structure and Koolhaas accepted it because it was part of the concept of the building and it made the building stronger, so there is a relation or integration of structure and architecture. I think it's the same with materials and detailing. **Materials have meaning only when they are within the architectural concept, otherwise, they're not very important in terms of how smart or dumb they are.** They acquire meaning only when they are in a building or space, then they reflect the idea of an architect. Since this Session is on "new materials", including

new structures, etc, I was wondering whether new materials and structures imply a new way of teaching.

Maria Voyatzaki: I'd like to correct you on the remark you made about Belmont's structure. It wasn't the strength of the building; Cecil makes no reference to this in the book. He merely made the suggestion and Koolhaas agreed. It's a very strict and rigorous way of dividing space and if you have large pieces of artifacts in a grid it's as if you frame them with four columns, so, all he said was let's transcend and go beyond this old grid system of putting things evenly distanced and loosen up the space by arranging the vertical support in different directions. As a result, it has nothing to do with strength. However, as far as you're second point is concerned, I think you're right in saying that the discussion here is about educating people to come to terms with the fact that there is a new world of new materials, as well as traditional ones, and that these materials demand new methods and new ways of understanding architecture as a whole if we want to accept the point made in Session 1 that only by integrating the idea with its construction, we can have good architecture. Consequently, of course, as teachers of architecture and construction, this is what we're here to discuss.

Ola Wederbrunn: Just a short commercial presentation: Rasmussen's 'Experiencing Architecture' is a book written in the early '50s and it's about experiencing architecture for people that we'd like to talk with, i.e., those that are interested in being educated as architects. Rasmussen died in the 1980s at the age of 90. The book is in English, published by MIT Press.

Herman Neuckermans: We've come to the end of the session, but, in my opinion, I don't think we've answered the question of what we should really teach. As our colleague Professor Gorski from Warsaw emphasized at the beginning, there is a great deal of information, but where does it all fit in terms of what we consider essential to be taught so as to prepare students to adequately face the demands and requirements of the future? Surely it's not enough to simply teach new materials. We need to teach the basics first and then enter into a discussion on the rudimentary basics of materials, which I'm afraid was not dealt with in detail here.

Session 3: The Teaching of Construction and the Environment

Chaired by Emmanuel Tzekakis

- *What should be the necessary competences and skills acquired through construction education that allow architecture graduates to be responsive to the sensitivities and consciousness of our society towards the environment, sustainability and energy conscious design?*
- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be responsive to the sensitivities and consciousness of our society towards the environment, sustainability and energy conscious design?*

The Schools presenting in this session were

Genova, (Italy), Faculty of Architecture by Adriano Magliocco

Thessaloniki, (Greece,) School of Architecture, by Nikos Panagiotopoulos

Antwerp, (Belgium) Institute of Architecture Henry van de Velde by Lucien Denissen

Please find the respective interventions in the section of articulations.

Debate on presentations and theme

Emmanuel Tzekakis: We will now begin our discussion on the presentations related to the theme of Session 3. As proposed by the former Chairperson, which I found to be a very good suggestion, we will proceed with questions on the general theme first and then move on to the more specific ones.

Nicolas Remy: I teach at the School of Architecture in Grenoble and wish to comment on the speech of Nikos Panagiotopoulos. Although I'm addressing the question to Nikos, this is also part of the general

discussion. From what you have described on the role of the European Community, we can extract a few good points. For example, regarding the recent thermal regulations, as well as others related to acoustics that we have in France, all of which try to improve the comfort of inhabitants in buildings and reduce the consumption of energy; one of the overriding goals of such regulation is to enable us to engage in dialogue. In fact, I was very pleased to read in a leaflet that people in Belgium share the same criteria with us. However, does regulation really mean comfort? If we take the example of acoustics, I'm not sure that the maximum level authorized in Northern Europe has the same meaning or can even apply here in Greece or Italy or the South of France or Spain, countries where there is a different relationship with outdoor, public space. So, my question is what can we do with trying to improve the level of construction that aims at better and better care of the environment while trying to maintain the uniqueness or singularity specific to each country? Moreover, I think a school of architecture can play a major role in achieving these goals.

Emmanuel Tzekakis: Does anyone care to comment?

Nikos Panagiotopoulos: The point I made was precisely that -indeed that is our role! Also, we should bear in mind that to enforce a regulation takes at least ten years: you start in 1980 and by the time you finish in 1995 it's already outdated. Therefore, we should be more flexible.

Ola Wederbrunn: I think there are regulations, but they're difficult to handle. The European Community's regulations also relate to things other than economic ones. There is the Council Directive 85 / 347 amended in 97 / 11 and, again, amended last year that takes care of cultural heritage and architecture. It also deals with environmental impact assessment and strategic environmental assessment, both of which fall in the category of the environment regulated by the European Union. The question, however, is whether we should regulate down to every project. We need to have some flexibility in the system. I think you're right in saying that it's the schools that should be involved. After all, dealing with every type of project is much too detailed. Finally, it's important to stress that sustainability has to do with culture.

Lucien Denissen: I don't agree that there should be a great deal of flexibility; after all, regulations are there for a reason. A regulation should be flexible

enough to allow each country to make some exemptions or special amendments, but the overall goal should be to abide by the Kyoto Protocol. For existing buildings and matters concerning cultural heritage, certainly, exceptions can be made as far as isolation is concerned, but that's another case. However, for new buildings the matter of regulations is an issue that an architect has to deal with, and it is our duty to teach our students to take into account factors such as fire prevention, safety, sustainability, etc.

Emmanuel Tzekakis: Are there any further questions?

Ed Melet: I have a general comment. Sustainability is also a matter of attitude. **Of course, sustainability is adequately covered in the regulations, but for people like Piano, Foster, etc. it's an attitude of improving sustainability beyond regulations. There is also the attitude reflected in your own individual school methods through which sustainability is encouraged beyond regulations onto the design.**

Emmanuel Tzekakis: That's a good point. Does anyone wish to comment?

Vangelis Evangelinos: I believe that if you see sustainability as a series of criteria, then you can prioritize or set a hierarchy of criteria concerning architecture. If you put on the top of the scale the sustainability factor, then you could use it as main criteria for checking your work. In this sense, you could use local materials as being sustainable in creating the local picture in architecture, use material that is energy saving, etc. If we introduce these criteria in our class discussions, which we sometimes do, and put sustainability further on the line, then we can start a dialogue with our students regarding the specifics that could improve the picture of sustainability in local architecture.

Ole Vanggaard: There seems to be too much talk about used materials, but you must be aware of the fact that according to regulations, producers are not allowed to sell material that's not certified. Used material can't be certified. I was a member of a Danish Committee and was very surprised when I realized that used bricks couldn't be used again unless they were first tested. The question is, how can they be tested? Old bricks can't be certified although we know that they can be quite good. Seemingly, with these European stipulations, we're running into the problem of not being able to reuse materials, ultimately.

Lucien Denissen: I don't think you are required to test the material at all times; that applies to public buildings and so forth, but in the private sector that's not the case. Nevertheless, we should allow such experiments at the experimental phase. Of course, where there is a large production, there should be testing and certification, especially if safety is in question. However, if it's a matter of a used tile that's not easy to clean in the recycling process, then it can enter the experimental phase of reusable materials. If the person who plans to reuse the material decides that it's fine, then I really don't see why the person shouldn't be allowed to do so.

Ole Vanggaard: I'm sure that one's judgment is correct and that they could be used and if so, they should, in fact, be used. However, it basically boils down to the question of responsibility – who would assume responsibility for a house that may be fine, but not worth it because it was built with uncertified materials whose safety can't be guaranteed? Eventually, it would end up being illegal and the contractor, architect or engineer would be held responsible. Therefore, I doubt that anyone would take the risk of being sued in court for using uncertified material. In fact, it's a professional obligation to use certified material. However, I am also fully aware that this legislation creates a rather unpleasant situation for which I have no solution. I resisted accepting it for the longest time while I was on the Committee mentioned above. I could understand the difficulty so we circumvented it by trying various tests with bricks. For example, we thought that if by throwing them on the floor they would be intact, then they could be used even if for low-level or use. The same principle applied to timber; however, that's no solution for reusable materials.

Vangelis Evangelinos: I think that the way one can use an old building material depends on the imagination of the architect who makes the final, recycled building. I've been using recycled materials for quite a while. For instance, I've used load-bearing brick for paving; this is a very good solution because you needn't check its strength, but merely its wholeness. I've also used ceramic tiles for roof paneling. The tiles I used were 150 years old and they've lasted for 35 years with no ill effect. When I first used them I had to clean them and check each one to ensure that they weren't broken. There are simple things that you can do to recycle old materials; all it takes is a little imagination.

Ed Van Hinte: I'm wondering, sustainability is not

simply a matter of regulations and complying with rules, it's also an educational challenge.

You can, for instance, ask your students to design a building where there is sufficient light for 24 hours without the use of electricity and they are to work out how this can be done. Such matters are very important in education. It's not just about knowing all the rules, but finding interesting solutions as well.

Ed Melet: Are there any other colleagues, here, who do similar kinds of exercises where students are challenged to think of sustainability beyond regulations?

Emmanuel Tzekakis: Do you mean that you would like others to share their experiences in this aspect?

Ed Melet: It seems to me that we're not discussing sustainability itself, but in the context of the teaching of sustainability. Undoubtedly, we all agree on the importance of sustainability in general; however, what I'm wondering about is whether there are any workshops, seminars or specific exercises that are being conducted on the subject of sustainability beyond an isolation of fifteen or twenty centimeters, so to speak, which is not really relevant, in any case.

Spyros Raftopoulos: In answer to your question, I think that we definitely differentiate between teaching sustainability as an exercise where students may produce something in one of their projects, just applying as much as possible the regulations pertaining to a certain country or particularly now in our country. What we also do is try to sensitize students to the subject of sustainability while they're working on their architectural projects. In this case, we cannot or even think it would be proper to try to insist on the application of regulations at a time when we want them to concentrate their efforts on having a free hand on the architectural design. Nevertheless, we do discuss sustainability and inform them of the importance of sustainability as a major issue in design confronting them during the entire course of their future practice. However, we're not very strict on the regulation issue since in many ways it could limit their intuition or imagination that is required in order for them to express themselves in architectural terms. Of course, I'm referring to the studio projects that our students do in the 4th year, in the 7th and 8th semester, scheduled just before the final design thesis, where again we ask them to take all these factors into consideration. To sum up, I would, personally, never ask my students to try to apply strict regulations or even the very limited criteria that they will eventually have to adhere to

in their professional practice. I would be happy to hear your reactions to this matter.

Ramon Sastre: I'm thinking about my own experience of teaching sustainability to first year students who, on arrival, know nothing about construction.

What needs to be considered is that they have to learn about sustainability as another property of materials or elements or construction, in general. So, when explaining to them a certain type of wall, you talk about properties such as weight, isolation, etc. Actually, you're talking about sustainability as a property that is not either sustainable or not, but more or less sustainable, simply because things are not black or white, they're grey and other colors, too. Therefore, this is a notion that should be taught in the beginning as another property of materials, elements or architecture. Another problem is defining sustainability because with such terms, it's often difficult to arrive at a common meaning due to their wide repertoire of meanings or associations. In the case of sustainability, many people think of energy, ecology, etc. As a result, a commonly accepted definition would certainly facilitate our communication. Finally, I think that the teaching of construction must always include sustainability as another property.

