

Expectations | _____

Welcome

Maria Voyatzaki: I will drop all formalities and call you Network members. Last year when I started the presentation of the first workshops, I was very anxious to see so many unfamiliar faces and it was difficult to predict, then, whether the outcome would be a positive one. I'm proud to announce that we have 85% of last year's school participants with us this year and have got an additional 20 participants. So, we have almost 38 schools of architecture and 61 participants from 14 different countries represented here. However, these are just figures! The essence is that we have met many of you during the last academic year, which proves that the Network does, in fact, work. We also had invitations for Jeremy Gould the keynote speaker of last year's event to present a keynote speech in a series of weekly workshops that take place annually in Antwerp Henry van de Velde Institut. We met with the Hugo Dworzak, the Lichtenstein participant who came to run a workshop with his students at Grands Ateliers. In conclusion, the Network is warming up and improving. It's a great pleasure to see familiar faces this year and so many more.

I would like to take this opportunity to thank Denis Grèzes from Grands Ateliers and the whole team, Miriam Olivier, in particular, the Director, for kindly offering the hospitality and resources and, above all, their very stimulating environment, which we will all have a chance to explore and make the most of within the next few days.

We will approach the academic angle of the event right after the keynote lecture, which is scheduled to start in about thirty minutes. A discussion will follow on the real content of architectural education with an emphasis on the teaching of construction.

Finally, I would like to express my thanks once again to the staff of Grands Ateliers for hosting this event and wish to invite the Director of Grands Ateliers, Myriam Olivier to the podium.

Myriam Olivier: As a Director of this magnificent structure, Grands Ateliers, I'm really happy to welcome you here today. I do hope that the tour that Pascal is about to give you, along with the explanations, will provide a good idea of who we are and encourage you to become members of Grands Ateliers and that you will, hopefully, come here with your students and/ or partners, in order to use the facilities it has at your disposal. Denis and Pascal will provide further information about the

place. Most of you are already familiar or heard about it from the previous session.

In brief, Les Grands Ateliers is innovative and the only structure of its kind in all of Europe. It's not exactly a school, but a place for schools to come to and work, such as schools for architects or engineers, or institutions that set standards or guidelines, along with industries that produce or transform materials. Therefore, this "neutral" place is an area of innovation in both the technical and pedagogic fields, mainly because the capacity for mixed culture is an important feature of training, research and increasing knowledge. Denis and Pascal will show you how we arrived at making this project what it is today. Another important factor is that since our structure is both unique and special, we try to organise different events for the benefit of students and professionals. One such event is called "Les Matériaux en Tous leurs Etats" (Materials at all Stages) where workshops, animations, exhibitions and a conference will be held for an entire week. The first will focus on concrete, which has been scheduled for October. Should anyone be interested in attending these special workshops or come to the Grands Ateliers please do not hesitate to contact me.

Last but not least, Albert Casasse showed some of his books dealing with building and construction that you might be interested in browsing through. Please see him if you wish to examine them more closely.

Thank you very much for coming here. I hope you will have a pleasant stay and that this meeting will be fruitful.

Denis Grèzes: Grands Ateliers is a meeting place. The first meeting for students coming here is an encounter with material, since in building their projects, they have to eventually get to the material phase. They will have to jump from small cardboard models to the actual structures. Even if they are small-scale models, they will have to get accustomed to such materials as bricks, iron, etc. because they need to understand the logic of these materials as well as learn how to dismantle a project and reassemble it. Moreover, we consider it important that they understand that materials have thickness and weight, require cutting and loading, etc. especially when using large stones. Basically, materials give a project the idea of dimension. Therefore, we ask students to first touch the material with hands and feet. Then we have them cut, blow, assemble, melt,

mould, solder, bolt or screw it, depending on the material. As a result, they discover that there are two logics of building. That is, the heavy and light. In parting these various materials and matter, they can build very sophisticated things.

Grands Ateliers is also a meeting place for people and disciplines, which is obviously not always an easy task initially. Polarization can pull people in different directions, but they, sometimes, learn to work together and get to know each other. It then becomes a very good place to work and team up for particular objectives. For example, we have a team with a Spaniard, two Canadians and a Belgian. It can also provide an opportunity for friendly competition, such as the project you can see for yourselves, downstairs, on breaking bridges, parasismic structures or testing structures (bridges, as was the case with the visit of the Lichtenstein School last December).

Keynote lecture by Pascal Rollet entitled: Construction, Experimentation and the Design Process

Maria Voyatzaki: Thank you very much for a very stimulating presentation. We would like to invite questions from the audience.

Jerzy Gorksi: I'd like to ask about the financing of all these projects. Is it the school or students that pay for them?

Pascal Rollet: That's a very good question. Myriam will give you some information about this. I will tell you about Grenoble. Each of the schools that are members of the Grands Ateliers are funded by the Ministry of Culture in charge of education and architecture. These substantial funds go directly to the Grands Ateliers and Myriam can supply the precise figures given for each school. These funds enable us to use the structure. We provide an estimation of running cost and, then, it's all planned and organized with the Grands Ateliers. For example this particular workshop cost 10,000 Euros, but bear in mind that it's reusable with 1st and 2nd year students on next year's workshop.

Myriam Olivier: I won't go into details, but what is very important is the enormous advantages and benefits that our various school members, including schools of architecture, engineering and art obtain by using the Grands Ateliers for the training of their students. They pay in two installments. At the beginning of the year for maintenance, heating and electricity and basic materials. Then when a school comes for one of the training modules, such as the one Pascal has just described, they would pay for their material expenses, in the same way that they would have to pay for them in their own schools. In addition, they would have to pay for transportation and accommodation. In other words, if you were to come here you would have to pay for basic building maintenance and for materials.

However, you would benefit from a multiple network of services and expertise, not just related to the academic, technical or industrial sectors, but to other services such as accommodation.

Maria Voyatzaki: To obtain basic knowledge and acquaintance on the primary materials (wood, stone, concrete, etc.), we require a minimum of seven weeks of the school curriculum. As far as Grenoble is concerned, how do you manage to integrate or efficiently arrange to fit in material-experimentation workshops without interfering with the rest of the student's curriculum? It seems so difficult at times

to even arrange a field trip without coming up against conflicting course schedules.

Pascal Rollet: Special arrangements are made to accommodate the workshops right at the beginning of the 5th year of the programme. However, for students enrolled in the lower years, we encounter the same difficulty you've described, simply because these students also take electives from other disciplines, so their programme is difficult to manipulate. However, we must think in terms of optimizing learning, even if it means having to revolutionize our pedagogic programme. It's been my experience that students learn far more during intensive work periods rather than in sessions of one or two hours per week. If the school programme would be divided into intensive periods, then we would be able to get through all the basic material knowledge acquisition in three years. The rest of the time could be devoted to research projects, including a residency in more specialized individual work. For example, there is a student, here, who is doing his thesis while working with VICA, a concrete industry.

Question period following Pascal Rollet's keynote lecture

Jerzy Gorksi: How is the project you described financed? Is the school paying or the students pay?

Pascal Rollet: I can answer for the Grenoble students. For the Schools that are members of the Grands Ateliers the Ministry of Culture gives a lumpsum for them. In this sum includes the use of this space. We have to provide the school with an accurate calculation for the module. This module cost, for example 10 000Euros. But we recycle the material as I am going to use things again with my first year students.

Myriam Olivier: In reference to what was discussed earlier, I would like to reassure those schools intending to come to the Grands Ateliers for a week and faced with having to either drop or exchange a course in their curriculum with training here, that they will eventually gain considerably. Mainly, this will mean that their schools will have adopted a policy to include Grands Ateliers as part of their training programme.

Spyros Raftopoulos: Firstly, I would like to thank you for a most interesting presentation. An issue that arose during the presentation is the relationship between the student designs and actual constructions as products of their own inspirations. As far as I can remember, you stated that this exercise is done in the 5th year, when the students are mature, practically full-fledged architects. Indeed, I can understand that the value of such an exercise is to give students an appreciation of materials and ways of manipulating them. However, the question is if such an exercise can be extended to having them construct an idea of their own, which would be useful as well. The reason for my asking this is that we have tried to do this (we may have an opportunity later to present something along this line) and it has proven problematic.

Pascal Rollet: I'll answer your question from two perspectives. Firstly, I often ask myself whether such an exercise would be more effective in the 1st or 5th year. On the one hand, we assume that exposing students to basics in the 1st year would contribute to career orientation. I agree and would be very pleased if this could be done with all 200 first-year students at Grenoble. On the other hand, you pointed out a factor that is very important, which is, that 5th year students are mature enough to be able to understand architectural ideas and aware of the

importance of how to go about realizing such ideas, even if the ideas are not their own. Therefore, at this stage they have reached autonomy and can give and gain a lot more to the exercise. However, the answer to the question of appropriate timing is neither definite nor simple as there are other considerations. For example, we have been able to do the exercise only in the 5th year at Grenoble simply because it has been the only year with a suitable time slot available in which to conduct the exercise. Therefore, for practical reasons we can't do the exercise during the 1st year. The other problem, though a minor one, with the 1st year is dealing with a large number of students.

Lucien Denissen: Since this is a workshop on construction, I would like to ask a related question. More precisely, I would like to ask about the roof you designed for this building (Grands Ateliers) you made. The external part of it is inclined on the inside, as is the case usually with inclinations, but the end is flat. Why was it not inclined like the rest of the roof ?

Pascal Rollet: It's not completely flat. It's slightly tilted because we wanted to have better protection at the outskirts of the building. With further inclinations, we would have left a large area of the building exposed to rain.

Lucien Denissen: For shade, too.

Pascal Rollet: Actually, it doesn't provide that much shade since it's transparent, but the aim was protection from rain.

Lucien Denissen: Basically you made a ventilated roof in two parts. How did you weigh the advantages and disadvantages of doing so?

Pascal Rollet: The initial idea was to make the roof independent of the upper part of the building and be able to move things underneath. The other idea was that it should be largely ventilated so as to avoid heat rises in summer. So far it has worked very well since we don't have problems with the heat during the summer months. I must say that the building is not expensively made. The technical inside surface is 1.000 Euros the square meter, but if you extend it to the entire covered area it's down to 300 Euros the square meter.

Herman Neuckermans: I agree with everything you've said as I think that what you've described is the ideal way of working, even if it's not completely new. In fact, if we look back at some of the drawings I've seen at the Ateliers from Henry Van de Velde,

we can see that he used to draw in close contact with the real thing, which is ideal. Unfortunately, however, l'Isle d'Abeau is in France and for those of us who come from other countries, it's quite difficult, even though we are fully aware of the benefits involved in teaching / learning design in close association with the real object. In our school, as a substitute, because we no longer have the means, we design furniture and build models instead. In making furniture, the amount of material required is reduced and the equipment is less sophisticated. The principles of architecture can be learned through small objects as well. However, this is by no means a critique of your procedure, which I believe is fantastic. I simply want to offer a solution to those who don't have access to l'Isle d'Abeau. The only problem, as far as I'm concerned, is that the duration of the project (7 weeks) is a bit too long. Also, after such a long period, my School would expect students to know a lot more about materials than what you mentioned.

Pascal Rollet: The furniture option is a good one and was practised at Grenoble for a long time before we had access to Grands Ateliers. One of the things I learned in doing this module is that the notion of scale is very different when you put up a roof on a real structure than placing the seat on a chair. Of course, as an architect I've always known the difference, but not as a teacher. Judging from my own students' reactions and comments, it was obvious that it helped them realize the physical difference, which was remarkable!

Jean-Marie Bleus: Can you specify what information you give to students and when? Also, you said you took on the role of the architect for the sake of the exercise. What about the student role? Were the students builders or were they also engaged in the conceptualization process?

Pascal Rollet: For that particular module, we gave them what we thought a French Architect would normally give a contractor to build, including not much more than a series of sketches, 3D computer views, and a vague geometry (3 meters x 3 meters, 2 ½ meters high). The thing that was clearly stipulated was that we would make design decisions, although the students could freely propose changes or make improvements or suggest new directions, but we would make all final decisions. The reason I decided to conduct it this way is that for the first two years when the course was studio based, without the experimentation at Grands Ateliers, we used to lose

a lot of time on individual student queries and general hesitation, so, pedagogically, I thought it would be more efficient to implement a more directive/ prescriptive approach. Projects of this nature will involve a certain amount of time loss, even under the best of circumstances, so the idea is to find ways for them to minimize delays in completing their construction work. For example, for this particular project, we were late. Although we had seven weeks to finish the project, we did not complete it until the 8th.

Ola Wedebunn: I teach material at the Academy and I very much appreciated the part of your lecture where you talked about the various sensations derived from materials. Experiencing materials is very important. However, I would like to ask you about the 5th year programme. It seems that you present a kind of standardized set of materials (same size, materials that can't be drilled into, perforated, etc.) I wonder why you bring in the sensational (socio-cultural) aspects of the materials in as late as the 5th year, when students are already so far ahead in their training and have reached an autonomous phase. It seems that there should be a programme where students are gradually exposed and develop a connection with or sensation for these materials in circumstances when they're asked to do something technically with them.

Pascal Rollet: I would say that the most sensitive and sensitizing part of the module is when students actually visit the material sites and have exchanges with the relevant people (steel workers, in this case) as well as the visits to the building sites, where they can see how the material is applied and used. Of course, this can be done earlier in their training, perhaps it would be perfect to do it in the 2nd year, as was the case in my own personal training. Sensitizing students to matter should, indeed, be done earlier. However, as I explained earlier, we do it in the 5th year simply because that's when there is adequate time available. What I have learned is that when you get to the experimentation phase, you need to have a strict agenda and be more exact in calculating our pedagogic expectations, that's what's important.

Opening Session of the Workshop

Maria Voyatzaki: If there are no further questions, I would like to thank Pascal Rollet once again. I will now go into some of the history behind this Sub-Network. It all started with the EAAE (European Association for Architectural Education) whose Council, under the presidency of Herman Neuckermans, who is here with us today, suggested the creation of thematic networks related to subject matter in the field of architectural education, which would allow professionals to get together and share their views in the various areas. The idea matured and eventually became part of a proposal. As you can see on the logos, there are two different parts, the EAAE and ENHSA (European Network of Heads of Schools of Architecture). This Network has many activities, one of which is the Meeting of Heads of Schools in Hania, Greece, which will be held this September for the sixth consecutive year. Another activity is the creation of a website that will disseminate information derived from all other activities. Moreover, there is research in architectural education itself. Finally, the fourth that consists of four main sub topics, is the creation of the thematic sub networks.

The areas we have concentrated on for the first and second years is architectural conservation, as part of the history of architectural design, urban design and construction. In other words, you are here for one fourth of the four activities of the Thematic Network, which primarily funds this event. Therefore, the fees you pay are nominal. They would be far more, were it not for the financial support of the European Commission.

When we originally discussed the case of creating a thematic sub network, it was difficult to find a starting point. I was given the responsibility by the EAAE to create this sub network and along with the initiative of Constantin Spiridonidis, on behalf of the Aristotle University of Thessaloniki, we managed to obtain funds for the first year. These funds were renewed this year, as well, thanks to our effort and skill at conveying information which managed to convince the EU to renew our contract. Last year, when we had this first workshop in Thessaloniki, with about forty-five participants present, the idea was for us to start from scratch investigating the field of architectural education in relation to construction teaching. As a result, we produced a book of proceedings, recording the debates based on such questions as: What do we teach? How do we teach?

Who is to teach? To what extent? Besides the various conclusions we arrived at, our discussions also culminated in proposals for the future. From our very first encounter with construction teachers, we managed to identify and respond to the above-mentioned questions.

As I mentioned at the beginning of this Workshop, one of the things I found interesting was the atmosphere and friendships made through this network, which is quite an important outcome. Apart from that, we were all very keen on continuing to meet and further investigate the issue of construction teaching. Everybody found that our discussions last year were very valuable in helping us locate key issues, even if at the superficial level. Although some questions were answered, back then in May, the fundamental question we all committed ourselves to delve into was that of methodology in the pedagogy of architecture and construction.

By the end of the workshop, we were all too tired to make definite commitments, so I asked people to send me e-mails of their ideas. Surprisingly enough, two days later I received four e-mails from Ed Melet (Amsterdam), Christine Simonin (Normandy), Denis Grèzes (Les Grands Ateliers) and Cyrille Simmonet (Switzerland). What was most interesting about this correspondence was that these people were all willing to proceed with this matter immediately after the event. Therefore, being committed to the proceedings, I called a meeting last September at Grands Ateliers, where we came up with four key words, which appeared on the first correspondence we exchanged. Therefore, we have four words to deal with and they are: "Explain", "Transmit", "Memorize", "Act". Cyrille Simmonet suggested that we elaborate on them or break them down. After analyzing them, the reaction from some of you was to incorporate them in your own elaborations on the teaching of construction in your individual schools. Others, however, chose to ignore them. I do not wish to go into the intentions behind this choice, at this point, because the debates of the next two days will, surely, allow them to surface naturally. However, I would like to remind you of these words.