Vangelis Evangelinos: A few years ago, we had an elective for the "Self-built". In this particular course, we gave as a topic for a project to redesign a cement block that could be recycled with ease, i.e. students were not to use cement adhesives or mortars binding the blocks together. We got some interesting solutions. One of them was a block made from LEGO, where the pieces could be reused. So, a major theme of sustainability is recycling and using less. When the lifecycle of a material ends, recycle and re-use it in order to give it more life. A way of dealing with the problem is by giving the students the means to design something sustainable. Others may have other ideas or examples of such exercises.

Ola Wederbrunn: We can focus on sustainable materials, but we can also focus on the built mass of existing buildings because more and more of the work we will face as architects will be to build within the existing building mass. This could initiate discussion on how to work within the built mass and how to deal with these existing buildings in terms of sustainability. In Germany, there are a lot of housing blocks in need of renovation or turned into something new because they can't be used any longer in their present condition. The question is,

what can we do with them? Should they be torn down? Should an assessment be done on how to recycle the existing materials as built structure of the cities? I think that this is a very important area to be taught in architectural schools. There is, perhaps, a discrepancy between this and what we talked about previously, i.e. the rapid development of materials and architectural ideas or trends. However, I think that it's also the slow developments that should be encouraged in some ways as in the case of sustainability.

Donal Hickey: I'd like to make one more comment. What I've noticed in recent years is that there is preoccupation with the topic of sustainability. It may have something to do with our culture of consumption and, maybe, there is a shock value. When I see students dealing with this as an issue, they think of it as something they add on rather than something that is integral. I have direct experience with that in Ireland though it may be very different in other countries. When visiting the agencies that are meant to assist in terms of helping designers who want to engage in more sustainable means of developing, I found that they were only interested in funding something that would propagate industry and were less interested in more passive methods of sustainability in terms of form and the way we actually do things. I don't know if the circumstances are similar in other countries. You end up with the motor car that you have to peddle when you take the engine out. I find it kind of strange. It also seems to me that there is a culture of levers to stop the sunlight and they seem to be cropping up everywhere. I'm just wondering, are we actually teaching students in a way that they understand the fundamental principles as a starting point rather than tacking pieces on to make it better? Another thing that worries me is that when students are taught about sustainability, one of the first comments is that it's sustainability that should inform architecture rather than the form informing the architecture and this can sometimes turn students off.

Lucien Denissen: I agree with you. We should make architects with integrity. I can't imagine a good designer not taking the sustainability factor into consideration. It's a question of mentality and principles rather than calculations and the impact on social life and their position as architects later, which is important.

Nikos Panagiotopoulos: One more thing to consider

off the record: A building itself is a major intrusion on the environment. The very fact that a builder builds is a major intrusion. However, if we insisted on this point, we wouldn't be here. The other thing is that we still don't know what exactly sustainability is and how it can be judged or determined. I've seen buildings in which the choice of materials is not entirely sustainable, but that, in the long run, have proved to be less detrimental to the environment than some that were strictly built with sustainable materials. Therefore, we are always on the look out, searching and experimenting. However, in an effort to return to the question of how to introduce such lessons, I would say that it's far more essential to me that students realize the importance of this matter; otherwise, to simply introduce a new item into the curriculum and burden students with more information to learn without being convinced of the necessity of it is something I wouldn't dare do. On the other hand, as the construction teacher from Barcelona said, **if the teacher believes in sustainable design, this will permeate his / her teaching of construction at all times. If the notion is internalized, then one can't avoid thinking about it.** For example, how do you mount a door? Do you use spray polyurethane or a mechanical fastening means? If you use polyurethane, you can mention in the process that it releases EFC and the student can decide. Anyway, one should be free to decide -sustainability is not the only thing we want to teach new architects.

Ramon Sastre: I also think that it's not just a matter regarding construction, but it has to be part of the general attitude of the student. In Barcelona, we talk about materials and get some insight into them. We also have a design studio in the 7th semester where students are specially trained on the impact of sustainability, but not as a "sexy" or sensational word; instead, we go deeper into the notion of sustainability to include different factors in forming space and structural scheme behind it, working towards flexibility, recycling and detailing materials and renovation.

Herman Neuckermans: I'd just like to add a layer to the discussion. **As far as I'm concerned, a sustainable building starts with a sustainable concept, which means that the idea behind the building should at least survive as long as the materials survive, which is not often the case.** Perhaps I'm generalizing, but in the beginning of the '80s all theoreticians were proclaiming the typology of Aldo Rossi. Consequently, in construction courses,

you had pitched roofs because pitched roofs were in the typology of many countries. Ten years later, as we moved into the Modernist paradigm, if you proposed a pitched roof in the studio, you would have been considered old-fashioned to say the least. So, what I'm saying, and I'm sure that this might not be a problem for the construction people, is first of all that it, perhaps, has to do with fashion trends in architecture where ideas change frequently, even quicker than the pace we are discussing sustainability. Possibly, in construction teaching, we don't have to shift from left to right, going from pitched roofs to no pitched roofs, just because there is a change of fashion.

Adriano Magliocco: It seems to me that the problem is not teaching sustainability in construction to our students – that's easy enough. However, the market does not ultimately consist of our students. There are many professionals who don't know much about sustainability. They work in our society and build our cities. Of course, we must teach the mentality or attitude to our students, but to our colleagues, the architects and engineers as well.

Emmanuel Tzekakis: Unless there are any questions we will close the Session. Thank you for your participation.

Discussion on Ed Van Hinte's keynote address

Maria Voyatzaki: Thank you very much, Ed. I'm sure we're all eagerly awaiting to read the written version of your lecture in the proceedings since it was quite dense and, undoubtedly, we're all looking forward to taking a closer look at the information you've presented today. Are there any questions?

Cyrille Simmonet: What exactly is the significance of "smart" in terms of your presentation? How would you define it?

Ed Van Hinte: The term has several meanings from (a) "looking smart", looking good when one wears clothes that suit them, for example, to (b) "being smart", being intelligent. In this case, what I mean is thinking about structures and using materials in an intelligent way and in terms of the combinations I referred to. For example, if you want to make light structures in composites, intelligent fibers, etc. Intelligence can help buildings work through simple feedback systems, so that if something moves, it can react, which can help buildings function better. Actually, it's not a very new principle. I met an architect from Israel who made a brewery in Cyprus, if I'm not mistaken, which I think is a very "smart" building because the ventilation system is automatically regulated so that it doesn't need air conditioning, which is sustainable. It has a very clever system of vaults for air to circulate in and which keeps the beer cool. So, basically this is what I mean by smart – trying to outwit nature.

Discussion on Bjorn Sandaker's keynote address

Maria Voyatzaki: Thank you very much, Bjorn! Are there any questions before proceeding to the next Session?

Chris Williams: I was very interested in your observation about Jean Prouv_, where you said that he had a relatively simple structural form for the Pavilion, and you then went on to describe his details. One of the things I find in teaching architectural students is that they very often start at the overall level and want to have an interesting and exciting structural form, which they sometimes achieve, but then they find that they can't deal with the details. So, **time and time again, I try to get students to have a very straightforward structural form in order for them to spend more time thinking about the details; so, I think that Prouv_'s example is very illuminating in that respect.**

Bjorn Sandaker: I think this is an experience that many of us share. We try to formulate exercises that allow students to go deeper or closer to actual execution or design detailing and, as you said, I think that Jean Paul Prouv_ is very good: he's subtle in that respect.

Herman Neuckermans: First of all, thank you for the lecture. I fully agree with what you have said. The influence of making on the conception is an idea which has come up in all the conferences we've had in this context since the Plymouth Conference because I remember when Mark Mimram was presenting his design for one of the bridges, he even designed the machines that would make the metal sheets in the form he wanted for the bridge. We have also seen, several times, schools presenting students working with materials and making details or structural elements. I would like to complement this with the idea of also going into the industries to see what they do because I have the impression that doing things according to what you have shown us, i.e. welding, folding, etc. and working in the traditional ways with materials, with the new developments, schools of architecture will never do that. Stereotography, in essence, has been around for 20 years. Some schools bought it; they may be happy with it, but, I think, they will soon be dissatisfied because the box is too small; the technology has changed, selective centering came and, meanwhile,

you have spark erosion – machines that you can never buy in a school. So, there is plenty of new technology that we need to be aware of. I agree with your argument that we need to look at what this technology consists of, how it operates and learn from it. However, as far as what can be done in the school, it's limited and, I think, is bound to lag behind new developments since new developments in machinery and technology take place outside of architecture. They occur in the airline industry, mechanics, electronics, etc.

Bjorn Sandaker: Yes, I agree with you. I think that what the school can contribute is the attitude of investigation. They should be curious and look into how things are actually made, starting by going into the industries. Even if the schools cannot compete with technology production, they can at least provide students with an attitude of developing interest in the area.

Ed Van Hinte: I have a relatively simple question. Suppose you have a very talented student who says that he / she doesn't want structure to play any role in the expression of a building. What would you say?

Bjorn Sandaker: I would say Okay and not spend much time on the particular student.

Session 4: The Teaching of Construction and the Rare and Traditional Knowledge

Chaired by Miltiadis Tzitzas

- *What should be the necessary competences and skills acquired through construction education that allow architecture graduates to be capable of encouraging the creative encapsulation and synthesis of particular knowledge deriving from the construction culture of a place to new construction logics and practices?*
- *What should be the necessary educational methods and strategies to ensure competences and skills acquired through construction education that allow architecture graduates to be capable of encouraging the creative encapsulation and synthesis of particular knowledge deriving from the construction culture of a place to new construction logics and practices?*

The Schools presenting in this session were

Vallés (Spain) School of Architecture by Ramon Sastre,

Ion Mincu School of Architecture, Bucharest, (Romania) by Rodica Crisan

Normandie (France) School of Architecture by Nicolas Nogue and Christine Simonim-Adam

Mons (Belgium) School of Architecture, by Alain Sabbe

Please find the respective interventions in the section of articulations.

Debate on presentations and theme

Miltiadis Tzitzas: The panel invites reactions and questions related to the theme presented.

Ed Melet: I have a question for our colleague from Romania. As I heard you say you send your students

out to investigate historical buildings. I don't know if you've shown all their work, but there were some very good drawings. We have a similar kind of exercise where the students examine new construction: what is in between the outer and inner. We do this for a purpose. You mentioned that energy use in historical buildings is minimal today, but I don't think so. In the Netherlands, we've seen a change from the massive brick walls of the early 1900s to a cavity wall with isolation in it, etc. I think that this is common practice in the Northern countries. What we ask our students in the case, let's say, of an historical building, is that, once they have examined the structure and construction of it, to think about a way of altering the structure and construction in order for it to comply with the present day regulations. This exercise is becoming quite important, now, although we didn't perceive it as such at the time we started it. We simply saw it as an exercise to build awareness of the changes that have taken place during the last one hundred years in an effort to understand the reasons for this change. In the Netherlands, there is legislation which prohibits historical buildings (except for 10 or 20) from being tampered with due to their historic value. Even the listed monuments, if altered and are used, have to comply with current regulations. However, to return to your students' task, I'm wondering, are they asked to simply produce a good drawing or are they expected to examine the structure of the assigned buildings as well?