In an effort to put these words back on the table for discussion, I came up with a very simple analogy. On examining these key words and thinking about the audience they would address, what struck me was that it wasn't clear whether the words were meant to be for students or teachers. Initially one would think that "explain"

and "transmit" are meant for teachers whereas "memorize" and "act" are what students are expected to do. So the analogy that came to my mind is a very motherly one (as any teaching process is kind of parental), that is, that of preparing food and feeding someone. If one explains, the recipient understands and when one transmits, the recipient receives. If the person, in turn, starts to digest, the person absorbs. One acts on what one receives and thus applies the knowledge one has received. In other words, when as teachers we explain, we are dealing strictly with the objectives of the exercise as a philosophy of teaching construction. When we transmit in order for the students to receive, we are talking about the structure of the exercise as structure for teaching construction. Finally, the content as a reciprocal action of memorising and absorbing the exercise can be seen in terms of a content pedagogy for teaching construction. Last but not least, between acting and applying is the outcome of the exercise as knowledge of construction.

I will keep bringing back these key words since I feel that they will provide structure to our conversation. As you saw from the tentative programme you received, my objective was for us to exhaust each of these words in each session. When I received your extracts, it became clear that it would be impossible to isolate these four concepts, as they are interrelated and, therefore, difficult to talk about one without the other. Consequently, as you will see from the final programme you've received we have classified things differently. We would like to remind those speakers who are presenting their exercises or animating the debate, to introduce the objectives, structure, content and outcome of the exercises, using this classification. Furthermore, we have adopted headings, for example, in the first session, you will find that the four schools that will be presenting their exercises will be talking about materials from many different points of view, that is, from conceptual approaches to the more down-to-earth approaches of teaching materials. The second session, which is on Friday, is on the teaching of structure whereas the last sessions deal with integrated projects in architectural education.

Session 1: Explain

The exercise (or the series of exercises) proposed aim at exposing, exploring and explaining a specific problem, at 'staging' by means of various tricks so as to make the initial problem intelligible. This may involve a simple calculation, like that of a beam for a project, or the design of an original construction principle. Whatever the case, the exercise generally shows and demonstrates something.

The schools presenting in this session were:

Aarhus School of Architecture (Denmark) by Anders Gammelgaard,

Antwerp School of Architecture (Belgium) by Lucien Denissen and Koen Van de Vreken,

Normandy School of Architecture (France) by Christine Simonin Adam,

Athens School of Architecture (Greece) by Goulielmos Francis, Spyros Raftopoulos and, Miltiadis Tzitzas.

School Presentations

Debate on presentations and theme

Spyros Raftopoulos: I think the challenge of trying to relate architectural design with construction is something that we are keen on and try to do something with. The tutors of construction in our school take part in pure design projects in the 7th or 8th semester, which we call interdepartmental teaching. We feel that construction should not be separate from design since both are closely linked. Unfortunately, for a long time students were taught construction exercises that were very poorly-designed architecturally. In many cases, these design projects were far too unrealistic for the Greek environment. The Athens School of Architecture is very large, with a student population of 1,650 and 106 staff members. Therefore, we need to examine the feasibility of conducting such an exercise under the circumstances. The fact that it could be accomplished was a success in itself, despite the problems encountered. We would like to hear your comments or criticisms as to whether this type of curriculum is applied in your schools and if you think it's simply not practical or recommendable.

Miltiadis Tzitzas: I would just like to add a few points regarding what Spyros Raftopoulos has just mentioned. We've been doing this exercise for ten years. It started as an elective, but with the increasing number of students, we decided to make it

compulsory for all. However, this turned out to be disastrous simply because there weren't enough teachers for the number of students, as well as the fact that there were too many students working together on one project. We had different themes for the exercise, which changed from year to year in order to add variety. The last one we did require them to elevate 50 kilos (a sack of cement) from the first to second floor of the building. The positive outcome from this was that the students managed to create some very clever elevating machines. However, there were various problems (breakage, etc), as well as the fact that we lost a great deal of energy worrying about potential hazards due to the number of people involved in the exercise. As a result, after two years, we decided to run it as an elective in order to minimize the number of students engaged in the exercise. Nowadays, we work on simple constructions using materials that can be handled easier, such as wood, metal, etc., but not concrete, stone or bricks. They make models (1/10) and some elements are done as details on a larger scale. It's quite instructive, but certainly not the same exercise as the previous one.

Herman Neuckermans: I would like to ask the School of Normandy a question, but perhaps we shouldn't disrupt the flow of the discussion, so let's finish with questions for the Athenians first.

Ola Wedebrunn: To say that students don't know much about handiwork or crafts is not a good starting point. Your work shows that this is not even true. There is a lot to gain by addressing a philosophy, as you do in your exercise, by asking students to imagine what is around them. I think that it's important to have a narrative role in construction and not the role of the mimicker (trying to make something look like a bridge, etc.). Rather, we should be dealing with such questions as why make a bridge or bow? What is the philosophy or rationale behind the construction? This will raise the exercise from mere mimicry to a more general view and then move on to the actual construction.

Spyros Raftopoulos: We agree with you on that approach. In fact, with reference to your "narrative" role, I mentioned design "scenario", if I've understood you correctly. We are talking about the same thing, aren't we?

Ola Wedebrunn: Yes, but when you ask for particular skills/crafts, you are being mimetic. However, things do not exist in the same way they existed thirty-five years ago. For example, today young people could

get cartons of milk or tins, etc. from the streets and, as teachers, **we have to make them feel that they can produce a craft with such material, rather than making them feel that it's impossible simply because they have to behave according to a prescribed code of what they should make. The outcome of your work shows that this is possible.**

Spyros Raftopoulos: Yes, but it requires a lot of effort. My point is not that students are incapable of craftsmanship, but simply that they do not consider using it, mainly because it's not part of their daily living experience. Young people seem to know a great deal about computer games, nowadays, but have very little knowledge about the kind of games that people of our generation played. **Besides, computer skills are not enough to help them master the principles of construction and design:**

Ola Wedebrunn: That's their reality.

Spyros Raftopoulos: Yes, of course, but in order to develop the perception of structure and construction in a young architect he/she has to know about materials.

Ola Wedebrunn: When looking at materials, there is no atomic structure between stone and bricks. So we have to refer to the sensations, because in wood, stone, glass, etc. there is no difference. For example, in a way, there is no difference between glass and hand-burnt brick.

Spyros Raftopoulos: In architectural terms there is a difference. Perhaps from the point of view of physics (atomic structure) there isn't, but in terms of our profession, they are different in the way we build and they are used differently.

Ola Wedebrunn: Sorry, what I meant to say was that there isn't one solution, but that one needs to be open to the fact that such divisions needn't always exist. Sometimes between the organic and non-organic we can find a way of making the transition.

Spyros Raftopoulos: Yes, to a certain extent I would agree with you, but we teach architects and supervise the design and building of structures, therefore, we feel that the perception of the architect is different from the engineer. **When we ask students to design, we don't expect them to do any calculations, but we feel that they should be able to perceive the actual scale of the construction, depending on the material they're using** (e.g. if it's a steel beam, an arch, a timber beam, a brick or masonry wall, they should be able to differentiate).

It's in this sense that we feel there is a difference among all these things. We've had a lot of criticisms from engineers because our students, even up to the 6th semester do a lot of calculations. Nevertheless, they learn from us in very simple terms how big a beam should be if they want to span a certain opening, without calculations. We give them rules of thumb and it's these common sense rules that are eventually memorized and used when they design in scale. For example, if the span is 10 meters, the height of the beam is about 1/10 the opening of the span. If it's a bit more or less it doesn't matter in the design, but it's according to the scale.

Ed Melet: I have a question for Christine Simonin Adam from Normandy. If you let your students design the panels, how are these panels tested?

Christine Simonin Adam: Although we wanted to test the panels in the laboratory, we don't do so because it's too expensive (2,000 euros per panel). To ensure that the results match student claims, we check the formula with the industrial information and compare with other products and materials in respect to alphabene. It's interesting because, even if it's not very precise, the students learn that each material has acoustic behaviour. Secondly, they can write about industrial information and discover that there is a great deal of information available, besides the acoustic that they can gather about the materials of their choice. Next year, we plan to go to an acoustic centre to find out how we can test material, just one, not a panel.

Marko Suutarla: Your exercise was done by a group of students. How well, do you think, was it carried out? Judging from our experience, we found group work problematic.

Lucien Denissen: That's quite simple, everyone got the same points. Group work depends on acceptance. Sometimes we see that certain individuals leave the group and go on to work on their own. I accept it, because I can't force social interaction.

Maria Voyatzaki: Any further questions or shall we call it a day?

Eriksrud Steinar: I must say that to a great extent I enjoyed the Athens' presentation, probably because I felt at home since we do the exercise almost the same way, with all the practical and negative aspects involved. We put much emphasis on model buildings, not necessarily just as projects, but exercises, also, in order to explain technological

issues. I think that this is very important, nowadays, especially because we've got information technology as an alternative. So, to balance these two types of tools in design work, it is important to do all that work plus the exercises. I also feel that for students to be inexperienced on entering the programme is not a problem. Perhaps, this is due to the fact that our school has an entry test, part of which requires students to make a model and explain the artistic relation between materials and space, etc. The fact that they have to do something is very important. We don't require that they have scientific knowledge in maths or physics and that, of course, has an impact on the kind of teaching we do.

Herman Neuckermans: I'd like to comment on the Greek presentation. I agree that integrated construction design is the right way to proceed. Although many of us are convinced of doing that, I'm not quite sure that this is what actually happens. The reason for this, as we discussed last year is that there is a division between those who teach design and those involved in construction, along with the fact that, usually, construction doesn't appear in the beginning of the project, but squeezed in somewhere at the end or even phased out completely. So, the reality is probably different from the ideal. Nevertheless, I do agree with your point of view. **What I disagree with is the commonly held view that rules of thumb are sufficient when it comes to knowledge of construction.** I'll give a simple example to justify this. If I have two walls and a weight to support, it can be easily understood that there is tension between these two things. If the weight is heavier, the tension increases, making the two walls come closer. So you put something there for compression. Imagine if it's even heavier, at a certain moment in time, buckling will appear. In this case, relying on intuition or rules of thumb in dealing with buckling is far more difficult. Moreover, if you start to compare wind loads with bottle loads, common sense will not explain the movement behaviour of objects or determine the need for computation. Being influenced by the fact that I received engineering training, I think that some scientific knowledge beyond rules of thumb is important for an architect. However, I'm not suggesting that we create a TGV station of Satelas, as we've seen, but certainly we can't rely merely on rules of thumb. They come in handy on a day-to-day basis, of course, but to take construction a step further, more in-depth knowledge is required. The question remains who

should know more, but this is open to discussion, despite my opinions.

Spyros Raftopoulos: I think we would all agree there, particularly because this field is becoming more and more complex (Calatrava's work is a typical example). In cooperation with various other engineers, the architect's work is moving closer to construction. Therefore, when we refer to rules of thumb, we mean that the young architect will be able to relate to the scale of a certain structure. Once this becomes a more difficult problem, certainly more knowledge is required. For example, in Greece, we have the problem of earthquakes. Surely no architect would dare design on the basis of rule of thumb, under the circumstances, as you would all agree!

Herman Neuckermans: With regards to tutoring time, you mentioned the difficulty involved in tutoring such a large student population. In the example you gave about supervising the platform, could you provide an estimate of what this represents in actual tutoring time in the span of one semester? Is your semester 13 weeks or so?

Spyros Raftopoulos: It's 13 or less.

Herman Neuckermans: So, 13x4, that's 52 hours or less. During this time, how often do you see the students? I presume that, like us, you do see the students when tutoring design classes.

Spyros Raftopoulos: In reference to this particular example, as it's not the same each time, the eighty students were separated in smaller groups, with five or six students per group project, bearing in mind that students were expected to construct the project. There were four tutors conducting sessions on a weekly basis for six hours, meaning that they were able, even if for a short period of time, to have a clint with the people concerned for their projects. The students were all involved in building their projects in the school itself, although some were away, which was a problem. To return to our discussion on whether or not to use rules of thumb, I think that this is interesting when things go wrong, which is when we learn.) I think that we can see both here and with some experimentation exercises that we have done where they build beams, the interesting moment was the cracking point, just when things were about to break. That's when we could actually see how things move and students learn much intuitively from this experience about movement.

Session 2: Transmit

This function is often difficult to represent, and teachers tend to consider it natural. Yet, any exercise includes a measure of efficacy or even of considerable educational productivity. This is especially true of architecture, in which students are strongly conditioned, so to speak, by imagination. One can imagine a thousand ways of inscribing construction laws or rules within the architectural design process.

The schools presenting in this session were:

Paris-Malaquais (France) by Jean-Marie Delarue,

St. Etienne (France) by René Hughes,

Lyon (France) by François Fleury,

KU Leuven (Belgium) by Herman Neuckermans

Vallès (Catalunia Spain) School of Architecture by Ramon Sastre.

I would like to strongly urge the speakers to adhere to the time schedule so as to allow ample time for discussion after the presentations.

School Presentations

Debate on presentations and theme

Lucien Denissen: I have a question for Mr. Fleury. Is there any relationship between the frequency of the test and some places in the world where there are earthquakes, taking into account that it's only a model?

François Fleury: There is no relationship between frequency of real buildings and the frequency of the model. The point is that, on this table, you can adjust the frequency, at a certain range, so that you can usually catch the ion frequency of the model and that's what's interesting. In reality, an earthquake has a signal composed of an infinite number of frequencies and a certain number can't be delivered with this small table. However, the point is not to have representation on the time scale, here, but to show what the effect of resonance can be.

Maria Voyatzaki: One could say structural models because they're not just maquettes, but physical models representing structures. How do you actually simulate or draw analogies between materials and imposed loads on a structure.? If we have a delicate, physical model made of balsa, for example, and we punch it, it will obviously collapse, but how can a student understand that if the same structure is

made of timber, steel or concrete, etc., you can proportionately impose loads. How can we make the analogy and make sense of the imposed loads, which, I think, is important? When you have a bridge, such as the ones you have there and you put bricks on top of it, what does this, in reality, represent? I would, personally, like to do this test with my students, but I know, as an architect, that if I impose a balloon full of water on a tiny bridge made of balsa will collapse. But, in fact, this would never be a real load to the structure. Could you give me some tips, please?

René Hughes: I think the best person to answer this question is Remy Mouterd, who is in charge of this exercise.

Rémy Mouterde: Je pense qu'il a deux voies différents. La voie que vous avez vue hier n'est pas une maquette analogique du comportement réel d'une structure, mais le comportement réel d'une structure de petite dimension avec des charges réelles. Ce n'est pas la même chose. Et si on veut modéliser les structures de grande dimension à l'échelle qu'on a utilisé hier, il faudrait avoir une analogie de dimension, mais aussi des matériaux qui seraient..... Il y a, certainement, des règles physiques, mais certains effets sont liés à une dimension, certains effets à deux dimensions de la surface, d'autres effets sont liés à la troisième dimension de volume, et d'autres à la quatrième dimension du temps qu'on a passé à la dynamique, par exemple. On a beaucoup de mal à rassembler simultanément sur une petite maquette.

François Fleury: Let me translate what Rémy has just said. I think there are two different ways. Yesterday's models are not analogical models for the analogy of real structural behaviour but it is the real behaviour of a small size structure behaviour with real loads imposed to it. If you want to model with reduced scale, real size structures with real loads, you have to take into account scaling rules, which are different for the length, surface or volume, especially if you want to consider different densities and joints.

Herman Neuckermans: I know that structures were tested empirically by loading them before finite elements and complex computing methods were available. If you build the models with the same materials (e.g. wood) as the real structures and if you make the nodes accordingly, then you have to charge the real load; that means x kilos per square meters and then see the outcome. If you take the

same material and the same nodes, then you apply the real load. This can be done with wood, aluminum, maybe even steel, perhaps it's easier. This is how it was done in the past.

Philippe Liveneau: I have a question for René Hughes. When we make a model with wood, the problem you point out is basically which material and which scale, but, with computer models, which loads would be used to test those models?

René Hughes: Thank you for the question, Philippe. We are from the school of architecture, and in the 2nd year we try to present to our students the notion that there is no choice with loads, as they are governed by regulations. There is no way they can try out this or that. Everything has to be done by the rule. Therefore, in this exercise, analogy is a sort of engineering exercise. The problem is the behaviour of the structure. When you know that the wind is horizontal or uplift the load is down this way, we don't try to simulate the load, but just add two tons to determine the behaviour of the structure and show what works in the deflection.

Philippe Liveneau: In this case, it would be possible to make the same structures made of wood, concrete or steel and same loads to show the differences.

Jean-Marie Delarue: I would like to answer the question on scale of form and structures. Of course, at the beginning on structural morphology there is the problem of scale since there is a form for one scale to another. Students know this. Nevertheless, we make structures that represent some other behaviour according to the scale. However, as far as behaviour is concerned, tension will always be tension and compression will always be compression. Therefore, behaviour will manifest itself in the same way. **Material is important, but it's structure and the analogy one makes of the material that provide an answer as to how it can act.** Therefore, the problem of form in structures is very important to the understanding of scale forms and is an essential part of structural composition for architecture. An excellent book on morphology is D'Arcy Thompson 'On Growth and Form' It's the first scientific explanation of form in any field of scientific observation.

François Fleury: Even if the use of models is interesting for showing the behaviour of structures, I think we have to be conscious of the different biases that can come from these models and the messages

that these models send, which we don't think of or can't predict. For example, students can come out of the experiences from the seismic table thinking that a sheer wall has the same behaviour as what I've shown or that a flexible, sheer wall is quite stiff or brittle and not at all in the same non-linear behaviour as shown here. Therefore you have to try to track down these biases and paraseismic messages when you expose the objectives of the model and how it really works.

René Hughes: If I can just say something about the model. It seems that in considering engineering methods, the engineer makes calculations and designs beams without a model, maybe in front of a computer or through virtual imagination of potential structural behaviour. It seems that if we use it, it's only for the purpose of quick understanding, so we don't want to go into simulation except in the 5th year, when you want to try new connections, new complex structures, etc. However, at school, as teachers we use the physical model which is more architectural or very simple, without simulation or analogy, for quick comprehension.

Jean-Marie Delarue: So, it's a very simple way. The best example of this is Gaudí. It's a very easy way of changing the parameters of form and organization, but you may also have a very precise approach with something whose weight is negligible or, perhaps, very heavy that you weigh with precaution. These are all the qualitative stages of construction.

Ramon Sastre: I'd like to add that if you use a model to generate a shape, it's a bit boring because you can change things quickly. If you use a physical model you can change things easily. If you want to know the result of a real calculation, it's better to use a model, but if you just want to check the behaviour of the structure, in the middle, it will be evident visually. After all, architects understand things visually. Making a model is time consuming and expensive, but it can be broken or taken apart, which is an experience. However, not many things can be removed from it, depending on the joints and many other factors.

Jean-Marie Delarue: A model is not a mixed object, but a concept as well. Here you have some distributions of force, so it's the bridge between reality and abstraction.

Miltiadis Tzitzas: I don't have a question, but want to make a few comments. None of us here speaks

English very well, as we're all non-native speakers. So, we're trying to understand each other in a foreign language and, in the process, we sometimes lose about 30% of what is said. Therefore, it would be useful for us to repeat ourselves when necessary.

The second point is that we don't teach construction, but architecture to architectural students. Of course, construction is an important means of implementing our abstract ideas into concrete form, but it's a very difficult thing to be taught because it depends on many factors. It seems to me, that we tend to put too much emphasis on structural issues. For instance, in reference to this model, here, it shows to students, in a very effective way, how to assemble pieces of timber and put them one on top of the other to form joints. It also shows how timber stabilizes itself and behaves. However, this is not architecture. Perhaps, it gives the idea of how to use and combine materials in order to make something that stands up on its own. The other thing is that some of us come from regions that have earthquakes (Greece, Italy, Rumania, Turkey, etc.), but the northern countries don't have them, so their approach to teaching structure **is quite different. Indeed, all these things together teach architecture. Students have to learn to respect the way materials behave and the forms that emerge from various materials. Models help this learning process to a large extent, but we cannot separate architecture from structure. The whole thing, the whole idea, depending on the construction, is architecture. There are structures that stand or are strong enough to withstand loads, but they are merely structures, whereas there are those that bring music to my ears and when I pass by them and look at them they say something to me because they are architecture.**

Herman Neuckermans: Perhaps, I can add something. This meeting represents the fact that we are no longer isolated in our own schools and regions. Also, our students will live in a world of greater mobility and move faster than we ever have. Therefore, I think that in order to teach structure, we have to include seismic design, irrespective of where one lives. It's an awareness that we all have that our students need to be prepared to build not just for the circumstances of their homelands, but elsewhere as well.

Ola Wedebrunn: I have a question for Jean Marie de la Rue. I liked very much the way you addressed

the morphology of structures. I think it's different from the more structural, linear and quantitative way of measuring how you can have forces in diagrams, etc. It's more like searching for a form rather than defining it. I think that making models is a big problem because one needs to decide what kind of wood to use and the scale for a model is different from the actual object or material. Based on what you have shown earlier, in your presentation, what do you think of using new media (computer, etc) to develop these experiences of forms for students? Computer media could be very appropriate for this kind of study.

Jean-Marie Delarue: The answer lies in different areas. Firstly, in discovering or developing structural logic / construction rationale, constructive rationalities, I think that some lucid or inventive approaches with models are always relevant because in every engineer there lies the child playing with cubes and bricks. Therefore, in the material approach, an inventive streak is important along with conceptualization and representation through various means. The use and manipulation of modern information systems is a necessary complement, nowadays, to this sensitive approach. I don't know about the manipulation of such systems, so I would refer to Frei Otto or Robert Ricolais or others who have explored and produced some inventions as initial steps. Evolution is collaboration with people who can express themselves through the language of information systems, which is very important in this field. Nowadays, the review, *Architectural Design*, for instance, usually shows surfaces, virtual things, transparencies, etc., but structural rationalities of forms are never in question. So this free-form style, which people accept today, is so because, before, it was so difficult to imagine complex forms, but they were contained in the elements. **For surfaces, the example is evident because they are tactile, visible, audible, etc. so the sensitive approach is important. With modern simulations, we can go further and further. Finally, discovering the role of structural composition is never complete, since there are always questions on the behaviour of things to be answered and I want to give students the taste of research. I hope I've answered your question.**

René Hughes: I would simply like to add that the gap between playing with sand and the computer is that with materials one feels free to experience (one feels the cup in one's hand pouring the sand). I can't imagine how this kind of sensation can be

felt via the computer. There is a gap between the demonstration and people working on the computer. In the end, you try to represent, modulate or realize models on a scale of 1 to 1.

Jean-Marie Delarue: When you play with sand, of course, you're actually playing. You show the form at some scale. But, you can question the behaviour of matter, the role of friction and a number of other questions that must be answered. So the approach shown is just a superficial aspect of the teaching mode, where many questions, both local and global, size, material, etc. need to be dealt with.

Anders Gammelgaard: I would like to make a comment to our Greek colleague regarding his point that we should make divisions between construction / structure and design since what we actually deal with is architecture. **I think we have to go one step further in order to take architectural students of the 21st century beyond. Dealing with architecture alone is mundane. One can realize this by merely looking at today's magazines relevant to our field. So instead of dealing with architecture, we should be dealing with architectural problems, structure being only one of them. When students come to us, they expect to do architecture, which, according to them, means buildings with doors, windows, ceilings and floors. This mindset, however, prevents them from being innovative and from dealing with architectural problems.**

Ramon Sastre: Let me just add that we are talking about structures. These days, knowledge is in the form of bars and linear elements. Architecture is spaces, using walls and vaults and these are not mentioned here. When we think about it, forces are engineering oriented, but spaces are made by existing elements and the behaviour of a building depends not just on structure, but the internal elements as well. One of the ways to stabilize a structure is to build a wall in the frame, but this has not been mentioned. We seem to focus on rigid nodes instead of ways of stabilizing structures.

Jean-Marie Delarue: Along the same vein, the 2nd word of the presentation was constructive geometry. The specialty of the architect is to organize space. We understand structural abilities in relation to the way the following points are put on the surfaces (linear, curvilinear etc.). Then you have a deep understanding of the freedom you have to organize space. I think it's important for an architect to develop a knowledge of geometry and its structural

implications because geometry is precision of form and calculations of quantity, etc. Of course, we know curvature, symmetry, orthogonality, fractality and all kinds of geometry with deep structural implications.

Maria Voyatzaki: I was wondering, since all the exercises presented focused on the issue of structures as a quality of architecture or as a way of enhancing architecture, if there is an "in-between" way of stimulating students' imaginations when they design. If I were to classify or have typologies of structures, I would simply distinguish the mundane frame (4 columns or 4 load-bearing walls in 4 points of a plate) and that would be all. I could go on the other end of the spectrum to talk about structural morphology (3-dimensional architecture and topology). But, there is something in between, which challenges the existing forms. The structure, itself, does not play a protagonistic role in the architectural expression of a building or form, but there are challenges in establishing forms, which is really what students would like to know. For example, case studies can demonstrate how Zaha Hadid's cantilevers work or how they work in the Koolhaas's Villa in Bordeaux with the round windows. A cantilever is a very basic term in the jargon (specialized language) of the structural engineer and architect. But, architects want to go beyond, conventions and overcome formal constraints to their imaginations. **This is the time when students want to transcend and go beyond the existing body of knowledge. A good student is experimental and interested in exploring, investigating, going beyond existing forms in search of novelty.** When we teach, whether it's construction or structures, etc. surely there is something *in between* that must be taught. Of course, I don't underestimate the existing body of knowledge, the traditional structural elements and traditional ways of building students have to learn, as well as the other end of the spectrum, the extreme, three-dimensional morphology for example. But there is something else which allows the student to investigate in the same way he/she does with forms, construction and structures, without being extreme. In that sense, I wish to return to the example of the cantilevers. **Students really want to know how things work in the realm of the extreme.** I'd like to hear your views on this.

Spyros Raptopoulos: In other words, do you mean that what we present inflicts certain limitations on the students' imaginations and inspirations? Are you saying that our insisting on precision on the behaviour of certain structures brings about

restrictions that don't allow them to go beyond? You mentioned Zaha Hadid, for example. I'm certain that if a student presented a project of that nature in school, I don't know if it would be accepted.

Maria Voyatzaki: What I meant was that there are *different* approaches and we have a *neither-nor* situation. However, I was referring to an *in-between* one. It seems that there are traditional approaches to architectural teaching, which entail giving basic knowledge and anything beyond that is considered somewhat unacceptable. There is, also, the other extreme in which we rarely find, except in public buildings, stadiums, etc., structural morphology applied. However, there is an "in between", which may have to do with the scale of the building as well as the use of it. With structural morphology, I feel that there is also the question of the content of the building (building type) that allows for something to be morphologically interesting (3-dimensional) and it also has to do with the functional need of covering long spans. With these 3-D structures, you can use lightweight materials, reduce the degree of vertical support and have open plans and uninterrupted long spans. So, in a nutshell, what I'm actually inferring is putting construction in the architectural educational process as part of the student's creative development.

Jean-Marie Bleus: Yesterday, we talked about explaining and, today, we're transmitting; moreover, we are together. However, what is happening now is that we have reached the point of complexity. We've been talking about structure and architecture, for the past hour, but nobody has referred to thermal physical properties. About five years ago, we met with some French people from La Villette and there was a student there who had worked with Renzo Piano on a project. He started talking about the project and went on for four hours. Renzo Piano is very close to materials, no doubt. When he designs a project he observes the structures and material in the context and then he designs. He did that right from the beginning. Some other times he looks at low technology. On another project he collaborated with engineers on natural ventilation, which in the engineer's experience has never worked. In other words what I am saying is that in every project we have to deal with complexity.

Anders Gammelgaard: I have some thoughts about the references we use like Zaha Hadid and Peter Zumthor. But we can ask, where do they go to get their ideas, they do not have something they

copy from? I think that shows very clearly that to go beyond the limits of the architecture we know. As teachers we do not have to know the answers, it is important to be open-minded. If we know the answers we make a bad copy of what is existing already. For architectural students and future architects, we do not want the bad post-war architecture to be repeated. We have to do something about it. Coming to Lyon you discover such a wonderful city, but when we pass it you see all these suburban areas which are all over Europe. We really have a high burden on our shoulder in meeting that big demand for change. What we could do is a process-oriented teaching, which is to stick to architectural projects wherever they take us. It is hard to be in a situation where you do not know the answer when a student asks, that is very much the challenge. So we have to stick to the process without knowing the answer. When we know the answers we diminish architecture. That can be a way of teaching the students to be more innovative, to stick with the process. The muscle to be trained is the muscle up here (he points at his brains).

François Fleury: Another key point in order to allow innovation and students do not copy, to avoid recipes, but to develop as Maria said an understanding of what is going on and a capacity of generalising and maybe a certain number of tools for allowing an empirical approach and this way they can transcend the limits and use them as inspiration points, because you need limits for design for artistic reproduction. I think all our different approaches we teach converge to develop students' capacity. We admit that we do not know, but for me it is not enough to say so. For seismic design and the dynamic behaviour of the buildings you have to know. So for example when you talk to them about structural behaviour instead of suggesting them the design of symmetric buildings you can ask them to align the centre of gravity with the centre of rigidity and then things work. For example students suggest using wood in an entire building of 28m height. I have never seen such building myself. I suggest therefore, that there are no precedents of this type. We cannot let them go in ways that are infeasible. How can we cope with our own limits and deal with innovation? We have to go into research ourselves.

Ola Wedebrunn: I do not agree with the limits. You have to break the limits to drive imagination. The limits are not there. If we accept that there are limits we cannot teach. We cannot accept that construction is only about natural laws and

definitions but it is also about qualities, and the qualities of tradition. We must give them ideas and support them on that. Construction is also about culture and we have to bring this notion of culture into construction.

Herman Neuckermans: I would like to make a distinction on our presentations about the generation of structures and the understanding of structures. Both sometimes intertwine or focus on one of the two things. If you look at the work of Greg Lynn his blobs on the computer have nothing to do with materials, which indeed generate a problem if you ever want to use in architecture. So this is the dilemma we face. In architectural education, we start from architecture and not from a part of architecture be it construction, or function, or form. You have to start from the whole thing. If you do not do this you get the reaction we are having here. Stimulating creativity is fine, but you cannot create from ignorance. It is very challenging to teach on the experience of the others. You have to find a way of mixing the transmittance of knowledge. So you have to start teaching architecture from the general. Then your question to me could be, what was it that I showed you. My answer is that I reduce complexity by eliminating function and language. Once students know the complexity of architecture, then you can focus on some of its aspects.

Student from the audience: I am a postgraduate students from Grenoble. My question is where in your pedagogy you although we all agree that we live in a globalised world we travel a lot and use different materials. The thing is that the materials we use without telling the students what the impact of the materials they use is on the environment. How is a structure and the materials chosen, how we cooperate with builders or the future inhabitants of the building we design. We as future architects are responsible for these choices.

Herman Neuckermans: Sustainability which you are touching upon is a hot subject in Western Europe. In Delft for example this is considered an important issue.

François Fleury: This is an important concept in France and it preoccupies our teaching. Sustainability has to do with a lot of issues beyond the thermal behaviour of a building, but recycling etc. So good architecture has to be in line with that.

Nikos Panayotopoulos: I am grateful to the student who brought up the subject. I am thinking of it

continuously. In our Schools we are weak, we do not have the means to globalise our teaching, in order to include subjects like this and some of us do it, surreptitiously, under their hand. Sometimes it works because this information flows unobtruded it is not the part of the module that goes on formally but it goes into the conscience. At present to my knowledge there is no school that does it, organised in such a way to globalise in order to do it and this is the only thing we can do. Resource architecture as we call it today constitutes a whole and it is difficult to be taught as a whole.

Ola Wedebunn: I believe that the question of globalisation is a question of diversity, the more you globalise the more the experiences you get. That gives us a lot of things to deal with although in Denmark we do not have the thermal problems or the earthquakes, but I think that globalisation does bring up uniformity but diversity.

Anders Gammelgaard: Maybe I should correct what might have been mistaken from what I said yesterday. The students that we see do not have skills, quite the contrary, they have fantastic ways of learning and dealing with things simultaneously, a capacity of dealing with the media, they are ahead of us. On the question of ecology, we are many steps behind the students. This is more a political issue and I see it more for the students generation to develop.

Maria Voyatzaki: I would like to give you some feedback on the summary booklet you have received. Out of eighteen cases there are only three that teach environmental issues as a key exercise in their School.

Lucien Denissen: I would go back to the point about knowledge and creativity. As teachers we have to pass on the knowledge we have. So we have our fixe principles and doubts and that is difficult because the students need our certainties not our doubts. We can tell them that we have doubts too, but they can have doubts too but do not hesitate too long, have an iterative approach and if they fail they have to start again. When we have our doubts what do we do? Let them continue or stop them?

Maria Voyatzaki: I think that there is a slight misunderstanding here, that I would like to put right. I think the views from Copenhagen, Aarhus and myself refer to the next step ahead, which is about increasing doubts as knowledge increases. I think your view refers to the fundamentals on construction.

We are talking about the doubts which although deriving from the fundamentals and the basic knowledge, they nourish imagination and hence allow students to go beyond that.

Constantin Spiridonidis: I am not a construction teacher, so I would like to pose a question as someone who does not teach the subject. If we look at the contemporary trends in architecture which influence our students very strongly we will see that they look for inspiration to the architectural avant garde not necessarily to imitate but to inspect the way to invent new forms and experiment with architecture. However, at the same time they find in the discourses in this avant garde architecture notions and values which are very significant for them such as for example transformation, liquidity, instability. If we had a quick look at what has been presented here as construction exercises I have a feeling that many of them are totally incompatible with this way of thinking architecture of something which is changeable, transformable, liquid. For example the student in front of a material organised on the basis of very stable structures and it is taught to them as something very stable it will automatically become unattractive to them. So we have to find ways to be closer to this new tendencies, new agendas, new paradigms, and to organize the methods of construction teaching close to the main preoccupations of the students, the value system that dominates their mind. I have the feeling that there is a gap between construction teaching methods and design studio production, which is very dangerous for our ethics in our schools and it is a condition which appeared in our schools in the last ten years. So to close I can very well understand the approach in Malaquai, Arhus and Athens but I find the difficulty to see the compatibility and compatibility with the other approaches.