Rodica Crisan: Yes, we would have much to discuss here. I have presented only a few examples and I meant to present exercises which they had as a team to analyze historical techniques and materials as support for architectural form. For example, in the class of Technology of Building Rehabilitation, there are exercises, case studies aiming at realizing preliminary diagnosis of a building, considering the physical decay and relation between present requirements and performances of old buildings. As a treatment strategy in reference to contemporary regulations and old buildings, as far as I know, nowhere in the world is there the purpose of transforming an old building into a new one. Contemporary regulations are usually at the level of restoration, but not compulsory limit. Generally, we don't transform an old building into a new one. We cannot impose on an old building to respond or have the same values for several parameters.

Ed Melet: I agree with you that it's very difficult. We have a town hall in a small town in the Netherlands

built in about the 1400. It's a building on the waterfront which has to be extended with extra functions, but the historical part has to comply with today's regulations because it's a functional building.

Rodica Crisan: It seems to me it should comply in a more flexible way. Obviously, it has to comply with the new requirements in terms of rehabilitation, but an old building cannot be transformed into a new building. For instance, the same degree of insulation is normally not required. Especially in our case, as we're a seismic country, even in structural restoration, the same degree of safety is generally not required. A reduced level of safety based on traditional safety standards that can't be quantified by contemporary codes is permitted. This is perhaps the most interesting relationship between traditional and contemporary knowledge. We now live and produce architecture in a modern civilization based mainly on modern materials, beginning with reinforced concrete, but there are old buildings of several hundred years resisting and functioning xxx without complying with modern codes. I've included in my presentation a quote from Bernard Feilden who claims that perhaps the greatest danger for historic buildings comes from the engineers that doesn't understand old buildings and mechanically apply modern codes.

Miltiadis Tzitzas: If I may intervene a bit because I find this whole discussion very interesting, you mentioned earthquakes and, as you know, they are quite common in Greece. When we started rehabilitating old buildings, mainly those of stone, there was ample use of concrete inside the buildings to make a wall attached to the stone one that with the first small quake or tremor, there was failure on the structure of the building which hadn't occurred in 200 years. So, engineers mostly realized that they comply with regulations as far as concrete or the structural system of a building are concerned, but that they should be mindful of how a particular building has remained standing for so long without anything happening to it, except of course, for the deterioration caused by the fact that maintenance of old buildings has not been a priority. As far as regulations governing the use of buildings, such as safety, fire exits, etc., one can easily comply, taking into account that these should enter the architectural plans and design; however, the stability of the building is another issue.

Ed Melet: It focuses on comfort, so, thermal laws. I think it's a nice exercise for examining old

construction and to try and alter it in such a way so that according to thermal laws and comfort you can create a nice building. In this way you can understand the new regulations affecting old construction. This involves transforming the old into the new without losing the characteristics of the old building. I think this is a good exercise.

Rodica Crisan: You claim that I said, in my presentation, that historic buildings are low-energy and you don't agree with. May be according to the modern codes. For example, our recent code concerning the energy consumption does not consider the solar control that exists in historic buildings. There is also the great thermal inertia of mass buildings to be considered. Also, regarding the relation between modern codes and old buildings, we can observe that old buildings of masonry always have small windows. But it doesn't mean that we have to modify the windows of a historic building in order to comply with modern standards for natural lighting. There is a limit to what can be done. In my opinion, it's very interesting to analyze historic buildings from the point of view of specific mechanisms complying with the general comfort requirements of human beings.

Karl Christiansen: If I may, at this point, I'd like to refer to a general comment made by Neuckermans earlier this morning. **Actually, it concerns an attitude that I personally have trouble with. I'm not sure if I completely understood what you meant, but it sounded as if what really counts goes on in practice or industry, production, etc. and that's where the ideas, technology and materials really come from – outside the school. However, technology is in fact material that came from the schools and universities.** To be a little idiosyncratic, the program I showed yesterday stemmed from the University – it would have never been developed in practice! It was actually the students who started it and it was further developed by Ph.D. students in that way. There are other programs, too, and that particular one is actually being used by industry. **What I'm trying to say is that as schools we should be the ones to build the "lighthouses" for the practical world to navigate towards. This calls for ambition – we simply can't keep repeating what's being done outside the school! After all, that's what the school or university is for, if not we would just send our students out directly into the practical world and, in that case, shut down the schools.**

Herman Neuckermans: So, if I've understood you correctly, you're objecting to the remark I made earlier. However, my point was that schools could never catch up to the latest developments in technology, i.e. in the realm of manufacturing. I was not at all suggesting that schools and universities should be on the opposite side. They contribute to theoretical thinking and ways of conceiving things and the example of the program you showed is just one example of that. I think that yesterday we saw, in one of the slides, the software Cobra that was developed by people from our school who have now left and, I must say, that it's widely used software on building physics. Therefore, my point may have been misunderstood. Of course, at the scientific level, developments happen where the scientists are and these spin off into the industry. We're not slaves of the industry. From my personal experience of organising exhibitions for a long time, once we made a low-tension lamp with 2 bars of stainless steel 1 ½ mm in diameter. There is no architectural school that has the machinery to drill a hole at the top of the stainless steel bar, let alone a school that can drill a hole of 1/10 of a mm through that bar. So, my point is that there is a lot of technology out there that is not accessible to schools simply because it's too expensive and subjected to constant change, and my argument is that our alternative is to go out and have a close look at those who do have the technology and develop it. It isn't the schools that develop technology although we have numerous ideas that we can export and many of our ideas are carried to other domains. Everybody talks about architecture today – information architecture, about patterns or the old concept that we use architecture in computer science, which is a trap, but that's another story! My point is to challenge the issue of how far the school can cope with "making", which is a very interesting concept that I agree and practice. However, in my opinion, in terms of "making", schools will never be avant-garde, unlike "conceiving" which is another matter.

Lucien Denissen: Regarding Ramon Sastre's presentation, I think you made a good statement by saying that architects always want to do more and never do less and students do about the same. I guess it's quite normal because we should always do more. There are new requirements, new intelligence and there is the challenge or risk to do more. On the other hand, I like the idea of how to do less, but I'm afraid I didn't get an answer to the question of how to get students to do less.

Ramon Sastre: What I was trying to say is that the answer is not always a question of adding things on to the problem. Certainly, we have more knowledge, more means, more requirements although the requirements can be grouped according to what Vitruvius said 2,000 years ago. But, the easiest way for students is to act, which means not to think. The problem of adding things is that of secondary effects. What I try to introduce into the minds of students is that if they add things they are not finished because by adding something, they have to look for its effect. Often this is the case (pointing to a visual). Other effects may be the price, the weight of the solution, etc. – the thinking process hasn't finished! On the other hand, at times, if you don't add things, you don't meet the necessary requirements or expectations. So, I'm not against adding things, provided that when you do, you will look further.

Nikos Panagiotopoulos: On the issue of restoration, I'm pleased that such topics do come up in our Workshops, but there is another issue I want to bring forward. We have ongoing urbanization; although everybody's dream is a house in the country, still cities are growing and there is built substance in our cities from the '60s and '70s and these houses perform far worse than other buildings of the 17th and 18th century. I think there should be some legal means of intervening with this substance, in the first place, in order to rescue building ground and create better quality living spaces for a lot of people. I'm wondering whether anyone has any opinions about this matter.

Rodica Crisan: This is a real problem as we have a lot of dwellings that were built around the period you mentioned with specific problems and this category of dwellings is being given educational attention. As a subjective option, I have included this in my presentation in the form of non-listed historic dwellings. These buildings are in danger now because they are not legally protected and, as they are in an advanced state of decay, they are easily demolished and, for financial reasons, they are replaced by new buildings. Personally, I try to sensitize students to this category of unprotected buildings that have certain cultural value. It is this minor architecture that gives the traditional town its character, but which is practically disappearing.

Ola Wederbrunn: I'd like to address the question of cultural heritage in terms of how we approach restoration and the documentation and measuring of buildings as something that is ongoing and which

does not have any absolute answers. I'm a bit concerned when we talk about Vitruvius because he could be extremely absolute in giving definite answers to questions. Sometimes, when we carry out an investigation of buildings, the buildings themselves will not answer Vitruvius' questions, but the questions related to the specific buildings, and the building stock or existing buildings will not retrocede, providing answers to questions once asked. The point is that there are always different answers. Even with restoration, it's not a matter of just looking for a listed building to maintain it in a certain condition, but rather to give the existing building a meaningful existence that can change or transform in time, just as is the case with human life. Therefore, the crucial question is whether we follow the example of Vitruvius if we are constantly after definite answers, or consider a process in which we don't know the answers, but search for answers that are never constant, but forever changing. Some, of course, will opt for precise answers while others will prefer an ongoing discussion without answers. I would appreciate receiving Ramon Sastre's reaction to this crucial question.

Ramon Sastre: Yes, I must admit that I was somewhat apprehensive about mentioning Vitruvius in my presentation because we live in a different era – 2,000 years after Vitruvius – and at a time when things are far more complex. However, when I was preparing my presentation, I was actually thinking of my students in the first semester to whom I try to convey the idea that many of the problems we face in construction are very old and exactly the same, even if, obviously, some have changed. Take regulations, for example, noise was not a problem, then, whereas we are faced with a different context. The essence, however, is that problems have to be faced, irrespective of whether they are few or many, old or new and, when confronting these problems, you try to respond in terms of that which has to be built and not in words. So, it's items such as bricks, windows, etc and such things need to be seen. Therefore, the response is objects and not abstract words. The problem is that with every idea you have, you add things and every regulation calls for a response, so, sometimes students in their first course are somewhat overwhelmed with all the information, not knowing what to use. Even when we describe buildings and explain that the windows or chimneys are for this or that according to the requirements of the building, it's actually not that easy for them. I must admit that my presentation may have

oversimplified this process; however, I wish to modify this impression and state that it is by no means an easy task and we sometimes tend to complicate matters.

Christopher Lowry: My comment will begin in more general terms and will gradually get more specific in reference to what the panel talked about this morning. If I can just go back to what the nature of the conference is and what potentially the conversation we could be having is, we're, generally, at risk of getting into a debate on the capacity for architectural schools to investigate the technical. I'm not sure if I agree with the idea that some architectural schools would never possibly have the abilities to investigate materials, components and construction at a very detailed level. Certainly, within the School at Dundee, the Light Structures' Unit does have very highly specialized machinery for producing components that contribute to structures and construction. I think that there is a level of understanding that goes back to what the panel talked about this morning, which was all very interesting. **You have in your work a unique opportunity to enlighten students to an attitude towards understanding materials because with a lot of our historical architecture, there are very obvious examples of how material is being employed and what it's being asked to do that can contribute to developing an awareness and appreciation for material; so that, when students are faced with contemporary problems of contemporary buildings and of different scales, there is an attitude which they bring into it whether that may be related to stone, concrete, resins, polyurethanes, etc. Once this is learnt, they will then have an inherent attitude to a material and this is what contributes to the research in schools. It is innovation that we saw yesterday exhibited with the optimization techniques. A student leads into research and not that research, in effect, contributes to industry. In some areas, it leads industry.** So, my comment is basically that there is a unique opportunity in reference to what the panel talked about this morning, which is in fact the spirit of what part of the conference is trying to do and what we need to equip our students with. I think that it is precisely this attitude and understanding that is essential for us to equip them with and it can come directly from our area of work.

René Hughes: I wish to say to Ramon that, first of all, Barcelona is a very interesting town architecturally.