Spyros Raftopoulos: When I made a remark earlier about possible limitations that our projects impose to our students in fact I tried to provoke some discussion about this kind of thinking. If ones looks at these exercises out of the curriculum of each school definitely this limits the inspiration and the imagination or the initiative of a student in a school of architecture. Without trying to make excuses, in our curriculum what we are doing is, in the final year we have integrated construction with design and the design studio is compiled from both construction and design teachers. We try this way to explain to them what architecture means without inhibiting their imagination. But in the first years these exercises

give the students the possibility to understand how a building stands up and built. From then on they can go further with their design ideas and imagination to complete to answer to the point you made you, Constantin.

Maria Voyatzaki: I admit that I will repeat myself with what I am going to say but this discussion brings this up once again. Every teacher of a specialized subject is never happy with the time allocated and importance attributed to their subject matter, and wish therefore they had more time in their school's curriculum dedicated to their subject area. It is a matter of staging knowledge transmission and knowledge acquisition and combining the comments of Spyros Raftopoulos and Constantin Spiridonidis, I think they are the two ends of the spectrum, integrating design in the studio by teaching basics and then transcending this existing knowledge base of the basics. I would like to submit an anecdote, a recent experience I had when my students asked me how the 'cloud' in the Swiss Expo worked or how nanomaterials create space. Questions that need a lot of research from my part before I know the answer. Students can see that knowledge is infinite and the good ones need to know more. They have to be as experimental, inventive and creative when they design, as when they resolve the construction of their design.

René Hughes: I want to answer to Constantin. We have to accept that architecture is a discipline by itself and it does not need anything else. We heard things about nanotechnology and earthquakes, we realise what a difficult discipline architecture is. The aim is to simplify the understanding of this discipline. When François Fleury talks about the 20m high timber building, I think this is challenge to try and design something that has not been done before. Jean Marie de la Rue is not a construction teacher but an architect and people like him suggest ways to Ghery in Bilbao to design the unusual.

Lucien Denissen: I would say two things about the relationship between construction and architecture. First, we have to make clear to our students what the aim of the exercise is. If the exercise is architecture and not on construction then the construction investigation is limited on the structure and the fire protection regulations. But if there is a second step to go further and investigate construction they realise the interdependence and it is important for them to know that there is a second step of investigation. If they are told that the exercise

if on architecture they will stop there. Second, on construction teaching. There used to be architects who design without bothering about construction. Nowadays architects are competent if construction is interesting. So as a school we all have to ask ourselves what kind of students do we wish to educate? I am really concerned that there is no convergence to the answer as we hold different views on that.

Jean-Marie Delarue: I would like to return to Constantin's point. When you talk about transformation, fluidity, fractility all these notions in contemporary architecture these derive and recuperate from the theory of form. What I teach when I teach structural morphology what I teach is how structural logic is a part of the language of form, part of the etymology of the language. Of course everybody knows that the laws of form and transformation is not a new thing, the deepest knowledge of form is structural stability and morphogenesis of which constructive realities are a special case. So the deepest understanding is the language of form in all its manifestations as form is our way of understanding things, relations between things and this knowledge of form must be universal at any scale and natural forms. The form is a theory of structural morphology, of singularity. We have to make a bridge between structural realities which are more general than theories and I think that we see that the problem of geometry another structure is culture when we show things are stable. Structure is culture. Structure is also culture, when we show how things are stable or unstable or regulated. Colman & Ritter, in *Static Graphic* asked all kinds of questions for which we have no answers. We show what was produced, but we don't expect Colman or Ritter to explain the laws of how a beautiful frieze was built in the Middle Ages. Similarly, Nervi's book "Primitive Architecture" is a necessary reference for engineers and architects on the invariant laws of building structures.

Eriksrud Steinar: I think that the question raised today has to do with the gap between what is possible and what is desired, which from a philosophical point of view is quite interesting. This gap has always existed. Such ideas have always been ahead of developments and they have adapted to the technological possibilities of the time. In my opinion, as I'm sure you will all agree, we have to follow the laws of nature. I have an example, which you probably already know. It's a project by Daniel Libeskind, which won a competition in Berlin

a few years ago, but which was impossible to build. The jury had accepted this metaphor of the Berlin Wall and it would have been interesting to have seen it built, but it was impossible! What's interesting about this is that, despite the fact that it couldn't be built, his ideas, based on his philosophy, have survived and put into other projects that can be built.

François Fleury: I was somewhat concerned to hear from Constantin that our approach to teaching are incompatible with modern trends in architecture. I don't see why it should be so. Perhaps, I missed the point you wished to infer through your strong criticism.

Constantin Spiridonidis: I would like to clarify because I don't want to give the impression that what I said earlier was meant to be a criticism. Surely, I didn't intend to under-estimate anything that was heard here. **My point was that in architecture we always raise new paradigms. It seems to me, however, that these take time to be introduced as a way of thinking in the teaching of construction in our schools of architecture.** In looking at the proposals you have presented and considering that the teaching of structure is the main focus of your teaching, my remark is that it leaves out something that's very interesting for students. We all have the feeling that students are curious about understanding how those new forms of different materials could be built. **This is why I say that construction courses must be closer to these avant-garde trends. Students are strongly inspired by such paradigms and this is not because of form or their wanting to copy it, but because they incorporate a way of thinking, a way of understanding the world and it is important for them to use this awareness in order to produce architecture.**

François Fleury: I think I've understood you better now. Perhaps an answer to this is for us to work in collaboration with the design- studio teachers since what you're really suggesting is how to incorporate these paradigms so as to generate new architecture. That's a problem of the design process and integrating knowledge so that they can be compatible with new trends. That's food for thought!

Jean-Marie Delarue: The answer also lies in thinking about structure and forms. Robert Ricolais, the inventor of 3-D structures said that he was only interested in fixed things in a changing world. Therefore, when we teach construction, we teach

the "fixed", even if things do not remain fixed, but evolve, as a first step, it's important.

Jean-Pierre Franca: In my mind, I think that we teach a language. Auguste Perret said that construction is the language of the modern architect. We have two problems with this. The first is that this language has esoteric rules and these are not cultural but natural laws. We must know the culture of the scientist to know about natural forces and phenomena. We cannot negotiate with the physical world. We can only operate within the limits of cultural possibilities in respect to such phenomena. Therefore, we must have a deep understanding of this phenomena through the body. **The second level of complexity is the difficulty which exists in learning any language. We teach the basics while at the same time we introduce new words and their meaning. We must also teach the universal, scientific sites as well as the cultural and historical ones. It's a difficult task.**

Ola Wedebrunn: I agree with the point about natural laws, physics, etc. and the body as reference, but there are other forces governed by gravity, etc. I'm not a computer enthusiast, but moving into this new reality, these laws don't seem to apply anymore. In fact, these days, it's sometimes hard to distinguish whether we are in a state of fiction or reality in dealing with things around us. So, it's not appropriate to always say that we have to stick to the rules and limits since rules and limits are no longer there. When do we know when they are there or not is a question that I have no answer for, but which we must be made conscious of. We should all show concern for and insist on this awareness, otherwise we will ultimately lose track of what's real or virtual.

Session 3: Memorise

A construction exercise often appears like a happening, which raises the problem of its memorization. It leaves no trace but a recollection. A lot of teachers give handouts and bibliographies with their course. But the exercise itself may be designed as a memorisation tool. It is a kind of writing. The problem raised here is how construction exercises generate their own traces.

The Schools presenting in this session were

Copenhagen (Denmark) School of Architecture by Ola Wedebrunn,

St. Etienne (France) by Anne Coste,

Ion Mincu Bucharest Romania by Rodica Crisan,

Aversa School of Architecture in Napoli (Italy) by Sergio Rinaldi, Maria Isabella Amirante and Cristina Sannini.

School Presentations

Debate on presentations and theme

Lucien Denissen: I have a question for our colleague from Bucharest. In the exercise you have described when does technology intervene? I suppose they can start with design, but technology can be the engine for design, but generally it comes later.

Rodica Crisan: Unfortunately it comes later. As I said, for us, this is not an innovative teaching method. From our long experience, I can tell you the weaknesses of this type of exercise. One of them is that the technical project is the last part of the design, which means that technical science is not present at the early conceptual phase. Traditionally speaking, the technical project would detail the building previously conceived. However, a technological concept isn't just detailing. For example, someone mentioned, this morning, natural ventilation. This is a question of general building concept. There are cases where detailing is not sufficient. There are also cases where the general concept of the building is not adapted to the proper objectives of the technical projects. Moreover, there is the problem of scale since the projects generally delivered by the design studio is 1:100 or 1:200. It's difficult to make details on 1:5 for a project of 1:100.

The design project is a long one (9 to 10 weeks) and it's worth 13 credits. The technical project is of 3 or even 2 week's duration, with 2 credits. This is an important factor in the student's perception because he/she ends up regarding the technical

project as not very significant. For students, the architectural design or aesthetic concept is of major concern since this is the part that he/she will receive the most credits. As we mentioned earlier today, we have to collaborate more closely with our design studio colleagues, which is not always an easy task. Another point, which comes to my mind, is teacher qualifications and roles. In our department, we are architects and there is the idea that architects know about detailing. The question is who should do the technical- design projects. Is it the architect from the studio -design seat or the architect from the technical- sciences seat?

Lucien Denissen: They can do it together.

Rodica Crisan: Yes and no. Sometimes it's possible, but not always. It depends on personal relations and attitudes.

Ola Wedebrunn: I'd like to add that cooperation with the design studio is important for our type of exercise. We try to introduce material studies before settling on the form of the object they design. This means that if they have a project, we don't want them coming to us with questions at the end, after the design phase, asking about what material to use here and there, while pointing at their finished drawings. We want material composition, involving construction, to be an integral part of the design process; therefore, it needs to be tackled at the beginning of the project.

Rodica Crisan: I do not wish to monopolize the discussion, but simply want to add that what you've just said is logical and normal, but in practice, it doesn't always happen that way, at least not in our case. Things cannot be imposed or forced. They have to first understand that when designing, one has to think about the realities of building and actualizing the design. Moreover, as teachers, we don't always have the power to change an existing teaching orientation.

Ramon Sastre: In the studio, we see that students often refer to the construction teacher for even simple questions. It's obvious that these queries can be answered in the design studio by architects, but the more complex spatial and structural questions should be addressed to the construction teacher. Therefore, the construction teacher can guide the practical aspect of the project, but remaining questions related to details or how to construct a staircase, etc. are normally handled by the architect.

Rodica Crisan: I have a question for Prof. Rinaldi.

You said that you use a project from first year, which is later analyzed in the second year. According to the standard of quality or required norms, are the projects you analyze and criticize (evaluate) done by the person in the design chair or the construction chair?

Sergio Rinaldi: No, there is collaboration at a personal level with the colleague I'm working with. In my School, the first year project is assessed by another department, but there are colleagues who are friends and work in collaboration, so, we have agreed to differ.

Rodica Crisan: Sometimes our colleagues and friends from the design studio may disagree with the engineers' suggestions and to criticize each other's projects can be a very delicate situation.

Rémy Mouterde: I have an example of this kind of subjectivity from the sketches of students which are assessed externally for competitions. Usually a lot of work goes into these because they are being evaluated on the basis of the sketches; so, students often make mistakes by trying to put materials and structures on them that are not appropriate. In such cases, an integrated method, as you've suggested is better. However, it's easier to have individual or class discussions on what could or couldn't have been done with the project for the sake of all concerned.

Ola Wedebrunn: We all face this problem. It's time consuming to have individual consultation, though it's part of the traditional educational practice in Denmark. It is better in a project to get information in the construction of a project, after consulting specialists to make your design ideas possible with construction that works. Integration is the central idea in the way we teach in Denmark. They are very fortunate to have such facilities! However, I do agree with your suggestion that there should be more general discussions and seminars, along with the idea of one project with construction.

Rémy Mouterde: I don't think it's necessary, as was earlier suggested, to have an engineer following the practical side of the project. On the contrary, the students must have an idea of what they don't know. Our job is to open their eyes, stretch their understanding and show them a different way which is not his or hers. So, it should be integrated if possible, but it's not sufficient.

Constantin Spiridonidis: I would like to remind to those who participated in the meeting, last year, in

Thessaloniki and inform those who didn't attend that an outcome of the debates we had was that **it's absolutely useful and necessary to have the integration of studio design and construction in architectural education.** Integration was a principle highly valued and supported by all speakers. Along parallel lines, it was also felt that integration was almost impossible within the existing educational system. Although we heard some exceptions, at that meeting, they, in fact, proved the rule rather than the converse. For example, I can't remember if it was colleagues from Villette or Bordeaux who spoke of a perfect collaboration with designers and eventually we found out that they happened to be friends or relatives. Therefore, these are very exceptional circumstances.

In our school, for example, after many years of having teaching of design separate from the teaching of construction, we decided to integrate the two, despite resistance from both sides. The designers' argument was that they didn't need builders because they knew how to do the details, whereas, the engineers said they didn't want to become the servants of studio designers or be at their beck and call. **Integration has its problems, but is a condition we have to face. It's probably time to think about hybrid courses as a different concept in the teaching of construction.** Personally, I don't have any proposals, but we've probably heard of some right here, today. **Perhaps, the old paradigm we used to teach construction is no longer very efficient and would like to suggest that one of our objectives for our meetings could very well be developing, together, new approaches and methods that will help us integrate the teaching of construction and design.**

Rodica Crisan: I don't think that finishing a technical project or doing a part of the building design, nowadays, is such a bad experience. Also, the feedback from architects who work in different parts of Europe, say that they have learned a lot from technical projects and construction was the most useful part. Despite that for the student is a difficult part and the perceptions differ among students and practising architects, who consider construction as very important. I do not think that we have to make radical changes to the integrated project we run.

Ola Wedebrunn: One problem that is very crucial is that we do too much representation and we are concerned too little with the real thing, we should not work in an abstract manner but put our hands

on and make things. Get the students to believe that they are making a real thing and not a simulation.

Spyros Raftopoulos: Admittedly, the remarks that were made regarding the problems that arise in this sort of combination are often due to personal relations. This is all very understandable, after all, even amongst ourselves as architects there are differences of opinion in matters related to our profession. This should not be perceived as a problem because students can gain considerably from different points of view. Of course, it can present a problem within the educational system, but the very simple, down-to-earth solution, as Ramon Sastre mentioned, is that despite one's background or orientation, all teachers operate as architects. Therefore, the architect designer can give answers to certain construction problems and the construction teacher can give answers to some design problems.

In our case, there is a group of three tutors, depending on the number of students per semester (30 to 40), all three of whom are architects from a slightly different background. For each one of us to respect our individual backgrounds and teaching methods calls for good personal relations and an ability for us to function as a group. In this type of integrated design studio, students can gain much.

From discussions in our School, I know we have a certain degree of success. I have been in teaching situations where the group has operated very closely and well in many ways and at various levels, such as in ideology, approach, etc. However, I also know of situations where friction existed between the three. That's understandable, unavoidable, perhaps even productive.

Christine Simonin Adam: We're talking about strategies for design projects and I think that we should ask ourselves, altogether, the question, *what is construction teaching, today?* In fact, when we look at architectural teaching, we see that some architects have chosen to work with construction and others without. This choice depends on the architect and the dynamics of the way architecture is. It's always the same question, *construction or not?* Each architect has to make his/her choice. **Also, it seems to me, that we have to have a new view of construction and its dimensions. For example, taking into account the new information systems, how are they related to construction? Also, can we say anything actual or modern about construction is an effort to advance the teaching**

of construction? What are we teaching in construction, today? Is it only structure and static? Is it materials? Or is it all of these combined? How can we teach construction so that it's stronger, sturdier, more effective and synchronized with the conditions of life in the 21st century. The question we should be addressing together is whether we should teach construction alone, independently from the design project.

Lucien Denissen: I don't really agree. Maybe, we need some exercises that we do on our own, but the better way is to have **hybrid, integrated exercises**. The problem, however, is how to organize them. Perhaps we need **hybrid professionals**, that is, architects that are interested in construction and engineers that are interested in design. They are rare birds to find, but this combination works! For example, in Denmark, we have a studio on sustainable architecture led by architects who go quite deeply in the problems and techniques of detailing buildings. They take the idea of sustainability as an agent for conceptualizations. This is a nice example of what is possible. However, we don't always find people who are so versatile to be able to do both. Generally speaking, I, too, agree that in our schools we have architects and engineers that should work together and communicate in an organized way (such as special workshops for professors to prepare them for integrative exercises). However, paying lip service to this, without systematic planning of how this will be implemented in terms of time, task, etc. is not efficient.