Also, you made a statement that is explicit for all students: "new materials and technology for old problems". I'm sure they will like the phrase. But, it seems that the problem lies in human beings, and it is an age-old problem! However, society has undergone an evolution with new needs and requirements so that man-made problems can no longer be resolved only with old means. As a result, with the advent of new materials, schools and industry must be prepared to use them. Carbon fiber is a material that is in circulation and there are many others coming directly from chemical substances. You also mentioned that there is the issue of "adding things on" as a function of new requirements, which I fully agree is a problem. We know that people living in the southern countries, let's say, Barcelona, Spain, do not benefit from the use of large glass panels because they need protection from the sun and heat. So, as you suggested, you can import a product from the North to Barcelona and see if it works, and if it fails you try making shades or sunscreens. The point I'm trying to make is that we must jump on the bandwagon of new materials and technology and follow the new spirit or trend. We could run into difficulty if we think we can always play it safe by following our common sense. However, I'm sure that in the end, common sense will "acclimatize" and guide our thinking in the right direction. It seems that imagination is the clue to resolving problems, even old ones of a more complex nature, i.e. the kind of imagination inspired by various sources coming from different cultures and other fields, such as medicine, science, biology, etc. and adapting it. It is precisely this accommodation and adaptation which is the new spirit of materials and technology.

Ramon Sastre: When I was at school taking a course on materials, as most Spanish schools of Architecture offered at the time, I remember that there were only five materials we needed to learn about, so, it was all very easy then to explain what materials were about. Wood was hardly touched upon as it was not used in Spain for building and there was brick, rock / stone, glass, iron and aluminum, which was just beginning to circulate. **However, when we have hundreds of materials, we are required to change the way we teach materials. Possibly, we will need to explain the properties of materials because this won't affect the amount of materials that will be used the following year. If you know about properties, you can use materials at half the properties you need – that's the spirit of it all.**

When you have problems, you must have the knowledge to give a response. You can adopt a trial and error method by changing the design, adding things and, of course, the best choice would be an eclectic one by using all the resources you have. Sometimes, it's a question of making a change or simply adding on, which, as previously mentioned, can be a problem. Nevertheless, problems are challenging for those of us working in universities. It's interesting to see whether with the knowledge we currently have of materials we can manage to find a solution. I'm sure that it's this sort of challenge that we like and are after at university.

Michalis Limenitakis: I'd just like to provide some information in answer to the question of my Greek colleague regarding whether there is any political will to develop a real restoration policy of ancient buildings for people in towns. In France there is such a strategy based on the willingness to bring people from the centre of towns through restoration and renewal or renovation. However, there is also the question of political choice in terms of the price we are willing to pay in order to keep such a strategy alive.

Dimitris Papalexopoulos: I intend to address my question to all those who keep pursuing courses or keep a record of construction courses. The question is, how do you keep track of past courses if the database is built and if, in your viewpoint, there is a strategy of linking different courses and building a common knowledge of restoration at the European level? The second thing is, if the restoration course describing the object and the architecture is seen as a major theoretical problem which is not clearly evident? So, the main question is, do you have a strategy of linking your different courses in a common database?

Herman Neuckermans: I'm not sure that those of us in the front rows have clearly understood your question, so what I'm about to say may indicate some misinterpretation. However, to my knowledge, behavior or acts dealing with the treatment or handling of monuments, especially, is the subject of older charters written in the beginning of the century. However, as Architects and as an Association, we are now issuing a declaration stating how we think that education should be in the future in Europe and all those people who wrote the charters, be it in Venice or Athens.

Dimitris Papalexopoulos: Sorry, but you are not

addressing my question, so I will rephrase it. Each year, we offer restoration lessons and end up with about twenty buildings that have undergone analysis. The following year an additional twenty are analyzed and this number repeats itself year after year. So, I'm wondering whether there is a strategy for putting these buildings in a database. Does this database pose theoretical questions about describing the objects, describing the architecture and describing the construction sequences? Also, do any of you have any strategies in linking different construction lessons so that we can have a common knowledge about historical construction at the European level? I hope that I've made myself clear.

Rodica Crisan: That particular database would be a very interesting one to have. I must say that I, personally, have tried to obtain a research grant for such a purpose, but to no avail. More specifically, the focus of the research was on traditional techniques in European seismic areas.

Dimitris Papalexopoulos: Since there is interest in this area, perhaps we can put it on the agenda for a session next year.

Bjorn Sandaker: There are many topics being brought up simultaneously, but I'd like to comment on something that Karl mentioned and I also referred to in my speech. Industrial production is based on technological know-how and skills on how to transform materials into products. It's this specific knowledge that we can learn from industry despite the fact that this knowledge is somewhat limited by the logic of the industry itself, which is restrained by having to produce mass quantities, and this huge quantity excludes to a certain extent the making of products meant for specific purposes. So, I approve of Karl's attitude suggesting that **we should encourage students to investigate the basic technology of material production and that they should employ this knowledge to think in a different way from the industry.** After all, it is our duty to do so. How you look upon this issue depends on what goals or wishes the architectural school has, i.e. whether the architectural school sees itself as a trade school which produces architects or if it sees itself as a university department that explores architecture. Also, I'd like to ask a question to our colleague from Normandy, whose presentation I was very interested in. I'm wondering whether you described to us a course that you actually run on the culture of technology and historic construction and, if so, where can I find the structure and topics

related to the course.

Nicolas Nogue: For example, for metal structures, what I do to explain the evolution of metallic structures in the 19th century is to try to relate all the inventions and innovations of the century and show how they formed a system as well as demonstrating how the engineers and architects worked within the social system. I don't do this for all kinds of materials and it's easier to do it for past periods because we have archives, texts and documents, but we would like to develop this for other cases and more recent buildings and techniques. Therefore, this notion is slightly developed now within the course I run in construction, which is Course 3 of Construction in the 19th and 20th Century, however, I would like to further expand my teaching along these lines.

Michel Paulin: I'm sorry if I'm cross cutting previous questions. I teach an optional course on old techniques in my school and, I think that it's relatively easy to provide knowledge on traditional materials, but more difficult to provide knowledge on the traditional process of building with this material because in all developed countries, the competencies of the craftsman are decreasing more and more. This gives us two options. One is the way of the archeologist involved in experimental archeology, using the same tools and process, which is obviously something we can't do today in everyday building. The other is to replace more or less traditional material with new material and to ask industry to complement our knowledge. Both ways are not efficient, so, I suppose it's a question of developing specific research about new ways for industry to create a special process for assembling and building with traditional materials that would be feasible for the actual builders and specifically efficient with the interactivity of materials. Our Spanish colleague spoke very effectively on this matter. The main problem is how to replace old traditional process. Some industries process new process to get the same result as when we use traditional material. However, I believe that it's not reasonable to hope to conserve old manuals of building for a long time for conservatories. We cannot increase the competencies of common craftsmen, enterprises or teams. I guess it's a very dangerous situation for the future and it's important that we create a network of researchers, either through the EAAE or some other means in order to stir the industry to deal with this specific problem since, at the moment, industry is not concerned

about it. They are concerned with their own products, but not with traditional products. This is a direct way between the completely traditional way of building and the completely modern way with a specific field of research and, as architects, we ought to be leaders in this direct route.

Ola Wederbrunn: I'd like to go back to what Dimitris Papalexopoulos asked. I think it's time for people involved in conservation and restoration to jump out of their closets. Really, all this is extremely necessary – there's so much to be done in this field by working together. I think that we have so much to learn from the building tradition, including traditional construction and traditional materials like concrete, steel, etc. We have a great heritage that doesn't limit itself to wood, brick and earth and it's a modern heritage of the kind that Sandaker portrayed from Prouvé that teaches us a lot about technology. We can't make the glass blocks anymore to replace those that were made for the Salvation Army building in Paris because the market doesn't carry them. A glass block of that size is simply not available anymore because one needs an industry to be able to mass produce them and nobody is prepared to do so anymore. So you would have to go to a small shop somewhere in Norway or Sweden or wherever one could find such a place in order to get this custom made, which would mean having to make the glass block from scratch. That's restoration. Modern restoration also takes into account that we need to work together more and emphasizes that experiencing technology from the start in terms of how to treat materials in construction is extremely important. Therefore, it seems to me that you perceive this forum of technology as a means of stressing the importance of also having some kind of forum for restoration that is geared towards not just the past, but the future as well.

Anders Gammelgaard: What I'm about to say is not in answer to your question, I'm afraid. Anyway, over the last few days, we've heard a phrase that was repeated several times, i.e. "What we should do" and it sounds like a terrible burden on our shoulders! All-the-things-we-should-do when meeting our students -- it sounds like a parental complaint! Teachers and pedagogues are always telling us about "what we should do" in bringing up children instead of exploring "what we want to do". The driving force behind our way of teaching is that we really do what we like to do and I'm certain that if we do, then the students will follow and will be as enthusiastic about learning as we are. I think that

it's important that we focus on what we really like to do. Another significant factor that relates to the question raised before and which I would like to repeat is for us to ask ourselves, What is our purpose as teachers and institutions? Is our purpose to educate architects or is it to study architecture? I know we need to do both, but our priority or purpose is for us to study architecture and out of this choice there stems the possibility that very good architects will be produced, whereas by opting for the other – educating architects – we will always be looking at the demands or requirements for being a good architect, which means that our focus will be on what's going on at the moment, outside. The problem with this latter choice is that we will be caught up in a situation where we won't be doing what we like to do, but what is prescribed or we are told to do.

Suzanne Fulop: I'm from the Technological University of Budapest and wish to state that, in my opinion, the construction work of a period building is a special area in the field of architecture and architectural education. Certainly, the traditional solution of reconstruction is basic knowledge for architects and engineers, but the reconstruction of a period building is a special kind of work. The first step always involves expert opinion along the lines of what can be done with a particular building and investigating whether its function can potentially be changed. The decisions taken should be specially made and oriented towards the specific case in question. It seems to me that these are the essential factors to consider in educating students in the traditional solution of reconstructing period buildings.

René Hughes: It would be interesting to make a link with what was said yesterday on the subject of recycling. It appears that in terms of appropriateness or suitability, we can say that the fact that a building undergoes recycling makes allowance for our mistakes. In the not so distant future, buildings will be recycled like cars, but a car has a lifespan of five years whereas a building fifty, which means that some people like Suzanne from Budapest won't have much work. Also, this recycling process will entail the whole building – walls, foundation, and structure, including the mistakes we've made. Of course, it's not a reason for not making a good car or building, but practical for giving us a chance to make mistakes.

Donal Hickey: My comment is a general one. I think that archeology is seen as being a separate piece, restoration as another and so is technology. However,

we should understand that what exists, what was built yesterday and before that all have an inherent genetics, both in terms of the way it was made and why it was made. Through an evolutionary process, we seem to be continually losing technologies and techniques and cease to understand that what happened before is so important in terms of where we want to go. To return to a comment made about codifying and cataloguing techniques from the past in order for them to be transferred, the transfer of technology from one material or technique to another has happened through history. Therefore, I don't see restoration, rehabilitation or archeology as being any different from what we hope to do. There are many lessons to be learnt from what exists in order to understand our direction; so, I don't see restoration as being distinctly different, but merely a mirror of where we want to go. I have a strange example: I went to the Parthenon and photographed an iron tie. There was a codified knowledge and genetics in that piece of architecture, an object that was not fully understood when they came to work on it again. My point is that, perhaps, **there is genetic knowledge that exists in everything around us, and if we don't sufficiently understand or explore it, then we're doomed to make the same mistakes in terms of how we see new techniques. New technology is just part of a continuum in the genetics of how we have moved forward as a society.** It goes back to a comment made yesterday. When we look at old buildings, we try to codify them or apply our rules to the way they function. There was a comment made about old stone buildings or castles where they used tapestries to balance thermal comfort, but this is not something that we can measure analytically. Because buildings have existed for such a long time, there are facets of them that I don't think we really understand. Consequently, we don't attribute value to them as pieces that exist. I think that the codifying of techniques and how things function is really important to understand. If we don't start doing that, we will begin losing realities that are based on techniques and experience that are fundamentally important to understanding our direction.

Session 5: Dynamics and Tendencies

Chaired by Constantin Spiridonidis

Synthesis of the debates of the Workshop

Panel: M. Voyatzaki, H. Neuckermans, Em. Tzekakis, M. Tzitzas

This session attempted to make a synthesis of all previous sessions in order to draw some conclusions on the themes discussed. In the context of this discussion the future of the network of construction teachers will schedule its future activities.

Constantin Spiridonidis: The idea behind the title of this Session, "Dynamics and Tendencies" was to allow for synthesis and articulation of the various debates that have taken place over the last three days. I'm sure you will agree that a synthesis of this nature may not be such a simple process, considering the broad spectrum of information presented here, but our colleagues who have chaired the individual thematic sessions will endeavor to make such an attempt. Before passing the microphone to them, I would like to express my own views as an external observer, since I'm not a construction teacher, and as one who has had the chance of participating in three consecutive conferences. If I were to condense these workshops, I would say that they were structured around two agreements/disagreements and two issues that we did not manage to discuss, but that should be dealt with at a future time.

As far as the agreements are concerned, they are in fact significant because they have laid the groundwork for these discussions. The first being that till now, or at least for the last five years or so, **in schools of architecture, one has been able to recognize two parallel cultures or worlds – that of architectural design education and the culture of construction education. This can be characterized as a meeting of two worlds because, as I'm sure you will agree, the communication between them has not always been optimal, let alone the fact that we have experienced times when these two cultures were completely separate, full of contradictions, animosity and bad chemistry between them. Therefore, this change of attitude represents the**

agreement for the two cultures to co-exist, which is an educational policy that has been adopted by many schools and which has characterized the education of architects. However, this co-existence, manifesting itself in different ways in the various schools has by no means spread communication and collaboration. The second agreement is the commonly-shared notion that we live in **a rapidly-changing world with changes happening simultaneously at various levels, political, social, financial, economic, etc. with direct influences on the two worlds of architectural design education and construction education.** This impact has prompted us to consider the necessity of bringing these worlds closer together. It seems to me that throughout our meetings, this agreement has surfaced as a kind of demand, perhaps, an obligation or requirement at times and even a wish at other times. So, what has prevailed is the will to bring those two worlds together and change their chemistry. These demands mainly sprang up from the appearance of new factors or conditions in our understanding of architecture and our understanding of the human being, who is at the centre of architecture. Moreover, **they have been supported by the strong and decisive influence of information technology.** What was interesting to hear in these events was that for the first time we've started to reconsider the design studio, which has undergone change and crisis. Our friends from Denmark mentioned earlier that in their design studio each student has a personal place to work, which is very positive. Generally, **the design studio started losing its glory when students stopped going there as the conditions of work no longer encouraged them to be in the studio because they started working on computers elsewhere.** This necessity has generated a new conception of the studio and what it will eventually be like. Will the studio of the future be an internet arcade in view of recent developments? The point is that things are changing and our discussions must investigate future conditions.

Regarding the disagreements, by following the discussions one could detect two different tendencies concerning the way the participants perceived this link between the two worlds. The first consideration being that **we must bring construction education closer to architectural design education in such a way that there would be an overlapping.** At times, proposals were made

suggesting that the two worlds could coincide with each retaining their individual characteristics in their respective professional activities in the domains of knowledge, practice and conceptualization in relation to the subject matter taught. So this is the first layering conception about how these two elements could be approached, which also appeared in the discussion, but which was not investigated in terms of that layer of concept, but rather an attempt was made to reformulate in a new entity these two worlds or cultures. Because this tendency understands that the two worlds are different and their chemistry is not positive, they look for catalysts. I think that the metaphor "catalyst" Dimitris Papalexopoulos used on the first day is interesting. This **catalyst is needed in order to ensure the articulation of construction design education in a new entity, culture and nature, which will not be the culture of the design nor the previously-existing culture of construction education, but a hybrid of both, where the two parts will not be recognizable or distinguishable, but a mixture.**

Besides this major issue, I wish to refer to two other points that we didn't manage to discuss that, in my point of view, will remain at the heart of the political discussion that has developed in Europe after the reforms introduced by the European Union in the institutional framework of the European schools of architecture. Schools are now required to make their studies and educational systems more transparent, which means that they are to clarify their identity. **I strongly believe that the identity of a school is defined to a large extent by the way the school provides answers to the question of the co-existence and articulation of the two cultures, which, though controversial, are central to the professional education of the architect.** This school identity is what gives the school character or personality in contesting with other schools in the academic market. On the basis of this competition, we will organize the attractiveness of our school in order to cater to mobile students who look for attractive schools. Therefore, I think it's crucial to develop our collaboration in order to ensure the possibilities and means through which methods and viewpoints can be developed along educational lines in an effort to link the two aspects previously mentioned.

The last issue that I think needs development in our discussions is the research aspect. Although it has appeared at various intervals during the course of

our encounters, after having followed certain references from the European Union, **it seems that the question of research must become a focal point in this competitive game, not only among ourselves as European schools of architecture, but among those schools outside of Europe as well.** Consequently, the schools should develop research initiatives or find ways of keeping them alive; otherwise, they will always be running after what industry and practice develop. As a result, we will progressively lose autonomy, which at least within Europe is highly valued. In conclusion, I repeat that what I've just presented are personal observations that I wished to share with you as an external observer of your work. My colleagues who have chaired the various panels will now hopefully enrich and add another dimension to this closing session with their own comments and insights. Therefore, I will now ask Maria Voyatzaki for her remarks on the first Session, entitled, "The Teaching of Construction in Contemporary Architectural Education."

Maria Voyatzaki: Although I have not shared my views with the other Chairpeople on this panel, who, by the way, happen to be Chairmen, I'm certain that they would agree with me that when faced with the task of synthesizing on a panel, we each have our own "readings" and interpretations of the various viewpoints expressed and heard. Since we often hear what we want to hear and not what is actually said, I will start with an apology in the case that I may have misinterpreted or misread things either consciously or subconsciously. I would like to use my experience of "wearing the hat" of Coordinator of the Workshop and not just of Chairperson for Session 1 to ask myself if, in fact, on leaving here, we will feel we have answered the question about our future. Anders Gammelgaard, in the extract he originally sent us referred to a suggestion I found very useful and enjoyable. He said that it's a valuable exercise for teachers of construction to go shopping and added that an advantage of our Network meetings thus far is that we can all steal each other's ideas and implement them in our schools in order to improve our situations. In this particular year, there has been very limited reference to what we do or used to do, and when asked to speculate about the future, it seemed rather obscure as if dark clouds hung over us. However, it's just as well because if we could foresee the future, life would be very boring. So, the fact that the future is unforeseeable is an advantage for us educators. This uncertainty about the future is perhaps a means of finding a balance

in the juxtaposition that one can observe in the title of this meeting, which is unlike the previous ones that dealt with 'shopping'. The point is that we can't really shop for the future. There is a contradiction in the nature of the title: on the one hand, there is the romantic notion "visions" related to the teaching discourse while, on the other hand, there is the technocratic term "competences". **The reason I refer to this as juxtaposition is mainly because although it's in the nature of teachers to be romantic and keenly interested in advancing knowledge and learning, we are, nevertheless, also obliged to prepare students as professionals.**

We are all aware of the controversy around the issue of educating architects and preparing professionals, and I wouldn't want to fall into the trap of bringing this up, at this point, but actually we are preparing people to face the world of architecture. Therefore, despite the romanticism our teaching entails, we have an obligation to prepare students in the required competences through our educational methods and strategies in order for them to face the realities of the changing world of architecture.

I would avoid answering the question of whether we have really achieved our goal. I think it would be more fruitful for us to leave this meeting with thoughts and questions rather than answers. In any case, we need time for reflection, which is best achieved once we rethink about what has been discussed and, better still, once we re-read the Proceedings of this Workshop. There were many interesting points that were heard throughout the last few days that I have noted. Basically, I could distinguish two predominant schools of thought that appeared in the first and last Sessions which Miltiadis will synthesize later. I feel that there is the school of the new and that of the old and if I can associate this notion with what Constantin tried to express earlier, these two schools are comparable to design and construction in the sense that they seem to be superficially divorced. It seems fitting at this point to quote Dimitris Papalexopoulos who made the distinction between the "flexible" and the "transformable" or to reiterate what I said before, when quoting Greg Lynn's "modernist kit-of-parts" approach as opposed to vacillating smoothly from one approach to another. The difference between them is that in the flexible kit-of-parts' approach, the parts can be separated and thus become distinguishable, but the transformable is seamless, and without seams, the parts cannot be seen. This is also connected to what Constantin talked about in terms of layering.

Basically, it seems that we cannot see the future if we are protective of the old, leaning on it as a kind of crutch that we can hold on to safely and securely; although, understandably, we are rooted in the old and these roots cannot be easily eradicated. It's one thing to talk about moving from one phase to another and quite a different matter when referring to an even transition from one situation to another. I would like to make a distinction between the two tendencies and draw your attention to the fact that, **as far as most of us are concerned, this distinction is superficial because in actual fact, there is no clear-cut old or new, but a gradual flow or inter-link of one with the other. Only by perceiving these tendencies as such can we decide that the two are not mutually exclusive, but that they co-exist.** When we teach the new, which we cannot deny, the reality is that we cannot obliterate or ignore the old. This is a point that prevailed throughout our discussions. In the context of this reality, it is also inevitable for us to have a generation gap with our students who are up-to-date and follow the trends. It's scary to think that we're letting the game slip out of our hands when students present their work with all the digital means available and we very often ostracize them by refusing to accept work that is not on paper. We are all aware of this consequence whenever they show up with their laptops on the drawing board. We really ought to listen to what they have to say rather than being too strict about their new methods. **The reason for mentioning this is that, to a great extent, this new digital non-standard architecture is greatly misconceived. As construction teachers, we feel that this new form of architecture has nothing to do with construction. However, this is a wrong starting point and a source of all such misconceptions. Any specialist will tell us that it is the most precise way of defining a form geometrically and, therefore, a form that is easily feasible and constructible. The reason for delving into all this is to help us realize that the two tendencies are not separate. If, on the other hand, we follow the logic that there is one or the other, then it will take a long time for the new "to be born" and a very long time for the old "to die". However, the fact is that there is no need for us to be concerned about the old dying and this was part of the plot or rationale for structuring the four Sessions and to bring you back to basics. In this way, the First Session dealt with discussing contemporary trends in architecture, which effectively affect construction and the need to**

preserve and maintain the basics while remaining open to the new.

Constantin Spiridonidis: Thank you, Maria. Herman Neuckermans will now present his comments as Chairman of the Second Session.