Ola Wedebunn: In integrating design and construction, perhaps, we give up too easily when we always talk about design. We could complicate the scene by introducing research in the discussion. We speak of design as the educational aim, but I think it's necessary to bring in research, as well, in the educational process. In Scandinavia, we've had lots of discussions on what research in architecture is and nobody has come up with the perfect answer. Of course, it's difficult, but efforts should be made to introduce it as part of a student's educational process.

Lucien Denissen: Do you mean that research should be integrated in the architectural exercises?

Ola Wedebunn: To be visible in the architectural exercises so that you cannot say that research is done in isolation but research is visible in education

Maria Isabella Amirante: In my experience at our

University we had the opportunity to have an engineer teaching with us and we introduced energy and recycling in a landscape project. We started working in isolation students and architects but we introduced in the middle of the project these global problems of the project. The specialist was very useful in the studio and he began to understand the logic of our teaching. We all realised that integration was important in the teaching.

Herman Neuckermans: I'd like to comment on the points made regarding construction or not and the other on colleague relations. In our school, I'm the Program Director, which means that, with my colleagues, we set the educational aims. From this we decide what we expect from design, although, in our school, we believe that construction is an essential part of what we do. That's basically our color identity. I'm not suggesting that we have to be the color of everyone, but if anyone within this European Union is willing to come to our University, they have to know that we go under the label of construction as an important part of our aims. In this context, we expect that for every project, a student has to submit, right from the beginning or early stage, some concept about construction as well.

We also expect them to have a sound option in terms of construction and to guarantee that construction is not squeezed into the curriculum. At the end it is evaluated separately, but conceptually, it is integrated with the design. Afterwards, we assess whether we've achieved our goals.

René Hughes: When we talked about resistance, we agreed that if we have a beam, the bending or breaking point is the moment of interest. So, what I want to prove by referring to these examples is that we need to communicate despite our arguments. We teach and form architects, some of whom become teachers of architecture. We all want these students to be skilled in architecture with some knowledge of engineering. So, with our students, in our studios, we think we are self-sufficient, claiming that we know architecture and a bit of construction. As a result, we stubbornly convince ourselves that we don't need either construction or engineering and continue on with this attitude. The problem, however, is that we have to build what we design, which in reality means working with engineering in the workshop. This engineering workshop needs, in turn, to be brought back to School. If you just teach the general construction rules to justify architecture, I think it's wrong. The difficulty in the studio is the

mixing of architect with architect (one that knows a little more with one that knows a little less). If one sorts out clearly the position of architecture and engineering one finds that it's not a question of asking people to fight, but to discover and understand one another. This process involves an understanding of what is architecture and architectural design, but one has to build, which involves the understanding, explanation and argumentation of the engineer.

Of course, the engineer mustn't play the role of the architect, even if he/she has ideas of his/her own. The engineer can suggest and offer consultation, but the architect must lead the project. We want to have a strong, autonomous construction field and teach architecture to students. In checking that our students use what we teach in the area of construction, we are always very pleased when the argument of construction meets the argument of architecture. Therefore, our arguments are a means of understanding ourselves. However, in a school system, if there is insurmountable friction between the two, than one should best leave the school.

Ramon Sastre: This morning, I said something to the effect that the studio teams are to be friends. I didn't mean by this that we necessarily have to be friends in order to cooperate in the design studio. In fact, too many friendly chats about irrelevant matters is not going to contribute to student progress! We have a two-year experience with studio work, which means a total of 22 studio sessions. When things don't work, we shouldn't just blame the design teachers. Very often, we, ourselves, are not very willing to go into the design studio. It's important for us to learn to participate right from the start and not wait till the end to correct details. Therefore, as soon as the task theme has been selected, we should be present. The student should receive consultation about construction at the initial phase, at the point when he starts to draw his/her first lines.

Toni Tribo: I would like to express our experience. In our case, a teacher may be design-oriented, another may be more cultured or has knowledge in certain areas (acoustic, electrical, technical, etc.). However, they are all architects, sharing a common field, all talking about similar things. This combination brings about good results. In some countries, engineers and architects work separately, but I think that they must work together. In our country, Catalonia, the architect and civil engineer is one and the same person.

François Fleury: At the beginning of this school year, we had a debate on how to structure our pedagogical courses according to new reforms. The basic idea of the reforms was that the design studio should be at the centre of all teaching. Being new in the school, I asked a lot of questions to the other teachers regarding their expectations from the construction teachers. Some said they didn't know, but that I should continue teaching the formula $M = q \cdot l \cdot l/8$ for the time being and that they would get back to me later on. However, I'm still waiting. Basically, what works is for us construction teachers not to ask if we can enter the design studios, but for us to take the initiative to develop exercises and tasks and then invite the design teachers to work with us in integrating construction projects with design. I've had a positive response with this approach.

Herman Neuckermans: In our School, the design teachers are all temporary staff, so that if the Programme Committee sets new rules or changes profile, they can opt to keep the staff or take on new people. Our system is different from that in France.

Spyros Raftopoulos: I'd like to add that what you've mentioned is a school decision and its policy. Once a policy is decided then it is not up to individuals whether they are going to accept the collaboration or integration of specialists. A policy of a school is a decision of the school as to the profile of the architect they wish to generate. Our schools for example wish to create the architect-designer who actually has been taught all other subject areas such as technology, history etc. One of the important applications of integration is the final diploma thesis on which we put a great deal of emphasis. It officially lasts six months, but most students take over a year to complete. As a design project it incorporates construction, detailing and other more specialised disciplines. I must admit that the quality of this diploma thesis since it became an integrated design thesis in the last two years is far better to what it used to be some years ago, as a consequence of the policy we apply. We will never go back to the separation of people; structural engineers, mechanical engineers and architects.

Maria Voyatzaki: This is very interesting, but it is also interesting to note that in many avant-guard schools there is no trace of technology in their design projects.

Spyros Raftopoulos: It is a different type of policy. It is interesting to see why they call themselves avant-garde.

Vuslat Demircay: My experience in being wearing two hats at the same time, that of the construction and that of the design teacher. As an architect who teaches construction for fourteen years I realised that construction is not integrated in the studio so I got involved in the studio. In the past I criticised design teachers for not integrating construction in the studio. The emphasis is always on concepts and bright ideas. Now I realise that the process of architectural design. To start with the scales are different when we run a design project. We start from a 1:200. There are some concepts to be taught such as urban or landscape design as well as historical and functionally-related concepts. There are many parameters for a design project and construction is only a small part of this process. In spite of the difficulties, I'm happy to be part of the two sides because it provides an opportunity for me to question my students during my critique sessions with them on such factors as: what materials, what surfaces, what structural system, what about the interaction of surface and space, what colour, what texture, what will the thermal behaviour of the building be? By asking students such questions, they realize the problems involved in dealing with these concepts, some of which they cannot easily find solutions for within the twelve weeks allotted for the design project, whose scale is inappropriate (usually 1 to 100 or 1 to 200), but, as you all know, construction detailing needs 1 to 50 or 1 to 5. Another point is that when I teach construction, I can remind students of their design projects. For example, I can discuss or draw their attention to some critical areas of their design projects and urge them to rethink. I believe that there are no simple solutions, but attempts should be made on both the architectural and engineering sides. **What is important is that students understand the significance of construction or structural design in their architectural projects. Having gained this awareness is quite a satisfactory step in the education of an undergraduate. Greater specialization can be obtained at the graduate level, where they can come back to our Building Sciences Department and work on more sophisticated scientific concepts.**

Ola Wedebrunn: I strongly agree with what you've said. A way to get round this problem is to stress that they have to have a structural concept in their projects. Once they have that, then the teacher can start asking them questions related to structural logic. This is a way of integrating construction in

design. Concept and logic should exist, not only in reference to drawing, but to the real object as well. In Copenhagen, we have an examination period totaling 100 days. The students all start being examined on the same day and, on the 100th day, they all have to deliver. This year, this date is on May 20th, so they are all cramming, working day and night. This is a way to keep them working for three months and, hopefully, be prepared to answer questions on structural concept and logic.

Jean-Marie Perin: The question, in my mind, is not the power problem within institutions. We teach and must be able to express very clearly the reason why this system exists. Whether we are either in the architectural-design team or technical-design team, we must also be able to say why we choose a particular solution in order to explain an architectural intention. The solution lies in teamwork, working collectively and democratically and to be able to freely express our decisions and intentions.

Herman Neuckermans: Since you mentioned power, I hope I didn't give the impression that we impose things. In our school, we have had quality assessment visits, which all schools in Europe and around the world will eventually be subjected to. After this assessment, certain considerations were brought up for discussion, such as understaffing or not enough construction in the context of the education of an engineer or architect, etc. Consequently, we started remodeling in the form of a committee. Therefore, it's a fully democratic process. Also, schools should decide on a profile, set goals, plan ways to realize these objectives and develop a means of checking that these goals have been achieved.

Session 4: Act

In the teaching of architecture, construction is not a science in itself, universal, abstract and positive. It is by definition 'applied'. The question raised is precisely to know how to apply certain rules or phenomena and then to do the modeling. How can such phenomena, represented in this way, generate a project? What specific energy can the exercise develop in the process of putting it to work?

The Schools presenting are:

Middle East Technical University School of Architecture of Ankara (Turkey) by Vuolat Demircay

Tampere University of Technology (Finland) by Marko Suutarla

Technical University of Warsaw (Poland) by Jerzy Gorski,

Lyon School of Architecture (France) by Michel Paulin,

Oslo School of Architecture (Norway) by Ericksrud Steinar,

Vrije University of Brussels (Belgium) by Marijke Mollaert.

School Presentations

Debate on presentations and theme

Maria Voyatzaki: As you've noticed, the material presented in this session was mixed or more varied than that presented in earlier ones, the reason being that this last presentation was meant to fill the information gaps from earlier sessions. That is, we've had a combination of curriculum presentations and the exercises themselves, while, at the same time, we also tried to fit into this session as many speakers as possible so as to produce a broad spectrum of approaches. Consequently, the questions that will follow will obviously be varied, ranging from general to specific in content. I would, now, like to invite questions from the audience regarding the presentations we've just heard.

Jean-Marie Bleu: I have a question for Michel Paulin from Lyon. I'm interested in activities that sensitize students to some form of art or other technique. However, which part of the exercise do you use to sensitize students and which one is used for verifying, transmitting or analysing?

Michel Paulin: That's just the point. **This exercise is used mainly for sensitising. Behind this exercise lie many notions, such as** what is a model? **When**

you make a model, you usually mix everything (shape, volume, physical properties, aspects, etc.) We want the students to understand that each problem needs a specific model and that they can't think in terms of a general model because it will show nothing. This is, basically, our goal. They are usually very poor in relating the scientific result of this exercise. So, I devote one or two hours of course time to explain that some physical properties are maintained or preserved when changing size, but not in this case, which is a problem often forgotten. Therefore, I choose to leave in the dark the usual properties and magnify the unusual, that is, just those properties that alter when changing the scale of the model, like GDT hardness, shortness, etc. However, the effects related to bending and compression are visual, therefore, they don't need to be modelled. Hardness and shortness, as well as internal structure of matter change, depending on whether they are crystallized or fibred, etc. If you want to solve a problem with this type of material, then you will need to integrate the properties. Architects usually never do that, but my exercise is mainly to sensitize and not to calculate. Once I tried to transfer this kind of exercise to the fifth year, but it was impossible, because at that late stage, students consider themselves to be professionals and don't want to be treated as beginners.

Jean-Marie Delarue: I also have a question for Michele Paulin. Do you relate this approach to sensitization of form scale to architectural problems like those mentioned by Philippe Budon, who refers to scale as the most important problem of architecture? Do you have some opening on the other effects of scale, not only in the area of structural efficiency of materials, but quality, for instance, or monumentalising as in the Statue of Liberty. Scale must be respected, but it sometimes has good effects when you transgress it. Since all this is related to architectural finalities, what do you have to say about all this?

Michel Paulin: I recognize the genius of my colleague in expanding the subject. Yes, it is, indeed, a very interesting question, but a difficult one as well. The theory described by Philippe Budon is a wonderful basis for our architectural thinking. But he doesn't seem to know that in his book and never explained the question of rationality of scale or the morphologic universal property. He dealt with it just a bit in one chapter. However, I'm very interested in your question, but find it difficult to connect it with the kind of scale Budon described. Of course, my

approach is to ask the engineer to give his / her point of view on the question of physical scale. From this starting point, what's useful for us, in our teaching, is to make the effect of modulating the space understandable. It's very limited in our application, but I'm sure it can be more widely applied. For example, in the environment, you can show this by letting steel balls, previously dipped in ink, roll down on a roof and observe the rays. You can easily imagine other exercises in the field of physical and chemical properties, but if we extend the notion of scale outside this field, it will require another approach. Perhaps, this is something that we can arrange to do altogether next year at the Grands Ateliers.

Ola Wedebrunn: I also appreciate the approach of sensing things with food, for example. After all, we do not only visually appreciate our surroundings, but we go so far as to eat our surroundings as well. Since we have many senses, surely, they can be used to relate all things to the body. Also, the theme of acting (making the body act with the environment), which we addressed today, is a social theme of establishing relationships with our surroundings, just like making a shelter with trails on a mountain is nature related. Similarly, I'd like to ask how you address the theme of acting in relation to the environment as an architect, dealing with steel workers in the steel factory, for example, or, perhaps, through your students' experiences of learning technology. The question is, does the particular environment (steel workers or factory) want to continue this interaction or cooperation with you?

Marko Suutarla: As I said, this is the first time we've done this exercise and we were very glad that the people around us were really keen to cooperate and do things with us. We had three different participants: a company, a firm and an educational center. We didn't want to stress one particular sponsor over another, so we spent a day here and there, which wasn't too much trouble for them either. Generally speaking, I think we tried to deepen our cooperation and extend it to what to do with other materials too, such as concrete, etc. For me, this seems to be the logical way of doing things because students start off without any knowledge or skills related to materials and, after this short training period of a few weeks, they know more about connections or perforated / processed steel than I knew when I passed my exams. So this is quite a useful, practical and pragmatic approach.

Lucien Denissen: This is also a question for Marko Suutarla. You mentioned competition earlier, what, exactly, did you mean by this? Of course, every exercise is competitive in terms of points (marks), but did it also involve a prize for the steel industry?

Marko Suutarla: I meant small prizes. It involved setting up a short timetable and what we were looking for was a creative approach to the task. Usually, when students do the building construction exercise, they think they should be very technical and precise without the architectural element. However, with this kind of task, we were expecting them to be more imaginative. So, it's from this perspective that we called it a competition, although it could have just as easily been called simply an exercise.

Koen Van de Vreken: A question for Vuslat Demircay. Could you tell us about the student population of your university as, I think, it's a very particular situation for you?

Vuslat Demircay: The Middle East Technical University consists of three different departments, including Architecture, Industrial Design and City Planning. In the Department of Architecture, we have 350 students, with 80 undergraduates registered in the first year. We have a national university-entrance exam and our University comes second at the national level. The language of instruction is English and 20% of the entire student population is foreign, coming from eastern European countries (Iran, Africa, Azerbaijan, etc.). We also have graduate studies in the Department of Architecture, offering masters and PhD degrees. These graduate studies are divided into three different programs, including Building Science, Restoration and Preservation and Architecture and History of Architecture. Some students go on to American universities for their graduate degrees as our school is an accredited one.

René Hughes: I'd like to say that it would be nice to stay till the end of the session since more and more we're being presented with a great deal of interesting examples which we can apply to our own schools. Personally, I'm going to walk away from here with a lot of ideas for my school. I'd like to mention something to our colleague from Warsaw about the circle he made there (reference to a diagram) and comment on the reaction from our colleague from Oslo, who added another circle to it. Our President of the Grands Ateliers can easily put in another circle representing the economy. In addition, we could

have lots of other circles, with the architects' in the center. The teacher from Oslo had a wonderful idea, by drawing an angle with the narrow side pointing to the architect, but with the open end moving towards various fields and ultimately pointing back to the professional. This shows that the professional is not at the center of the discipline (construction, for example). He /she moves in and out of the discipline and brings back to the center. It would be interesting to have as a philosophy the positioning of construction in front of architecture, but Cyrille Simonnet will say more about this later. The fact is that we've seen, this time, lots of exercises on manual experimentation, for example, the floor and wall by the students from Ankara, etc. I imagine myself thinking, when I go back to St. Etienne, that I know we should build something and that each year we have to find another task and site. If we decide on stairs, for example, we know that we'll need iron, concrete, glass cut in a certain pattern and that we'll need to weld and use other skills as well. The question is, how do you manage without the help or expertise of external people who come into the school to teach students how to use tools or learn specialized skills, such as welding, making concrete, etc.?

Vuslat Demircay: Indeed, it's all very difficult to organize. Our school of architecture was founded in 1956 and the aim was to do these construction projects in underdeveloped regions. The chairperson organizes this with the help of teachers and the support of factories that supply materials. Although it's a lot of work, as teachers, we think it's worth the effort. In this way, we teach students the main structural principles in the first year design course called "Basic Design". The students make structures and models and experience the tension and compression while creating spaces with these structures, with exercises having different objectives. The next step is for them to go to the construction site and touch the materials (bricks, steel, concrete) and communicate with local people and workers who show them how to pour concrete, etc. Then, they bring in these experiences with them in the 2nd year, which is when all construction courses begin on a more serious note. At that time, they may be sensitized, but they've yet to develop more systematic knowledge of the components of the step-by-step building/construction stages as well as the environmental requirements. In the second or third year, the aim is to teach students systematically and in detail.

Maria Voyatzaki: I would like to answer for the school of Aarhus since they are not present at the moment as they had to leave earlier. I had the good fortune of doing a sabbatical year there while they ran the exercise. It's possible that the situation might have changed, though, since I was there, but because the outcome then was similar to what you've seen, I can more or less describe the logistics of it. The way the exercise was run the first year, this being a first year exercise, was as follows: they assigned three or four students per group or project with a budget of \$100 (dollars) per project, if I remember correctly. This was funded by the school itself, which received subsidy from the building industry. This policy of directly funding the students allows them the opportunity of dealing with the real issue of budgeting. Once the students are funded, they are put in touch with contractors of different companies with whom they are expected to deal with. This means that they have dealings with the steel, timber and concrete, etc. industries. Then, they start working on drawings to the extent that they can, taking into account the difficulties and limitations of first year students. They have their first meetings with the material contractors, which is quite a shock at first. The first difficulty they encounter is that the person they meet usually can't understand their drawings. Secondly, what they have designed is often not practicable (e.g. no sense of dimension or of how things stand or can be put together). The third and biggest shock of all is when they find out that what they've designed can't be realized because it's too expensive. Moreover, they get their instructions from the contractors they deal with, not necessarily in the presence of their teachers, and then go back to their drawing boards to re-think and re-design on the basis of their newly-acquired information. As a result, they start a back and forth process of designing and talking with contractors, culminating with the actual construction, which they do with the contractors. Therefore, they have the opportunity to touch the materials, walk around the factories and see different things, but the contractors do things while supervising the students. The students can make minor changes, but they are not allowed to go beyond their budgets. That's basically the logic of the exercise.

Herman Neuckermans: I would like to tell you how we interact with real materials and conduct real practice. This is done in several ways depending on the number of students, staff, etc. I remember when I was young, I worked on a volunteer basis for a

month digging the foundation for a school. Working on the side is time-consuming and in the time you're there, you experience only a few steps in the whole building procedure. Of course, we're not against that and students can do it. However, when students draw a detail, they have to number the parts in the sequence they will be built. It's simple and it doesn't cost anything. In one of the courses, since we have several construction courses, students have to follow a real building site and they do this for a whole year. We also go to the material factories. However, in terms of the building project, when one builds, one sees only part of it in the specific technology used, besides the fact that it's very time-consuming, whereas when they follow a construction site for a whole year, they experience the various phases. But, today, in our country, there is the problem of security regulations on construction sites, which are very strict.

René Hughes: It would be nice to have Marko Suutarla's answer on the staircase project, as I can get the answer from Michel Paulin.

Marko Suutarla: I must say that we have only 10,000 euros for all three exercises, throughout the whole year. This includes accommodation cost, student passes, excursions and cost incurred by the exercises. Therefore, it's obvious that we can't do or make things that are very expensive, so we rely on cooperation and personal contacts we have with the industries. As this is my first year, I don't know many people, but in the second year, things will be easier, I think. I got on the train and personally visited the industry people and introduced the exercises to them, without asking much from them, except for a bit of time and material. During our visits, we also saw the products they make, which is a kind of publicity for them and an advantage for both of us.

Ola Wedebrunn: I'd also like to bring up the question of skills such as welding, etc. and say that when you bring in people from the community to show students these skills, you bring, in fact, reality to school and cooperation with specialized people out there. We should not think that teaching is the only way to train someone to be an architect and then send him/her out into the real world, without expecting them to come back again. We must have them back in school again because teaching is also part of this reality and it's important for them to have this connection. I think that we should get help from the brick industries, for example, but when they have a problem with improving brick construction, they

expect us from the universities to go to their factories and do something about it. This is what I mean by bringing reality in the teaching, which is so important.

Eriksrud Steinar: I have some comments on two issues that were brought up earlier. The first involves how we get money for the model work. Minor things are paid for by the school, while the larger full-scale projects are supported by the building industry in general. I didn't have the opportunity to comment on these concrete structures, due to time restrictions, but they were paid for by an entrepreneur (a contractor). This exercise had a special place in his heart. These wooden bridges were built in the garden or in the park in front of the Norwegian Institute. So, with wood technology, they made tests on timber. In fact, we have an understanding that when a wooden beam breaks, they can bring it to the university for testing. In this way, we have a good working relationship with them. The other thing refers to the question of welding. In view of this new situation with all these fantastic buildings, we don't know how things will develop. An interesting thing is that the young student that I showed earlier testing roof structures in the workshop is now an experienced architect, currently teaching welding in the metallurgical workshop and looking into how such workshops can be developed. This is what's happening at our school at the moment. So, there are ad hoc possibilities and we think along the line of what the present possibilities are and adapt accordingly.

Michel Paulin: I'd like to add to what René Hughes said about recognizing well the 2,000 models from Vitruvius. I'm slightly afraid of looking at that kind of sketch where the architect is right at the centre of the world. I think it's an over-simplification, but the reality is more complex. We need to think about what it means to be at the centre. I'm sure that's not true and that we are somewhere and in many places in this conceptual model of space.

Jerzy Gorski: Perhaps there is some misunderstanding. The letter "A" stands for architecture, not architect. Therefore, it's not the person that's in the middle of the circle, but the field itself.

Toni Tribo: I think that the issue we're dealing with here is how satisfied we are with our teaching. However, the question is, are all our students satisfied with us? Is the knowledge we transmit effective for now and the future course of our students' lives? I'd like to hear your opinions regarding these questions.

Herman Neuckermans: If I've understood your question correctly, I'd like to answer by saying that **we don't have to teach only the what and how but we should also teach the why because it's this latter part that will survive. If the how changes during the course of time, you will still know the why. This is something we haven't yet discussed here, but both this knowledge and attitudes are of fundamental importance in coping with the realities of a changing world. Architecture is so important that we must educate our students to be critical, not only in terms of concepts, sustainability and materials, but in all aspects of architecture.**

Ramon Sastre: This being the last day of our meeting, it seems appropriate to draw certain conclusions. It will be very difficult to forget everything we've seen here over the past few days, although most of the exercises we've seen were difficult to assimilate because we don't know the context in which they operate. Therefore, a teacher comes here and presents his/her exercise. The exercises are all interesting and we can all gain something which we can apply to our own individual schools. However, what is important for me is to know why they are run in a particular course of study and how we can verify their efficacy, especially when we consider that an exercise is not like an exam that has a built-in assessment factor. Whether the exercise has been assimilated along with its intentions is something that is not normally assessed until later, usually at the end of the course or in a subsequent year. However, teachers do not make up exercises for fun. Usually there is an objective that is not necessarily for an immediate or short-term purpose, but long term, in which case, assimilation becomes difficult to assess. Nevertheless, we've seen here some exercises that appeared to work, not just along the creative/imaginative or more general mathematical lines, but also for the purpose of broadening our minds as architects.

Herman Neuckermans: I don't know if I can answer your question, but just for your information, EAAE has published a guide of schools of architecture, where they describe their profiles. There, you can find out, in general, to what extent the schools consider subjects such as structure, construction, materials and contact with reality as their aims.

Constantin Spiridonidis: I'd like to raise an issue that first came up at the beginning of the meeting and which has recurred throughout the

presentations. We had a previous discussion on the cost of the teaching of construction courses, but there is another cost which must be taken into account, probably not for now, but the near future. In all the presentations, we've seen very sophisticated approaches, pedagogies, experiments, construction materials etc. that, as I understand it, involves a great deal of tutorial time as well as a very close student-teacher relationship, perhaps somewhat more than required in a design tutorial. However, all these means are very costly in terms of teaching time. If we consider the policies developed within the European Union, we can see that the financing of schools is constantly on the decline, resulting in understaffing. On the other hand, there is a tendency toward increasing student population. **The question is, can those exercises and pedagogical practices that we've been describing adapt to the respective student-teacher ratios and circumstances? What concerns me, in reference to these exercises, is what will happen if the number of students increases? Therefore, we will need to think of ways of maintaining quality teaching by using different techniques in order to be able to deal with a condition which is just around the corner.** I'm sure many schools are faced with this problem and would be interested in hearing about approaches that could be adaptable to bigger student populations, without sacrificing the quality we all value.

Maria Voyatzaki: Before passing the microphone to Jean-Marie Bleus, I'd like to add that while Constantin was making his point, Herman Neuckermans whispered as a possible solution to the problem of cost "The Building Industry can sponsor!" However, as other Mediterranean cultures might empathize with what I'm about to express, in our school, there is a great deal of apprehension and difficulty in making people accept that industry can sponsor a school of architecture. Personally, I have nothing against this type of sponsorship if it's kept under control, **but one can appreciate the moral and ethical considerations of allowing the industry to step in and help. In a world where nothing is free, the industry will expect something in return.** The moral question is, can we allow, for example, the Coca Cola or Knauf logos to circulate around the school? I repeat that I have nothing against this, as it would motivate all industries to contribute and, in having as many brand names as possible in the school, the students would be provided with an opportunity to distinguish quality

products on offer. Nevertheless, there is always the danger of allowing monopolies of industries to enter the schools under the disguise of "aid". Therefore, it's a problem for schools to allow students to touch real materials because this involves money and not all of us come from resourceful schools. In fact, there are schools that are experiencing serious financial problems.

Jean-Marie Bleus: Perhaps, we should try exchange programs in Europe. We should try to exchange the typology of experience. During the three days we normally meet, we can form groups or make "families" of subjects we teach, the way we approach our students, etc. so that we are not in competition in this room, but make an effort to work together.

Michel Paulin: Constantin Spiridonidis has asked a "real" question for the future. Even now we can see how difficult it is to maintain or sustain this kind of exercise in our school because of cost and the fragmentation of activities as a consequence of future mobility in Europe. We want to organize or schedule our program in homogenous parts and exchange amongst ourselves. We must design a general form for our teaching modules and all the exercise we've shown you is out of the CTS model or its philosophy. So, I think that we should bear in mind pedagogical research that can represent or be adapted to a commercial product, perhaps even exchange modules for modules in the future. This presents a new and different challenge for the teacher in the future, which we have to face. It's difficult to think in terms of this new kind of large, open market.

Ola Wedebrunn: I'd like to address what Maria said about industries. We take our students not only to brick factories and make them work with clay, but also to Rockwell, for the sake of using a commercial name in this room. They explain how they produce these materials, how stone is melted into mass and how this mass is spun and made into insulation material. This is a very effective way of learning and teaching. Even as teachers, we go in there and learn quite a lot, besides the fact that we can cooperate with them in various ways and get a lot out of it. It can even help the economy and help them get some publicity for what they do or make. However, they are open and aware of the fact that we are a school and that we cannot be bound to any particular industry. They know that we are free to alternate between Sangpoint and Pilkington, for example. The second thing I wanted to say, although

I don't know much about it, refers to a place in Lute in southern Sweden where there is a huge school called IKEA Design School, which was recently built by the IKEA company to train designers. However, I don't think that the students trained there will eventually be obliged to become IKEA designers. It's all simply a way of facing reality, but this is not to say that we should not be careful of where we are treading. Nevertheless, we shouldn't be blinded by this.

Herman Neuckermans: I don't know if we are willing to make a list of more economical ways of doing similar things as we've been shown. You probably know that in the Bologna procedures, some people said that subdivision of education into Bachelor and Master's programmes would ultimately result in governments paying for education only at the Bachelor's level, while the master's would fall in a different category. Nobody can predict the outcome, but I presume that not all governments will implement the same policies. We are already facing at the graduate level, at least in our country, the constant argument of whether it will be the government or student that will have to pay the fees. Therefore, I fully support the idea of looking for alternative solutions with the economic factor in mind. I also agree with the idea that using certain materials from industries doesn't mean that you are sold to the factory. In our school, for example, we have a program spread out over the third, fourth and fifth years which ensures that by the end of it, the students will have visited Rockwell and similar factories for concrete, glass, fibred cement and other materials. Some schools have their own material stock (materiauxteque), a kind of material museum with an elaborate and varied supply of materials. To have this in the school is a very good idea. Finally, I fully support the idea that we should encourage creativity in teaching and expect our students, as architects, to do the kind of creative things we've seen here today, even if it means going around here and there and various shops to gather the necessary materials.

Jean-Marie Delarue: I think that we should discuss the point that Constantin has brought up and what Michel tried to say. I think **that what was being asked was to show what pedagogic tools are produced as means of allowing more time and making learning more accessible. I believe that one way of doing this is to produce adaptable pedagogic tools. Construction in the field of architecture is very important. There are many**

books that are old and not readily in use today like Salvadori Torroja's that promote the philosophy of structural composition as compared to architectural composition. In the field of surface structures, there is the book "La Representation des Structures Constructifs". On structural morphology, on the other hand, there is nothing. Therefore, I think there is a necessity to produce the fixed things that will remain as part of our evolution. Finally, **I think that it is also a question that allows for changes. For instance, in the history of construction, construction is referred to as "culture technique".**

Cyrille Simonnet: In reference to Delarue's opinion, one of the items mentioned in this conference, the term "memorise" seems to be ambiguous. This term doesn't just mean "recall" to students, but how teaching is learned, stored and whether it is done through books or the new electronic media, etc. For example, there is an influx of new publications in the field of architecture on the shelves of bookshops, with very good quality illustrations. Moreover, there are photocopies and CD ROMs, which everyone believed would be the ultimate invention, but as far as I'm concerned, they are not a good substitute for the book as a learning tool, even if it is old. Therefore, publishing and editing is important. The question is, how can all this teaching material and experiences be memorised?

Maria Voyatzaki: I would definitely agree with you, however, if you asked the young people of this generation, I'm afraid they would disagree with you since they are very monitor dependent, ranging from mobile phones to the electronic games they play.

Herman Neuckermans: A few months ago, I happened to be a member of a jury for a PhD. candidate who presented the new digital media for conservation purposes. A member of the jury asserted that what was carved in stones 2,000 years ago can still be read today, that what is printed on paper lasts for about 100-200 years, but what is in the digital media has a lifespan of no more than 5 years. This is something we should all be aware of and for those of us who have had experience with media, we all know that there are items that we can no longer have access to because machines have changed or become obsolete.

Maria Voyatzaki: I think that this is a discussion for a future workshop.

René Hughes: As far as the discipline of Architecture

is concerned, the essence lies in the philosophy which leads it, forming the basis or foundation from which we can begin to work around the "A", representing architecture, not the architect, as clarified earlier.

Ed Melet: I would like to add to what Constantin Spiridonidis said about the growing number of students. We have about 200 or 300 new students coming from high school and I see all these projects involving thirty to forty students. Do you think that we can easily use the same kind of exercises for a larger number of students or do we have to think of alternatives?

Michel Paulin: The exercise I presented is for more than 100 students, and it costs x carrots, but many hours of teaching.

Ed Melet: The x carrots I can understand, but it's impossible to go to a factory with 200 or 300 people.

Maria Voyatzaki: Even the bus is expensive!

Ed Melet: Yes, but besides that, it also involves having the factory people guide and interact with the students. Making stairs with thirty people is one thing, but a component with 200 people is quite different, so, do you think there are ways of adjusting the exercise?

Marko Suutarla: In our school, we're very lucky to have so few students, mainly because we have a policy of limiting the number of incoming students. If we were to accept all applicants, we would have about 1,000 students.

Maria Voyatzaki: Unfortunately, it's a question of not being able to meet student needs entirely for the sake of practicality. We used to take our students to building sites when we had smaller numbers of them, but if we tried to do this nowadays, we would surely get a negative response, mainly for safety reasons as our school does not supply enough helmets due to the cost involved. Another problem is that asking for a group of 20 students to visit a site can be reasonably negotiated, but surely not a group of 300! So, it's not just a financial issue, since even if a school is well off, there are other subtle factors that can create obstacles such as touching materials, following the building process that can potentially slow down or interfere with the normal operation of a site, etc. There are no easy solutions.

Constantin Spiridonidis: I can't provide an answer for this either, but I think that for every course there is a feasibility limit, which is determined by the

number of students, along with the number of available hours and teachers. Therefore, every team must define the figures that represent the "ceiling" of feasibility for the course and anything beyond that will make the course ineffective and incapable of achieving its educational objectives. Therefore, here, during these past few days, we've heard presentations on teaching exercises that have totally different rates. For my school, for instance only a few of them are applicable, simply because they could not be applied to our large student body.