Herman Neuckermans: At first I thought I was invited to provide a synthesis of the Session, but since it was a plenary, I don't see the need to do so. Therefore, I will do the following instead. Firstly, I will share with you a few ideas that I will "take home" from the discussion in my Session, and, then, I will end with two proposals for consideration as future topics for upcoming workshops of this Network. Right from the beginning of our discussion during the Session, it became clear, as Maria has already indicated that the digital reality is with us and will continue to be. There was a remark that was pertinent, emphasizing the fact that, indeed, information is available to all students in vast amounts, meaning that this is not what needs to be taught. However, what we should teach our students is "how to look for this" and "what to look for and why". I believe that this deduction brings us back to the importance of basics, a topic I'll return to later. The second idea that I found interesting in the specific debate was the comment made by a participant while we were discussing the issue of old and new materials which suggested that materials have what I would call "a cultural lifespan" as they go through several phases, "longue durée", "newly discovered" "the archaic or traditional" "the classical" or "mature phase", where materials are widely known and used and the "baroque", marked by exaggerated or excessive use and heading for decline. This particular imagery or metaphor is helpful, perhaps, in our understanding of old and new materials. Along the same lines, it was also mentioned that, in general, acculturation of materials needs time in order for them to be understood and acquire meaning and significance. Moreover, some reference was made to the opinion that materials carry different meanings to engineers and architects. I think that in the different types of societies coexisting, including developing, developed and over developed or post-industrial societies that exist today, one finds that low technology coexists with advanced technology. Furthermore, there were other thoughts that, although non-encompassing are worth-mentioning. The first is that, as one participant noted, when talking about teaching, we tend to burden ourselves with the term "should" rather than liberating ourselves towards personal choice. It's true that, typically, as teachers we have used this

term far too frequently in our discussions and I wish to take this opportunity to apologize for the lot. **Surely our focus is that of invention and discovery through experimentation; moreover, concepts are very important as well.** Finally, a point that was presented as a question, as I perceived it was that, perhaps, **we may be moving in the direction of performance-based design, which is an intriguing issue and still a subject for debate.** These were the main points I retained from the discussion, and to add a personal note on the margin, so to speak, in terms of speculating about what we will potentially focus on in the future, I would estimate that **it's back to basics, and I will attempt to formulate this perception with a set of key words that are opposites. To begin with, I would say that teaching needs to explain "why" and not "how" because the "how" is subject to change during a student's lifetime whereas the "why" involves teaching the fundamentals that ensure lifelong activity. Also, I know that there is still a debate without any decisive answers between the notions of "conceive –compute" and "compute – conceive" but, in my opinion, first comes the conception and then the computation.** Another key word that I consider useful for future teaching is "fundamentals" rather than "encyclopedia" (encyclical learning). Moreover, there are the "competences"_ questioning ourselves about student achievement, including Ramon Sastre's common-sense suggestion. I think that, on the whole, this attitude towards teaching will guarantee design independence of the architect since we can easily move into a situation where we have all kinds of specialists that we can call on for advice, but from my personal experience in designing, I need to have some kind of design independence or expert autonomy so as to avoid having to consult others at all times due to ignorance or limitations. For example, if I design a structure with bars, it will soon be important for me to know if the element in question is in compression or in tension, and I can't always ask an engineer about such matters while I'm designing. Therefore, constructive thinking should be part of what Nigel Cross calls the "designerly way of thinking and that's inclusive. Apart from returning to basics and how this can unfold through different principles that could be discussed more in detail, **another issue deserving attention would be the data bases.** In fact, data bases and case studies were repeatedly mentioned throughout our meetings in various contexts. I think this is a very important issue in which the digital realm plays a

major role. Although my purpose is not to advertise here, you may already know that we in our CADLAB have developed, after many years of research, a system called "Dynamo" (a dynamic memory of architecture on line). The address of the website is <http://dynamo.kuleuven.ac.be>, which contains by now 540 projects, not just images, but full documentation with images, plans and other data, sometimes texts. The cases in the data base are partially the results of student assignments like for example analysis of houses in Belgium. Everyone can access the data base for free, provided you first sign up in order to belong to the 'club' and be legally safe in terms of copyrights. I hereby invite you to log on and to collaborate with us. All together, I think it is better to co-operate than to create each of us our separate little number of digital cases. So, there are thousands of files that you can use free of charge. All you need is a password to sign up because there is a copyright on the program. One can't display images on the internet without belonging to a club. I would suggest to all those that will eventually use this data bank that we make a deal where you, yourselves, also contribute to the data bank some buildings or architecture of your interest. I'm convinced that in all schools of architecture, we all use at least 20 of the same paradigmatic examples of architecture. Of course, I've seen these buildings in real life and there is nothing better than to actually see them, but students have neither the financial means nor time to do so, and the digital realm offers the opportunity for such buildings to be described. Let's take for example la Villa Savoy, which is a trivial example included in the education of old architecture. You describe it in full detail and put it on the web, and if several schools would choose at least one of these buildings and input it, then every school would have information on them all. I think this is a great idea and, of course, I'm merely making a suggestion; the rest is up to you. This kind of data bank, also referred to in the context of conservation has three windows or ways of looking at the data, which means, first, through the window of "theory" in order for you to have access to it through the tendencies. For example, "occurrence" is where you find examples of Spanish minimalism while the second window, the core one deals with design and design-oriented key words. Then, there is the third, which is "theory" or "history". We could, however, make a data bank on construction. Some of you might be thinking that you are already doing this for yourselves, so why bother? The problem is that this can be very costly

in terms of not just making the program, but having to retrieve and store the systems as well. In this context, I wish to refer to another matter. In Europe, there is one system that I know which has an interesting idea in terms of data bank. It's called Ariadne, a wide European project where pedagogical material can be stored, and, technically, Helsinki, London, etc. are all part of it. If other schools wish to have access to the input, for example, a course on history via the internet, it would take a lot of time. So this system, funded by European means is such that the person making the input sends it to the main computer, which happens to be in our University, and during the night it dispatches it to all participants so that by morning all the universities and participants have a quick up-dated version as you needn't wait for the files to navigate through the Net. So, what I'm giving you here is an "appetizer" and without going into much detail, I think that the issue of data bank can be considered in the context of construction and / or conservation.

Constantin Spiridonidis: Thank you, Herman, for your information and remarks. The 3rd Session entitled the Teaching of Construction and the Environment was chaired by Manolis Tzekakis.

Emmanuel Tzekakis: Instead of summarizing the Session, I would prefer to take this opportunity to express some thoughts that I've developed not only during the last few days, but over a period of time. Perhaps, the audience will find them interesting. My impression is that over the last few years European universities and schools of architecture are facing a new external environment. If you are an optimist, you'll say they're facing new **challenges**, but if you're a pessimist, you'll assume they're facing new **dangers**. I will mention a few of these in order for us to have some idea of what lies ahead of us, although most of them have already been discussed. **One of them is the challenge of information technology.** I have been following this challenge since the early '70s. In the beginning I remember that everybody thought that with the arrival of computers, architecture would become an automated process, so people started finding ways for the computer to become an architect. Happily, after a few years, this was totally abandoned and we moved to a new era where the computer was a substitute for the drawing board, which was a much better idea, of course. Now, the years have passed and we see new tools developing from this substitute, providing opportunities for us to do many things that could not be done ten years ago. All this has brought about

change in many different ways and every school has its own ideas of how to use these new opportunities. **Another area of change is that of competition, which has existed for a long time, but today we face competition in a new dimension.** First of all, there is competition between countries, even if we consider ourselves European. Then, there is the competition between schools in the same country and across Europe as well as competition on a global scale between European Schools and those of other parts of the world. This is a rather complex problem whose answers are not so clear cut. **The third challenge or danger is the problem of compatibility.** We are now 25 European countries and some form of compatibility will have to come from somewhere. This is an on-going discussion, of course, and this compatibility as a need contradicts the idea of competition. Nevertheless, we will have to be resourceful in finding a balance. We must be compatible between ourselves in order to exchange students, teachers and material, but we will also need to keep competitive Heads otherwise things are not going to operate too well. In the face of such challenges or dangers, we need to look inside the school, which has been part of our discussion over the last few days, especially in terms of what is happening under the headings of design and that of construction. Between these two factors lies the crux of the matter and what is most revealing. I can't say for certain what will happen next within the realm of these two chapters in architecture, but what I do know is that in the area of design, there will be changes in one way or another, and the same applies to construction. **If you perceive design and construction under a "roof" called architecture and, in not knowing their outcome in terms of their development over the next few years, then you would have to find ways to piece these together.** Therefore, I will make such an attempt by borrowing from my minimal experience in a totally different sector, away from architecture. For the last three years, I have been involved in innovation in the business field, and, from there, I would like to adopt two terms that are useful in determining how we could proceed next year or in the future. One such term is "road map", which is a set of instructions that can help a business achieve a certain goal. In our case, we should, now, try to put behind us the notion of "visions" as dealt with in this meeting and move forward in order to formulate possible road maps that will enable us to see the scenarios of the future for the items we have been discussing.

Therefore, I would suggest "road maps" as substitutes for "visions".

The second word I wish to advocate, which I hope you are all aware of is "bench marking", which is a standard of measurement that helps a business know itself, understand how it works and develop an awareness of why it obtains certain results. Therefore, bench marking is a good tool to adopt in order to help us determine which of the possible road maps for the future would be more useful. Moreover, I don't think it's possible to specify one future because I believe that in the years to come we will be facing multiple futures. **I must add that I'm not even completely certain that there is a bench-marking tool to effectively make us find the right way.** Nevertheless, it's a good route to follow if we want to explore a step further what we have experienced here in terms of visions. Finally, I may not have provided an actual summary of points discussed by our panel, but I've certainly expressed my thoughts.

Constantin Spiridonidis: Thank you, Emanuel, for your suggestions and for setting us on course. The last Session was the Teaching of Construction and the Rare and Traditional Knowledge chaired by Miltiadis Tzitzas.

Miltiadis Tzitzas: One of the advantages of being the last speaker is that since so much has already been said, I can be brief for the sake of all concerned. The disadvantage, however, is that in being heard last, I must make more of an effort to stimulate my audience. In the final Session, although the discussion was somewhat generalized, two of the themes were highly concentrated on the old and rare technology and, we were pleased to have found so many common factors between ourselves and Bucharest, which contributed to our realizing that something good has come out of all this, as is usually the case with such meetings where an open exchange of views and ideas is very beneficial. Furthermore, I'd like to point out that, in general, throughout the last few days, we have been discussing the future of our fledgling new architects who virtually "come out of our hands". **Another point that I think was somewhat overlooked is the differences that we have in our countries, which should definitely be seen in a positive light. The reason for this is that on closer examination and in a spirit of friendship and brotherhood, one will find that these differences are not what pull us apart, but rather they are the diversity of**

resources that will draw us closer together in the future. The way young architects practise is quite different from the South, let's take for example, Greece than from the North, let's say, Denmark. However, I haven't seen any differences in the good student, that is, a student who doesn't actually need us because he/she is improving and working irrespective of whether that student has studied in Greece or Denmark or vice versa. The point is that there are different ways of articulating our trade or profession. Therefore, the way we teach our students differs in subtle or minor ways according to the special orientation or tendency of each country or culture. In other words, **as was mentioned on the first day by Anders Gammelgaard, it's not a question of how we do things in the fine details, but generally "the way we teach" and "the way we transmit the teaching of construction or design".** I do not separate these two because they go together and this is the way it is taught in our school.

I will now refer to some notes I made in order to be a little more concrete. In terms of the **new technologies** which received much attention during the last few days, personally, not all of my colleagues in this school think the same, **but a way of separating them from the rest is for these to be seen as new tools that should be adapted to the way we teach.** I think that this adaptation should be a gradual process for us since for students and young people coming into the school, this is not a problem because in some ways they are better than we are in using these resources. In any case, new technology should be incorporated in the way we teach with all the beneficial results that can be derived from it and by no means should we be afraid of it. In this school and, particularly, in the classes we run in teaching "architectural technology", as we call it, which is a more general term for "construction", we incorporate the new technology and it works very well. Even in the rehabilitation of old buildings, in reference to what I mentioned this morning, we use new technology and it has been adapted quite successfully because it is simply a tool to help us better understand the knowledge that exists in old buildings. Therefore, it is not a contradiction, but actually, as Maria mentioned before, the old and the new coming together and operating extremely well.

In conclusion, I'd like to close by saying that what I've gained through our meetings this year and last year at Isle d'Abeau both for myself and my teaching

activities is that through our discussions we are provided with an opportunity to assess ourselves in terms of whether we are actually doing a good job in our schools. It's a way for us to check ourselves by discussing, making comparisons and adapting or making leeway for minor differences that exist in the individual schools. It seems that by our continuing to adopt an even greater attitude of open-mindedness, we can all profit from this experience.

Constantin Spiridonidis: Thank you, Miltiadis, for the suggestions. We will now open the discussion to include final questions and comments from the audience.

Final Discussion

Jerzy Gorski: I'd just like to assert that it would certainly be a very good idea to invite the studio teachers to join us in the future for discussion. In our school, we have very similar experiences to those we've heard about and seen here. Moreover, we have an association of technical teachers, as I explained last year, and we used to meet twice a year to discuss construction, structures, etc. Studio teachers were always invited to these meetings although only a few would attend; perhaps, the others didn't think it was worthwhile to do so. Somehow, after a few years, the meetings started to die out, mainly because the novelty had worn off as we knew each other well and were all quite familiar with each others' opinions on such matters. Also, the meetings didn't manage to change much in the school except for some minor changes, but, they did provide another experience. Whenever the architectural design time would finish, the students would hang their works in the exhibition hall and the whole staff would go around inspecting them and a discussion would follow. Usually, there were questions from our colleagues about how we teach construction as they didn't know anything about this. When we showed them what we teach and how we teach it, they were very surprised at the amount of knowledge we transmit or pass on. **Therefore, I think that a meeting with the studio teachers would steer our discussion and provide an opportunity for us to look at our work from a different angle or another side, which would be very useful.** So, if it's possible to organize such a meeting, it would certainly be a great idea!

Constantin Spiridonidis: I believe that yours may not be the only school with such a problem.

Dimitris Papalexopoulos: I have two points I would like to bring up. The first is the notorious "divide": design / construction. I've mentioned that design teachers do not talk about the divide because it doesn't exist for them and they don't invite construction teachers to meetings. So, for me the divide does not exist or it's not the central problem, which is very ambivalent as a proposition or as an answer to Constantin regarding the two layers. The second point is about information and data bases in terms of whether there is a challenge for architectural / construction building, which concerns construction education, but much more architecture on the whole. We are all aware that 70% of the cost of any product is information cost. Everybody produces information. What instigates the problem, according to a chief innovator of Microsystems that I invited in a construction lesson at the School of Architecture last week, is that we have produced so much information that we don't have the tools to manage it. **We have produced content, but the time has come to move from content to knowledge. In order for this to occur, they expect from the different professionals (architects, construction teachers, etc.) to structure this content into knowledge. It's obvious that if we can get passed this notorious "divide" we will move on to a major debate which is going on at this time. We are all talking about information management and, hypothetically, we all want as architects the 3-D model of a building to become the axis and vehicle of this information from programming to design and construction to the use of the building. This is not just a theory, but a strong professional demand and teaching objective as well.**

Jean-Marie Bleus: I'm from St. Luc, Liege. It's about five or six years since I met Constantin in Drama, here in Greece, on a workshop, and I'm somewhat surprised by what he's just said, which I found very interesting. I remember we were on a boat reflecting on the issue of time and so far today, you have made no reference to time. You talked about two levels, two different things coming together. However, I think that this is completely impossible because they are two different entities. The way I perceive this is almost as if each of these took a look at the other like lenses zooming in and looking at the earth and a person from outside in. This is merely a reflection!

Constantin Spiridonidis: I think I should clarify my point. I believe that there is a kind of distance in individual schools between the department of

construction and the department of design since different staff members work in one and the other. The fact is that they are different specializations with specific domains of knowledge, exerting different powers within the schools through their respective departments – that's the situation. As a result, the knowledge that students acquire through this education presents itself in two parts. So, the question is how we articulate these distinct areas of knowledge. The point I made in the discussion was that one could easily detect two distinct and separate models of articulation, each with a different focus, as Prof. Gorski suggested and, which as layers must find ways of collaborating. The other means, perhaps, more profound is in the perspective of Dimitri, i.e. by perceiving these areas as one and the same, without any differences. These two viewpoints represent two different approaches to understanding the world of architecture and education. My intention is not to pass any value judgments on any one of these since that would be another issue altogether. However, I think we should at least try to look at this reality in order to understand it and, perhaps, even investigate the possibility of developing them either together or separately or through some other strategy.

Christopher Lowry: Regarding these last comments, if we go on the assumption that there are two situations, I'm trying to think about how those conversations would begin in an effort to take a more inclusive step in bringing the two together. One of the things that would be interesting to do next time is for us to talk about or demonstrate examples of that inclusiveness applied right from the start. You find that many situations that are being touched on are happenings where the architectural tutor will sit with the student developing a project and then will bring in the structural engineer or another engineer later on down the line when the design concept has already been developed, in which case the consultation has not been inclusive. Surely this kind of consultation would be more beneficial if it is timed earlier, right at the beginning so that the ideas could be included or incorporated into the actual design. It would be interesting to actually see some examples where all of the factors are sat down and considered right from the start with all of the people that input the knowledge and teaching. In effect, you're right in saying that before anything actually appears on paper and the student puts forward an idea and then reflects on it, you are actually bringing everyone back to the starting line, if you like, where

it's invention on everyone's part in terms of what they're bringing into the student's work. I think it would be a very good idea to really see students' work and then we'll see if there are more smiles than grumbles about the different disciplines.

Constantin Spiridonidis: Inclusiveness is indeed a useful word for the purpose of this discussion, and I wish to remind you that last year, we had the opportunity of following some inclusive examples from both approaches. After all, we're all looking for inclusiveness, but there are different answers to this inclusive tendency. I agree that your suggestion is really very useful and I remember that last year everyone left the meeting quite pleased because we had experienced the efforts of others toward inclusiveness and by understanding others, we naturally gain a better understanding of ourselves. Certainly there is the possibility of continuing this particular discussion next year in a slightly different way, perhaps.

Miltiadis Tzitzas: I don't particularly like repeating myself, but what Christopher mentioned has given me an incentive to mention a cause of our school. In the 4th year, we have a design studio that runs for two semesters and there are two teachers on the course, one teaching design and the other construction, both working together with the group of students, which, of course, is the optimal way to obtain a good design. This allows input from the very beginning on how construction is to be incorporated, including how it affects design and how design affects construction, etc. Some very interesting work has come out of it, but not in the total studio group. Surely, we have learned through trial and error. In the first years construction and design are taught separately because it is thought that students, generally, have to adapt to some knowledge and then for it to be composite in later years, but the fact of the matter is that it doesn't work like that. When students reach the 4th year and are faced with having to work together for the exam studio, they don't necessarily have the understanding of the basic things that were taught in the previous three years because, for example, they didn't perceive the importance of this knowledge then. Therefore, it seems that a very beneficial thing for us to do would be to incorporate the collaboration of design studio and construction from the start in a very different way so as to convey to the students the notion that those two go together, if building is the objective, that is. I stress the latter because, as is the case with architecture today, not all students,

on leaving school, end up building.

Boel Hellman: I come from Stockholm and also consider myself an observer here, today, because I'm from the purely design part of architecture, if it's the case that you think about the disciplines as two separate worlds in the way it was described earlier. **However, I would like to talk about another focus – the perspective of the students –because they are, in fact, the future! So, the answer to the question of what our future is all about is, without question, our potential students.** When you are in the basic design courses as I am with a group of 20 students that we teach during the first two years of their architectural program, then you realize how big a role you play for them. In fact, they often make such statements as "Can you imagine how important you have become to us?" or "You represent our entire understanding of what architecture means to us." I must admit that I was somewhat frightened to realize all this because when we first start off as teachers, we take our role and the institution for granted and don't really realize that we are the institution; so that in the eyes of the students, I am the school. Then, we also realize that they have no idea of what architecture is and that the onus is on us to tell them what architecture is. **So, if they think that there is a dividing line between architecture and construction, then it's simply because this is what they've learned in their first year.** In our case, we started off as a group consisting of an artist, an engineer and two architects as an experiment. Within the school they don't think that this difference you've mentioned exists, but there are the outsiders who come and remind them that they belong to different sectors. Then, we get students asking us how construction can be separated from architecture. Obviously, they are not aware that this is a problem that has existed within the field and a part of its tradition. The point is that from the point of view of the students, the first years are crucial in determining their conception of what architecture is. Later on, we can teach them as much as we want, but this first impression or initiation cannot be erased or wiped out.

Maria Voyatzaki: I would totally agree with Boel Hellman and combine her thoughts with what Christopher Lowry said to propose two words: continuing education. What I mean is that the education of an architect should be thorough, extending from beginning to end in order for him / her to break down the boundary line between construction and design. If we can go back to

something I said during our last meeting, if you talk to historians and theoreticians, they would say the same about their relationship with design, i.e. that theory has to be taught with design from the first to last year so that students avoid making unnecessary disconnections between subjects. Therefore, there is a question of feasibility and logistics in a school of architecture, which I think suggests nodal points in the education of architects, which means that at certain points during the educational process, they are reminded of things. In our school, for example, we have the advantage in the first three years to teach students this relationship between design and construction quite smoothly, and then they have an integrated project in the 3rd year with SMI project between design and construction. In the 4th and 5th years, when they have gained consciousness of what they're doing in design, they don't deal with construction anymore as there is no demand in the diploma thesis to discuss materiality and tectonics regarding their proposition. I don't think that we are the only school of the kind, but there are many schools that remain conceptual in the upper years because they think that knowledge in construction is limited and that it can be covered in the first year of education. As a result, they are deprived of real experimentation and innovation in construction, but integrate it with design conceptual thinking and the transition from concept to building. Basically, it's a question of handling a school curriculum to maintain continuity from beginning to end without really insisting on being in the studio throughout since a studio has to put emphasis on other subjects. **On the whole, however, in all subjects there needs to be reminders (nodal points) throughout the education of an architect, whether that involves the relationship between design and construction, design and theory, design and history, etc.**

Bjorn Sandaker: I'd like to thank my colleague from Stockholm for what she said. **I'm not so comfortable with this idea of construction versus design because construction deals greatly with design and design implies construction.** The design teachers at my school are very concerned about construction and the construction teachers are concerned about design; so, it's more a question of matter versus space and how these two relate. Matter and material relate in space in different ways, depending on the way you look upon it – as matter or limit or border space or whether matter is part of a constituent space and expressing a space. I would

be very pleased if this polarization between construction and design would not be so prominent, although this may have something to do with the different cultures. It's fair to say that Scandinavian architecture has always been very concerned with down-to-earth factors such as climate or materials and this tradition still exists. Anyway, where I come from there is no precise distinction.