So, I think that one of the characteristics of the course presentations must be to make this specification or definition. This will act as a kind of internal evaluation, thus answering the very interesting issue brought up by our Spanish colleagues about the importance of defining these conditions. **In other words, we must sort out the applicable and look for alternative pedagogies appropriate to bigger ratios. I must say that I don't particularly like referring to figures in this case, because we're dealing with a qualitative issue; however, it is a reality we should try to deal with.**

Eriksrud Steinar: I think that the question you're raising is an important one and, to some extent, we also face this problem. So far we've had groups of 35 students, which is a good size, but they are becoming more like 50 architectural students. Our intention is to maintain the personal contact within the group, while at the same time, dividing them into two studios, each having a separate team of teachers. From my personal experience, every year I accompany to Paris and Lyon the students on the technology courses and know the difficulties involved in going on excursions with groups of 50 students that often make the situation impossible. For example, we usually stay at La Maison de Verre and they let us go in 10 by 10 – it becomes a logistic problem! One way of dealing with the problem is to have more, but smaller studios when there is a large student population. However, we will also have to accept the potential development of different types of pedagogical practices within the same school with different teachers.

Denis Grèzes: Perhaps I can explain how we organize our teaching related to big groups here at the Grands Ateliers. Basically, we are able to provide exercises for about 100 students. When teachers teach first year architecture at Grenoble, they are able to identify the good students who eventually become their assistants the following year. We give

these students information and show them how to use the equipment and installation at the Grands Ateliers. They are very pleased to come here with their teachers starting from the second right up to the fifth year. In fact, if you look outside, you will see a group of them preparing for an exhibition. All these young assistants work with their teachers. Out of the 100 students, we use five young assistants. In terms of cost-benefit, this is advantageous and quite cheap.

Session 5: Dynamics and Tendencies

This session attempts to make a synthesis of all previous sessions in order to draw some conclusions on the exercised adopted and the emerging pedagogies of construction teaching.

Maria Voyatzaki: As we're nearing the end of our meeting, my mind is wandering in different directions, trying to process the gamut of information presented over the past few days. I remember the difficulty I faced when I first received the eighteen different papers from you in an effort to fit them all into a viable program. However, little did I realize then that the difficulty would reach the peak I'm experiencing at this particular moment. It's no easy task to try and synthesize the various discussions and points raised at this workshop while our minds are filled with ideas, thoughts and personal appreciations. Also, while going through this reflective process, we must also think in terms of future plans if we think that there is sufficient potential and zeal, not only for us to continue these meetings, but to question the very existence of our association as well. As already mentioned, back in September we agreed to structure our meeting according to four key words, which some of us employed and elaborated on.

I can conclude, at this point, by proposing a thesis that **construction teaching is a view of architectural teaching, which reflects our view of architecture. Moreover, if architecture is ever-changing then architectural and construction teaching is ever-changing.** Therefore, there is no point in crystallizing or holding on to any particular views because even if we implemented a program now based on such views, our methods and exercises will have to change in five years' time. The fact that we are here together means that we are all interested in not only sharing with others what we do, but learning from others and improving our situations by ameliorating what we do. If we accept that change is part of the game, learning how to adapt to change and appreciating this continual changing process along with learning from others and inventing new approaches are tremendous challenges for all of us. For me, and this is not just my own appreciation, this has been a very rich encounter of construction teachers. We have heard various schools present their exercises with pride, which on a positive note was quite moving. However, on thinking critically about the event itself, which in

fact means self-criticism, it seems that **we should have been, perhaps, more critical in terms of the kinds of problems teachers encounter in putting exercises into practice.** Although I didn't present my own case for the obvious reason that as organizer of this event, I didn't want to take up further speaking time, let alone the fact that being on the selection committee for papers, it seemed unethical of me to state my case. Therefore, it was decided that as a school this will be presented in the form of a poster for your observation.

However, I don't mean to criticize, but to direct our attention to the one important role that this meeting should play. We have many people here who talk with love and enthusiasm about their construction teaching, but very few cases that refer to problems. Therefore, we would like to encourage the latter as well. Also, there are a few more points that have been raised. Last year, as Constantin mentioned, we had lots of **discussion on integrating construction teaching in studio work, either implicitly or explicitly as it may be assumed that construction is taught either primarily in the studio, underpinned with other courses or taught separately, allowing students the choice of making the connection.** As you know, the issue of integrating construction has come up again in the course of our discussion here, this year, which can be related to my previous question of how we go about achieving this integration with a view of architecture as ever-changing. Another issue is that of continuity in areas where we fragmented. I'd like to refer to the comment made by Ramon Sastre about the contexts of the exercises. **Surely, it is difficult to understand an exercise out of context and, in the time limit of 2 ½ days, it's almost impossible to gain a thorough understanding of both the exercises and contexts in which they function.** Therefore, the contexts were missing due to time restriction. In addition, there is also the issue of "staging" and continuity. In other words, how does one start and continue construction teaching from the 1st to 5th year? We had cases that described that, but others merely described the "innovative" exercise as the key feature of their presentation. It goes without saying that the particular exercise presented by each school is not the only exercise given, but representative or among the more important or crucial ones. We, therefore, got a taste of the programmes of the individual schools, but certainly not the entire contextual situations in which they are run. **Furthermore, what can be seen as**

an outcome of this meeting is the issue of direct analogies for understanding construction by looking at the designs of buildings based more or less on the classical knowledge of technology with a degree of improvisation, depending on building size or complexity. This is integrated with construction investigation parallel to or following the design. There are also the less direct or completely indirect approaches where understanding of construction develops through the emotions and bodily experiences, such as tactile or gut feelings as well as other individual abilities. Finally, there is the issue of investigating the definition of new paradigms or hybrid exercises that can "stand on the fence" between the two sides as a way of keeping pace with architecture, if we want our students to follow us and like construction. If I've missed any points worth mentioning or if you disagree with the points raised or my interpretation of them, please feel free to comment.

Jerzy Gorski: We have looked at the problem of coordinating or working with the design studio from our point of view. However, the perspective of those teaching designing is also important, so perhaps we can find out what they think. Also, are there any viable methods used in other schools?

Maria Voyatzaki: Are you suggesting that we should arrange a meeting with design teachers?

Jerzy Gorski: Yes, we've been discussing this problem only from one side, but if our partners are not interested, then our efforts will have no results. We have tried and I know it's a difficult situation, but I don't know what it's like in other schools.

Herman Neuckermans: I don't know if you are aware of the fact that one of the themes of our Thematic Network is based on design. Unfortunately, I must confess at this point that it hasn't started off very well so far; however, it will not provide a solution to your question if the design teachers meet separately from the construction teachers. Therefore, we must consider ways of resolving the danger of having different groups operating under different schemes. I think you're right that we should be fully aware of this problem, even if an immediate answer can't be provided. The Thematic Network has advantages and disadvantages. If we decide on opting for the "middle", then we will not be able to focus on a particular topic since we would be jumping from one subject to another (from construction to architecture) and other related topics without much restraint.

Maria Voyatzaki: I think that before we go into discussions on or with other disciplines, we need to acquire our own identity and know where exactly we stand. This needs further investigation. When I leave this meeting, I will have a very good idea of the kind of exercises I can apply to my own teaching situation, but the exercise as a notion in the teaching of construction in Europe is still a vague or muddled concept in my mind. Therefore, I think that there is a lot that must be clarified and discussed amongst ourselves first, before we reach out to other groups.

Rodica Crisan: Regarding our relations with the design studio, I would like to propose the same theme for the Design Network, that is, **how do the design teachers perceive the idea of integrating construction as part of the puzzle they need to work out in their design process?** This issue can be discussed separately in their own group or network and the opinions expressed can be communicated to our network and vice versa.

Denis Grèzes: I would like to summarize what I personally have "memorized" from the "explain" and "act" of the past three days. **What seems important to me in the teaching of construction is (1) intuition for the purpose of understanding and memorizing; (2) the use of models to help students understand scale, mainly full-scale construction and proportions and I'm very pleased to have seen so many examples here; (3) experimentation through the body; (4) experimentation of forces through kinesthetic experiences; (5) spatial experimentation through choreography, which is quite interesting.**

I think that the topic of sustainability needs to be developed because it might be the "red line" of our teaching from the first to fifth year. **The most important activity in the teaching of construction is for the student to be able to dismantle and reassemble a project because it helps students understand that a building is made of parts and each part has life or a lifetime, so this is also a good introduction to the time dimension so important to buildings, along with the sustainability dimension.**

In response to Constantin's question, **today's architecture has new values and freedom and construction teaching must give this potential for freedom, where each part of a building can be moved, dismantled or easily replaced. Buildings are not made to appear on glossy magazines, but they must live and change**

according to the style, season and effects of time.

I also have some proposals that I wish to make regarding Les Grands Ateliers which I will discuss later.

Maria Voyatzaki: I'd like to add something which might sound like a complaint, but is in fact more of a loss or ellipsis. It was mentioned by Delarue and Simonnet. I was once convinced that it's valid to use bodily experience, but **university education has also to do with feeding the mind and there hasn't been a single exercise which a school would consider as a key exercise in "pensée technique" or technical thinking. It seems that there is no easy way that we can provide the "lenses" through which our students can see and appreciate architecture from the perspective of construction.** In the bibliography, philosophers talk about construction, but rarely refer to the term itself. They use other terms like tectonics, etc. instead, thus softening and elevating it to a more mental, intellectual and cultural rather than bodily activity. On the other hand, I truly appreciate the Danish approach of touching and feeling materials. However, if we really want people to understand concepts in depth, then we must encourage students to look at the history of architecture or architecture itself and, then, with this outlook, seen through the "lenses" appropriately selected with our help and support as teachers, they can develop an appreciation for architecture. Therefore, I think that we need both the practical and intellectual backgrounds. **Our job as teachers is to develop the intellect in order for our students to be able to appreciate construction and draw connections between concept and materiality, ideas and building.** As far as I'm concerned, this is an unexplored area in our field, which requires a great deal of work.

Eriksrud Steinar: What you're asking is, how can we touch the minds of students? There is a proverb that says that "the way to a man's heart is through the stomach".

Maria Voyatzaki: That's a typical men's trick to get women to cook!

Eriksrud Steinar: I prefer to cook for myself and have courses on food preparation at the school of architecture. However, I think that what has been raised during the course of this meeting is the emphasis on model building and the fact that the humanistic approach is also important. When young people enter our schools of architecture, we feel

that they are eager to approach new areas while, at the same time, we want them to understand things in an abstract manner. We want to push them from their 3D experience of the world to our 2D mathematical experience of the world. It's from this point of view that a unilateral approach cannot be maintained.

Maria Voyatzaki: I never meant to underestimate the bodily approach, but simply suggested that it should be complementary to another approach, which in my opinion has to carry equal weight in the school curriculum.

Eriksrud Steinar: Another point brought up by the Jerzy Gorski is the confrontation issue. Again, I would like to use a metaphor to state my point clearly, which is that Adam didn't know he was a man until he met a woman. Perhaps confrontation is a good thing! Denis Grèzes has touched upon the issue of sustainability, which is something that could be dealt with, because as a European culture, I think we have a responsibility toward it. Europe, after all, is the cradle of technology, but we have also created a lot of damages, so we need to develop the tools to both rectify and improve, but to also place these tools in the schools of architecture. In Norway, it's very difficult to get people interested in this area.

Nikos Panayotopoulos: On the issue of sustainability, which has been brought up several times so far, I get the impression somehow that for most of us it appears to be like a bug or some insect on our back. It's something we have to teach and deal with, but it's not exactly our field of interest. If this is the case, then we'd be better off dropping it altogether since there are schools all over Europe (in Germany, Switzerland, England) that deal specifically with this, quite satisfactorily as independent schools. They do global studies and integrate architecture into their scope, educating people who are really interested in the environment. So, if we don't want to tackle the problem, let's leave it to others who are interested instead of seeing it as an additional burden.

Lucien Denissen: I don't agree. I think that most of us want to because if we don't care about sustainability, what future do our plans have? It should be integrated in our normal, daily practice. We see that more and more architects consider the principles of sustainability as starting points. Therefore, I think it's crucial that we teach it as part of the programme and it could very well be a topic of discussion for one of our future meetings in a few years' time. Another point we heard today is that we

should find new ways of teaching in the context of a changing world and further consider such things as our relations with industry, computers and new developments.

Student: As a student, I would like to say that if that happens, I would be very pleased and I'm sure many other students would agree with me.

Ola Wedebrunn: We are in a group considered to be a Network of Schools of Architecture and teachers interested in urban design, conservation, restoration, design and construction. Therefore, we exist in a greater context where divisions don't have to be necessarily made and where we could invite others to participate in our meetings. **I also think that intuition, models, bodily experimentation and sustainability could be subdivisions of what we've been talking about.** In a sense, what we've been doing is "combing the area" or "screening the field" in order to discover what is going on. Although these are very different areas, there are similarities as well that provide stimulation for discussion rather than seeing them as prescribed modes or ways of doing things. In fact, we can say that these provide us with a wider repertoire of possibilities which can be further explored.

Herman Neuckermans: Of course this is a possibility, but the danger lies in making the group too large and not allowing us to focus on the particular issues we want to discuss. Also, the idea of the Thematic Network is not only to "screen the field", but also exchange and share ideas in an effort to learn from each other. Besides exercises and projects, what I would also like us to do is to collect and share important literature, bibliographical references and recommend books both for ourselves and for our students. We all read a variety of different material and it would be interesting if we could communicate this information to each other on a more systematic basis for the sake of expanding our knowledge. For example, I've been to other conferences and have seen some very interesting software by Wiley that will be available this year, which I would strongly recommend.

Ola Webebrunn: Maria said earlier that in five years' time today's information won't be interesting anymore. Nevertheless, statements need to be made.

Maria Voyatzaki: That's exactly my point because if that wasn't the case, we wouldn't be here. Denis, would you like to talk about your proposals?

Denis Grèzes: Last year in Thessaloniki we proposed

to host this second Workshop on Construction and we are very happy to have had you all here for this meeting. As I said yesterday, Les Grands Ateliers is a place for meeting people, for teamwork, and developing friendships for the purpose of inventing new methods of teaching construction and architecture. We were also pleased to discover other places (Oslo, etc.) that offer the kind of experiences that are provided at Les Grands Ateliers.

Therefore, I wish to make some proposals in order to encourage the continuing effort and influence of the Sub-Network and these meetings. First, as you can see in our booklet, our main activity here at Les Grands Ateliers is the education of students. So, you are welcome to come here with your students and organize with us summer workshops or thematic weeks. Secondly, we have also developed some courses for teachers. Can you imagine meeting in various places, not just at Les Grands Ateliers to share experiences and learn from each other on more precise topics, such as, sustainability, light structures or even propose teacher courses? The third suggestion is that we need to develop here research and experimentation, for example, organizing residency for students and researchers for the purpose of making and testing prototypes. We are presently considering the possibility of setting up a postgraduate school for architects and engineers, taking advantage of the numerous research centres of our industrial partners in the region. This exchange suggests that we can foresee a European postgraduate programme with touring courses and residency. The fourth is that we are now publishing teaching tools or material, such as books, CDs, models, etc. and we are open to proposals for cooperation in the area of translating and publishing new material.

Over lunch, I spoke to Saverio Mecca, who said that we could arrange a kind of "knowledge management", pooling all the exercises which have been presented here in poster form. Perhaps we can also arrange a kind of forum among ourselves or have a project on material tech or virtual tech that can be good tools for many schools. We hope that this Network will live for a long time, create many friendships among us and continue as a Network for Construction Teachers. Thank you.

Maria Voyatzaki: That's a nice note to finish on, but I think we need content as well. All these interpersonal relationships will certainly create a firm basis in helping us promote what we would like

to see in architectural education in relation to construction teaching. However, we need an academic content if we want this to have a life of its own. Of course, this is a controversial issue that can be argued, but that's my opinion.

Jean-Marie Delarue: I would like to say that we have seen many things here, not all of which exist or are of interest. I know some colleagues that have interesting experiences that have not been represented here. Structural morphology has a Network (ERSS), so perhaps as a field of constructive thematic network in architecture, like sustainability for example, it would be interesting to have such cooperation. I will not say anything else on structural morphology, even though I think it's a very important and interesting area.

Something which has not been evoked is constructive culture as a component of architectural culture, because architecture is culture and techniculture is an important part of it. Also, schools have the mission of transmitting knowledge through methodologies as finalities....? They also have the mission of inventing/discovering through research new challenges for the future. Perhaps, research areas can be found in any school, but my question, which should not be avoided, relates to methodology and finalities between reality and the virtual in view of the new methods of formfinding? I think that in construction, such a question is inevitable.

Rodica Crisan: It seems that the question of cultural dimension in construction teaching has been raised again. In my opinion, a very good occasion to emphasise this dimension is in the study of the history of technique. We have such a course and for students it's a good opportunity to understand the relationship between the value of architecture as validated by history and its technological support. **Technology should be understood in terms of its cultural activity or performance in particular historic eras.** I would also like to propose that we expand construction teaching to existing buildings. One aspect is the history of techniques, but there is also the pathology of buildings and the intervening techniques (traditional and modern). Surely, there are various problems to be discussed, for example, we could point out design errors or other examples as mentioned by last year's keynote speaker, Jeremy Gould in the lecture on "Poetry and Plumbing: Reality and Dreams", which I liked very much. Also, in the study of existing buildings there are always lessons

to be learned in designing new buildings.