Chris Williams: I think this issue of polarization is very interesting, particularly the last contribution made by Constantin. If I had been asked before coming here what was the major polarization among the architectural members of staff, I would have said, on the one hand, staff members interested in construction and design as one category, and separate from that group would be the theoreticians. The question I would ask, at least from the perspective of the United Kingdom and looking from the outside, because I'm an Engineer, not an Architect, is where do the future teachers of construction come from? Certainly, in the United Kingdom, the tradition for university teachers in Physics, Sciences and Engineering is that you do studies as an undergraduate and then go on to do a Ph.D. You then have to work as a post-doctoral for two or three years and then become a lecturer. **There is actually no space in that to gain design experience and largely because of that, in architecture, certainly in our school, all the permanent staff members that have been appointed in recent years have been theoreticians.** Even if you wanted to find somebody to teach construction, it would be very difficult to find someone that would fit the standard university requirement. In our University, the University itself gets very much involved in the appointment of staff and the Department of Architecture couldn't say we wanted this person unless the University agreed that the person had the right profile, which would largely be a research profile and, therefore, a theoretician. One last point, on this business of research, I'm wondering, if someone had done something interesting in terms of construction education, is there a good refereed journal that they could write this material in? If not, then you'd get no "brownie points" as we say in English. **In other words, it wouldn't count with university authorities unless it's published in a refereed journal; so, starting a refereed journal on construction-design teaching would actually be very helpful, just in terms of the academic professional requirements.**

Elisabeth Shotton: Chris, just as a short answer to

your question, there is the "Journal of Architectural Education". The JAE is bringing out an issue on construction very soon, so they accept that type of entry all the time. This comes from North America, the University of Berkley, I think, so it's possible that you people are not aware of this here.

Maria Voyatzaki: We get the Journal, but there's rarely an article on construction.

Elisabeth Shotton: Yes, but they're working on a new issue.

Maria Voyatzaki: That must be a special issue because there isn't one at the moment dedicated specifically to construction and that's what Chris was referring to.

Elisabeth Shotton: Isn't the whole point about the fact that there shouldn't be a journal dedicated to technology, but a journal dedicated to architecture, which is both technology and design?

Maria Voyatzaki: Yes, you're absolutely right, but the truth of the matter is that most of the articles in the JAE are on history, theory and their pedagogy rather than the pedagogy of construction as well. I have very rarely seen the integration of the two.

Elisabeth Shotton: Perhaps, the integration is already happening.

Herman Neuckermans: I'd just like to comment on what Chris Williams said. Indeed, by taking on researchers or people who have gone through the research track without any practice, some of these are bound to be part of the design teaching team. But, as far as we're concerned, our solution to this problem is that they are not entitled to do design teaching alone, but as part of a team.

Spyros Raftopoulos: It's interesting to hear all these opinions, but I get the impression that we sometimes go around in circles and repeat the same things. Nevertheless, I have the feeling that even as construction teachers, as we call ourselves, we don't have an absolutely common language. What I mean by that is that when Miltiadis Tzitzas referred to our case, here, in Athens, although we do consider ourselves construction teachers, we, nevertheless, also teach design in so much as that when we join a studio, we don't separate the construction teaching from the design teaching; so, in actual fact, from the beginning we do teach design, but we possibly emphasize construction, in contrast to somebody else who is a pure designer. However, we do not separate it, especially in the latter part of our

studies. Now, I have the feeling after listening to people that there are some that are more clear-cut construction teachers and, in many cases, they are also those who also do statics, engineering, calculations, etc. It would be interesting for everyone to possibly identify their profile and more or less specify what they do in their schools. Then we might be able to better understand each other. Another problem that we face a lot, which I discussed with Elisabeth earlier and which I heard our colleague from Stockholm also mention is that of student numbers, which is an important factor. It's ideal to have a class or studio of 20 students with two or three tutors and a completely different situation to have a class of 75 or 100 people with only 2 tutors. In that case, you have to adapt the teaching of design and construction to the specific number because the contexts are different. This is also part of the common language I'm referring to. We must identify the size of the school and class or studio size, then we may be able to understand why one school or teacher adopts one process whereas others another. If I had in a design studio across the drawing table 5 or 6 students, I could spend a lot of time with them and cover a lot more work with them, I suppose. Depending on my personal capabilities and abilities of the students themselves, we could produce more qualitative work. But, when I have 75 people and a critique to do, even if it's twice a week as I have, starting at 3:00 P.M. and finishing at 10:00 p.m., then I can assure you that it is a very tiring experience, as you can appreciate. However, I do not wish to dramatize this situation, here, in Athens, but simply to share one of our problems. Nevertheless, in reference to my original point, if only we could have a common language, we could certainly understand how people feel about teaching construction and design and adopt some of the ideas in an effort to improve our way of teaching. Regarding what my colleague from Thessaloniki, Manolis Tzekakis, mentioned in terms of drawing information from other fields or professions, I would agree with him whole heartedly and insist on the fact that we should not isolate ourselves in architecture and in the way we think as architects and, even more so, as construction teachers. Let's keep an open mind; there are people out there in the outside world that could broaden our horizons.

René Hughes: I'd like to make an association with a remark made by Jerzy Gorski, but first of all, I want to express my agreement with the statement of our Swedish colleague that our future is the students.

Indeed, this is a very appropriate thought and hopeful way of closing our meeting. This statement, however, coming from an architect-teacher assumes a certain direction in the educational course and I'm wondering whether this would be interpreted in the same way by a construction teacher or a history teacher. It seems that the architect, either in or outside the school is expected to be competent in architecture, techniques, construction, history etc. and when this architect arrives in the school, if he is alone, he is expected to teach everything. Usually, it's the case that there are a lot of students and not enough time, so he / she needs to share his / her competence with other specialists (engineers, historians, sociologists, etc.) Therefore, I don't think that we can talk about a common language. **There are different languages, but a common objective, which is architecture.** The language of the engineer differs from that of the studio-architect, but they both work towards a common goal called architecture. Therefore, I'll join Gorski in saying that **the way to improve teaching in a school is to have a good team. In a football team, for example, there are those working in and outside the field who speak different languages, but they all have a common purpose – to score a goal.** In the school, there is understanding and respect for other fields whether it's studio, construction, history, etc. The point is not to separate them so that if we're talking about engineering, you let the specialist have his / her say. If it's a question of the history of architecture, then, surely the studio teacher can handle it because it's part of the architect's background, but the essence is that school time needs to be shared with those that speak the various specialist languages, united under a common theme, architecture. Therefore, I fully support Gorski's suggestion of inviting other professionals from other fields to enter our discussion because our intention is not to "rob" or even wield power in the studio, but to understand the competences of each field.

Johannes Kaferstein: I'm from Fadzuz, Liechtenstein, and I wish to support that opinion because I think that it is possible to create teams. In addition, I would like to go back to the point mentioned earlier concerning the need for schools to define their profiles and, it is apparent that through this process of defining profile, we will have very different people working towards the same goal. In fact, we are actually trying to do this ourselves in Liechtenstein. Although we are a very small school, we soon discovered that we simply can't teach everything.

Being here among all of you, it is obvious that construction-design has many layers, each with a very different understanding of what this is. So we're trying to do less, not more, and concentrate (as it is a large enough area) on the alpine-cultural region, extending from Slovenia to include Spain, France, Italy, Germany, Austria and Liechtenstein. In focusing our efforts towards this region, which has culture and geographic and topological characteristics, we immediately derive construction out of it. This also gives us a basis or context on which to start thinking about what direction construction or design can take within the specific cultural region.

Krimizi (A student from Athens Technical University): **I thought you would be interested in hearing the point of view of a student. I feel very frustrated with the fact that you still divide design from construction. When I applied to the School of Architecture, I thought I would learn to build a house or building with the materials and tools used in construction. Yet, when I came here, I realized that there are two separate things here, design and construction. It's really unfair! The fact that a brick fits into the palm of my hand perfectly is a result of design – architectural-construction design. Therefore, don't put us in a position of having to choose between being technocrats and artists. During the construction lessons I have the feeling that I'm one hundred percent technocrat while, during the design lesson, I feel like an artist or designer. This is unfair for both the field of architecture and for us as students. Therefore, don't make us choose because we are all those things in one, artist / designers and builders.**

Constantin Spiridonidis: I think that this is a perfect conclusion for this meeting and this epilogue provides an inspiration for the next workshop on the theme "Don't make us choose" where we would present teaching approaches that avoid choice. That's simply an idea. I will now ask Maria to make some announcements and, probably, express some ideas of her own for the future.

Maria Voyatzaki: It's usually part and parcel of routine procedure to thank certain people for their contribution to our workshops, in general, but after the student's emotional outcry, it could only be a very sincere and deep expression of appreciation. The heart and soul of the local Institution should receive priority in being thanked for offering us this wonderful venue and I will eagerly propose that

since restoration of the building is scheduled to be completed in three years' time that perhaps a future meeting could be held here, then, as a way of inaugurating the new building. Therefore, I would like to thank Prof. Spyros Raftopoulos and Prof. Miltiadis Tzitzas for looking after us and for having made the necessary arrangements in order for this Workshop to run smoothly. Also, I wish to thank them for allowing us to gain access to the Olympic Village, which we will tour tomorrow, as well as arranging for the specialist researcher, Prof. Manolis Korres for allowing us to visit the Parthenon and who I'm sure will provide us with a detailed and highly specialized tour of the ancient site, which is a unique opportunity and privilege, as we will all realize tomorrow.

I would also like to thank others who took time out of their overcharged timetables and daily lives to enrich and stimulate our thoughts and debates. They are the keynote speakers, Dimitris Papalexopoulos from the National Technical University of Athens, Chris Williams from the Bath University School of Architecture and Civil Engineering, Cyrille Simmonet from the Geneva School of Architecture, Ed van Hinte from the Hague, Netherlands, Bjorn Sandaker from the Oslo School of Architecture in Norway and Pierre Lorent from Brussels for their very stimulating lectures. Moreover, I would like to thank the participants who took the time to prepare abstracts and deliver presentations as a means of sharing their experiences and providing more food for thought during the sessions. Moreover, I would like to thank all our members and participants for your presence, continuing support and valuable contributions.

Finally, this last thank you is actually a belated one from last year and meant also for the forthcoming work to come on this particular Workshop. Lina Di Ciocco-Kirittopoulou is the person who, as of last year, has transcribed our tapes and formalized and edited the dialogues and discussions into written texts for our proceedings' publications. She took the initiative to join us here in Athens for this Workshop in order to match faces to voices, so to speak and out of a sincere interest in gaining a deeper understanding of these meetings. I would like to thank her for all the wonderful work she has done and for the effort she has put in interpreting the content of the non-native speakers' contributions so as to make our proceedings sound fluent and coherent.

Lina Di Ciocco-Kirittopoulou: I would like to also take this opportunity to express my thanks to Profs.

Maria Voyatzaki and Constantin Spiridonidis for all the arrangements they kindly made for me to attend this meeting. Being in Athens, just prior to the Olympic home coming and seeing the marvelous transformation of this world capital, as well as experiencing the Acropolis through the eyes and expertise of such a distinguished scientist as Prof. Manolis Korres was indeed a privilege. I am also very grateful for the experience of being in that historic building of the National University of Athens, which is such a fine example of eclectic architecture, and participating, even if as listener, to a distinguished panel of speakers, keynote lecturers and academicians. I will cherish all the individual conversations and the learning derived from this rich educational experience. Since my task for EAAE-ENHSA has been related to the skills of listening and interpreting information spoken by non-native speakers, I do sincerely hope that in this process I have not taken anything amiss.