Generally speaking, what we have discussed here are the problems involved in construction teaching, bearing in mind the passage or transition from idealization to materiality, but there is also the feedback aspect, the study of an existing building which can help us understand how a building is made. Moreover, there is the "behaviour" of buildings under real conditions.

Maria Voyatzaki: As coordinator of this Sub-Network, my duty and obligation is to try and make our meetings as interesting and appealing to all, so your proposals are very welcome. The objective is not just a matter of pleasing everyone, but of keeping the Network alive. I can see that as we continue to put forth our views and proposals, we are narrowing down our scope. However, in order to get to the specific, we need to cover the general and I really don't think we've done enough of that yet. Perhaps this is my perception, so I would really like to have your opinions on this. I wonder if we have another round of talks, will we have proposals on specific themes or are there different views on ways forward?

Herman Neuckermans: I would just like to refer to the question on conservation, maintenance and pathology of buildings. These issues are in fact the themes also covered within the Conservation Sub-Network. You probably know that the *baufortion* is the part of conservation that falls into pathology.

Rodica Crisan: I'm talking about our school situation. The History & Restoration Department teaches only the theoretical part of restoration. The technical aspects of restoration are taught by our Technical Science Department.

Herman Neuckermans: So far, the event we had on conservation has dealt with investigating the present European situation regarding this problem. Although it's not the agenda here, we will explore this further and then it will go beyond our individual schools.

Constantin Spiridonidis: I would just like to clarify the proposal. Are you suggesting that for next year we organize a meeting entitled "The Teaching of..." (interrupted by Crisan)

Rodica Crisan: "The Teaching of Construction for Existing Buildings", for example.

Constantin Spiridonidis: In that case, we might have to change the audience because I think that a large part of this audience will not attend such a meeting.

Rodica Crisan: I don't know.

Constantin Spiridonidis: But we have serious reasons for thinking so.

Rodica Crisan: Sorry, but if I teach restorative techniques while someone else teaches structural restoration, that's not a problem for us.

Constantin Spiridonidis: Yes, your point is valuable and very interesting, but in repeating what Maria has just said, if we want to remain a group of people who are together for the purpose of exchanging views and aspects, we need to propose reasons for our existence that will not create any exclusion. It is absolutely necessary for this kind of network and association to allow its members to feel that they have a place and ensure their presence. Therefore, perhaps what you and others have proposed can be complementary to the Network activities, but not the main scope of our meetings as such. It's possible that amongst ourselves we can make SIG groups (special interest groups) and present something along the way, but not organize an event like this for such purposes.

I also think that the personal contact is very significant. It's important to be able to meet and discuss and not just exchange e-mails or texts.

Christine Simonin-Adam: I wish to comment and make some proposals. I can see that in this second year we are a real community and the fact that we exist is important. We can be quite sure of this as it is a view held by many people I've talked with.

The second point is the question of identity, which I've already referred to. The problem of our identity is fundamental and a way of getting around that is for us to become stronger. One of the things we can do is to continue to organize workshops like this. The second thing has to do with culture. **What is culture in construction? I think that in order to answer this question we need to trace historical references. When we teach, we always look at what has been done before us -- that's our reference. Our references should include the teaching aspect and not just that of construction. The other factor is innovation. When we teach we should combine both the historical references and innovation rather than be between the two, as is usually the case.** However, how can we combine both history & innovation in teaching construction when we are always in an in-between state? Perhaps this can be perceived as a formula for combining two things together without the

element of exclusion. I'm merely suggesting!

Constantin Spiridonidis: I'm very happy to hear that you have defined yourselves as a group, as was expected right from the beginning. However, we are a rather fragile group. If someone tried to make a typology of exercises presented over the past three days, I think that there were three types presented. **Type 1 exercises concentrated on the teaching of construction – structures, techniques, materials, analysis of existing buildings, etc. Type 2 (extreme type) focused on approaches dealing with problems of form and morphology as starting points (e.g. the case of Jean-Marie's, yesterday's keynote speaker's and the case of Aarhus). In between these, there is the 3rd type which focused on the issue of integration, that is, the exercises that try to articulate design with construction and other sub-categories, e.g. the cases that go from construction to design and vice versa. These are basically the 3 types of exercises we've experienced here in this room and my feeling is that the people who belong to each of these respective categories do not want to discuss with others.** They do not want exchange with the other types; on the contrary, they want to communicate amongst themselves. The enthusiasm with which each presented their exercises projected the feeling that each seems very pleased with what one does, so it's difficult to imagine that the person who teaches structure will start an exchange with someone from another area, as this has to do with different worlds, values, aspects of architecture, approaches and conceptualizations. Therefore, if this is the case, then our group is indeed very fragile.

Last year, we did an overview, while this year, we went into details and from this we can see that one group can discuss a particular issue while another group something else. This is all very well and in line with these interests, perhaps we should promote discussions on similar issues where people would have real things to share and not be bothered hearing exercises that are out of their own contexts. Basically, the question boils down to whether we want to maintain our homogeneity, bearing in mind that our organization is in its infancy stage. We started off just last year and this is our second meeting, so it seems that at this early stage, it is not fitting for us to move on to very general issues. Perhaps a wiser manipulation of this issue would be that if there is the prospect of organizing meetings with various approaches or simultaneously have groups that would deal with the various themes

separately, then we should arrange for a plenary to tie things up, to provide feedback or simply to add interest. This is not a proposal, but merely an idea.

Another point I wish to mention, which I find very interesting, is that when we finished our meeting last year, there was the feeling that we were all eager to take steps to work toward our objective of developing ways of bringing together both the design and construction teachers. **However, what I saw at this meeting was that half of the presentations concentrated on construction teaching without clear references to articulation rules. This means that there is a strong tendency in schools of architecture to teach construction separately for the reasons Prof. Gorski and others explained. There is, nowadays, a strong tendency in schools of architecture (about 50%) to teach construction as an autonomous course, not at all related to the design activity. Of course, we are not here to pass judgment as to whether this is good or bad since each one of us can assess that. However, in order for our Network to exist, we have to say that both views are valuable or acceptable and that we should find ways of establishing communication between them so as to influence their course in either direction.**

Ola Wedeburn: "Explain", "transmit", "memorise" and "act" were the themes of this conference. These words can somehow be defined and experienced in many different ways. Variation and not sticking to generalizations is, of course, highly interesting, whereas adhering to generalizations all the time can be a problem. At the end of a conference, it's more appealing to be able to say that various opinions were discussed rather than a particular topic. Sticking to generalizations is good at the beginning, but we should "act" at some point.

We are all different people here, coming from different contexts and perhaps all this could be explored in the form of a questionnaire. We could try to elaborate and expand this Network, not physically or formally, but operationally. Through this Network, we could put forth our different experiences, courses, maybe even set up a material library, which could be done in cooperation with various European schools. This Network should continue and not just be for the short term purposes and I would suggest that we go on to more pragmatic things.

Ramon Sastre: For me, this is my first experience here, and I think that if we wish to continue with this Network, then there are numerous topics and issues

that we can deal with in the future. For example, among the ones I suggested this morning is how to assess methods. At this meeting we were proud to present our practices and convey what we do, but are these effective? How do you assess that? Do we look at what students do in the last year, what architects do in your particular area and you can't do, at the architects you've taught, etc.? Perhaps each of these can present information for you to reflect on, which does not always generate a sense of pride.

Also, what about the cost of our methods? Do we have the appropriate funds to do what we want to do or do we do certain things because of lack of funds to do otherwise? What about the issue of our achieving independence in our industrial relations rather than just seeing such relations in terms of financial support. Sometimes, we may be in a position where we have to say that a certain material is not of good quality and can't be used. How will the industry react?

Another issue is the question of mobility for students who study on programmes in other universities. What is their level of construction and what exactly do they learn there? What are the difficulties of entering students in schools where the methods used are completely different? Although in some cases this may not present a problem since methods might not be completely different, this should be investigated and assessed.

Regarding the issue of directly involving students in building and construction, we could never imagine medical students not having hospital practice! In fact, these students spend a large portion of their training time in hospitals whereas architectural students might, in some cases, finish their studies without ever having entered a building site. Surely the laws in some countries may have to be changed, so the question is what can we do about them? Are we going to silently accept or are we going to help make it legally possible for at least a student to be allowed on construction sites here and there? I've mentioned just a few general topics for us to deal with, but there are more. As far as my opinion is concerned on the future of this Network, this is my first meeting, but I can say that I would definitely want it to continue and look forward to a meeting next year as there is enough enthusiasm and a great deal of themes to deal with.

Herman Neuckermans: First of all I'd like to say that my perception might be different from Constantin's.

This meeting went under the heading of "Construction Teaching Methods: the Exercises in the Teaching of Construction". Personally, I was quite happy to see that not all the presentations were exercises as we know them, which for us normally means exercises not on design, but integrated with design. Perhaps there are different perceptions, but I saw here a lot of things which were in fact design exercises.

The second thing is that in reference to what has just been said, at the EAAE Hania meeting, one of the subjects we're dealing with is assessment, which is a very broad subject involving schools, teachers, teaching methods and students in the design area. Assessment is an area in which we are not highly skilled and a lot needs to be done. We have started working on various things and plan to present a step forward at the Hania meeting. Assessing the method is part of assessment. Part of the discussion on assessment is indeed what you said.

Lucien Denisson: I'd like to refer to what Constantine mentioned. Maybe, his perception of the categories of projects presented or mentioned is that of a non-construction professor. If most of us provide an idea of the kind of organization we have in our schools, we will see the following categories: (1) material and technology; (2) lectures on structures: tectonics and morphology; (3) building physics, including equipment and sustainability; (4) construction in general. Therefore, we basically deal with these four categories.

However, there is a problem because not everyone here is the main professor of each of these courses which we try to integrate. So, even in construction, we deal with many things and I agree that this can be a problem for future themes in the area of construction. As a result, I agree that we must keep it general, although I don't think it's necessary to focus on one theme at a time. For example, putting renovation into an historical context is too restrictive. Maybe, as a proposal, we could do some research with a team on innovation which could include construction methods, materials and teaching methods too.

Cyrille Simonnet: I would just like to express a proposal made by Nadia Hoyet whose **idea was to analyze the place or position of construction with respect to mutation**. The first being the transformation of laws or regulations and normalization of material, today. Also, **what is the place of construction in the face of the big**

cultural transformation in terms of sustainability and the environment? Finally, where does construction stand in respect to industry and technological changes? It would be interesting to hear how we could develop a course around these issues.

Maria Voyatzaki: Do you mean what would be the description of an ideal course that would take into account these changes? So, it's an ideal course of what we would like to do in view of these changes, is it?

Cyrille Simonnet: No, I'm not talking about an ideal construction course, but a course that adapts to the real world. When each of us plans an exercise based on our knowledge, we must adapt it to our world.

Nikos Panayotopoulos: I fully agree with Constantine's analysis about the three "worlds" that appeared in this meeting. An idea for the next meeting, if there will be one, is to confront those three "worlds" with the real one – the world outside. **Mainly, we should explore what exactly is expected of a young architect who graduates from an architectural school when he / she confronts the real world. What is the duty of a construction teacher in preparing this person to meet the demands of the real world?**

Maria Voyatzaki: I think that Panayotopoulos' suggestion was also proposed by La Villette just before leaving the meeting. Their **suggestion was that we start with the competencies or essential requirements of a graduate of a school of architecture to effectively work in the real world and reverse the process. That is, we should look at what we have to do in order to successfully meet this goal.**

Constantin Spiridonidis: So, in this case, will each sub-theme define or determine the changing conditions or will each participant be free to define what is changeable or changing? For example, if our meeting will be divided into four sessions, then the first will deal with, let's say, **"changing professional trends", another with "changing aspects in architecture", then "new materials and production"**.

Jean-Marie Delarue: Or **"changing methodology with computers"**.

Herman Neuckermans: I would argue that we keep the group together and not divide it in different

groups because the problem is that we are already disconnected.

Constantin Spiridonidis: In this case each participant will be invited to address these subjects on the basis of how he / she perceives that the teaching methods used could be adapted to various changes.

Maria Voyatzaki: The coincidence is that we have many heads of schools and others that are interested in construction. I mentioned heads of schools because I can see the subject being related to a school curriculum. It's a strategic decision to place construction in a different way on the school curriculum. In fact, it would be interesting to have statistics from all of you in the form of tables such as those presented by Prof. Gorski this morning, which would describe the credits that are allocated to a construction course, so as to see where construction stands on the school curriculum. Similarly, such information as how much time is allotted to the teaching of construction and the weight it has in the school curriculum is important because this has certain implications in the way students perceive you and how seriously they take you, which in turn has an influence on the way they perceive construction. It would be useful to draw a map of this data so as to give us a clear idea of where we stand and plan what we would like our school to do in order to accommodate new trends in construction teaching.

Rémy Mouterd: Don't you think it's dangerous to separate the different themes of architecture into three or four sessions? Architecture is a combination, a synthesis of many different things. What was rich about this meeting was to see the various things that other people do. This is a lot more interesting than a closed-door approach where we don't have access to other ideas and ways of doing things.

Constantin Spiridonidis: Of course, I agree with you. I can't imagine that with a topic like that we would split the group. Certainly, in such a case, we should all be together to discuss different viewpoints in the way we see the future and, in this way, the work of the Network becomes more coherent. If we consider the course of our meetings so far, we can see that in the first year we conducted an overview on the general structure of construction teaching here and there in schools of architecture. In the second year, we carried out an investigation of the details of the exercises. For next year, then, what has been proposed seems a logical sequence, so I'm very

pleased to see that things look promising.

Denis Grèzes: A question worth considering is, **what is very essential to teach?** This is the target we should work on. In each of our schools, some will say they have 100 hours of teaching time, so they teach in a particular way, others will have 50, 20 or even 2, etc. In these latter cases, what will you say to your students? If you have only 2 hours to teach construction in relation to a changing world, what will you say?

Jean-Marie Bleus: This is not an answer to your question, but I'm just wondering. I teach mechanics and stability in the first three years in two different ways: a) by teaching in front of 60 students the principles and applications of projects from various architects or students and b) in the studio. What I've observed is that students are changing. They seem to prefer having me in the studio while they work on their own projects rather than just listening to what others have done. The student who is not interested in what others have put on their structures is very interested in his / her own structure. So when a student tells me the aim of his / her project, I am between a teacher and the student in the whole architectural department and there is one reflection and 60 students to share it. This was mentioned to make us realize that students are changing.

Maria Voyatzaki: As you can appreciate, this session can go on forever, but we are all too tired by this time, after 2 1/2 days. What we did last year that worked quite well was to solicit proposals from you for the next meeting, which were sent to me via e-mail after the workshop, when everyone had had the time to reflect. So, we will follow the same procedure this year by asking you to send me your proposals, briefly (about 1/2 page), stating your thoughts. Once you do that we will put the ideas together and then arrange to meet either somewhere in Europe or simply talk over the phone to discuss the proposals and take appropriate action. Last year, we all had the brilliant idea of proposing Les Grands Ateliers as our meeting place. I suppose we should give other places a chance, as well; therefore, eliciting invitations is important. You may want to discuss the potential of hosting this event with the head of your school, should any of you be interested in doing so. This would be a good opportunity for your school to not only accommodate an event such as this, but also give us and others a chance to visit your school and demonstrate what you do, as well as promote your

city or town. It requires a considerable amount of work when it's done away from my country. Denis Grèzes can tell you more about this. Last year we arranged it all by ourselves in Thessaloniki. However, if you decide to assume responsibility for hosting this event, you will have to speak to Denis and Myriam and all the people here at the Ateliers to inform you on what it entails. It takes a lot of work and effort. I sit in front of the computer to do the academic and superficial part of it, but it's the people from the Grands Ateliers that make the actual arrangements. I should mention that the organization doesn't involve only physical effort and time, but certain expenses will also be incurred, which is a consideration. As you know, the Network itself cannot fund the entire event. Therefore, we will leave it at that and await your proposals. As far as the Proceedings are concerned, I'm hoping that the 20th of June is a suitable date for me to expect to receive your reviews and revised papers. Also, please be sure to e-mail by then your texts and posters, which should not be too long or large for the sake of expediency.

I would like to end this meeting on a pleasant note based on what Denis said earlier that our Network meetings have not only created, but strengthened a big friendship between us and Denis and Les Grands Ateliers and its people. We would like to thank you very much for providing us with an exciting and stimulating experience by hosting us here. Finally, everyone here has commented on the choice of keynote speakers. We think that Denis did an excellent job in choosing people who could represent all the aspects relevant to this meeting, but, above all, who are great architects and concerned with the relationship between design and technology, as well as being conscientious teachers who teach innovative exercises to their students. Therefore, the choice was brilliant and on behalf of everyone we thank you, Denis. I would also like to thank all of you for your participation.

Denis Grèzes: It was a pleasure to work with you.

Myriam Olivier: Thank you very much for coming here. I do hope that you have received all the information on Les Grands Ateliers. Please do not hesitate to ask me any questions. If you wish to receive the Newsletter that we send via the Internet, I will collect your e-mail addresses. Good-bye and have a good trip back home.