



Fig. 1. Francis Matthews, *Depth Of Field And Motion, Generic Office Space In Urban Infill Site, final model*

### **A Discussion of Principles: Comments on the Conference**

## **Technical Intuition Experimenting with the Role of Reason and Intuition in the Design Process**

*"Intuition and concepts constitute, therefore, the elements of all our knowledge, so that neither concepts without an intuition in some way corresponding to them, nor intuition without concepts, can yield knowledge... thoughts without content are empty, intuitions without concepts are blind"*

*Kant, Critique of Pure Reason*

There was some discussion, formal and otherwise, at the recent EAAE conference regarding the relationship between the teaching of technology and the traditional design studio. Some very positive experiences were related but there was some hesitation voiced regarding the influence and role of design studios in developing a student's attitude toward technology as well. Now it is an interesting thing to hear this hesitation voiced *from the other side* as it were. Speaking from the vantage point of the design studio, there is often a similar hesitation on the part of design instructors as to the role that technology should or does play within the territory of design. Yet design instructors are not opposed to material and technological sophistication being exhibited in their students work. Quite the contrary. Despite the reputation we may have among technology staff the vast majority of us desire the fullest realization of a design project possible. So how is it that such a mutual distrust has arisen?

There is no simple way to trace the origins of these misgivings and misunderstandings. But what seems clear from contemporary experience is that many design instructors fear that technological imperatives may have a limiting affect on students' imaginations. That all design work will be reduced to the known solution and experimentation will cease to exist. Yet experimentation is an important part of the role of design studio projects...to encourage the questioning of convention in an effort to better understand the potential of architecture. What is being expressed is not a dismissal of the importance of technological imperatives but a refusal to accept limitations by its hand. But are limitations in creativity really necessary if technological imperatives are addressed in design? Given some of the more insightful lectures at the conference this seems a false worry. Indeed

the range and depth of experimentation and invention exhibited across the conference is reassuring to at least this design instructor and begins to suggest that the problem we encounter together is an illusion of our own making. We all, for the most part, desire the same end and could, if we chose, be mutually supportive of one another to the ultimate benefit of our students.

Naturally the answer to this false schism lies within the domain of both the design studio and the technology course. And this paper presents a version of a more integrated and supportive format from the design studio perspective. But prior to launching into a discussion of this proposal it seems useful to comment on a version of a solution from the other side, the side of technical instruction, which seems potentially supportive in a similar manner.

As a conference intentionally focused on the issue of new materials and technologies the question of how to teach an ever expanding field of knowledge was grappled with continuously. Yet in truth there have always been new materials and new technologies arriving at our doorstep, certainly since the industrial revolution, which architects and engineers have been compelled to address and exploit in their design work. The only substantive difference is in the exponential growth in the types of materials and technologies on offer. Which is no small issue to address. Yet the principles remain the same; the fundamental principles of architecture as social and environmental mediator, albeit with significant changes in scale; and likewise building science, structures and construction technologies, though perhaps increasingly quantified and more readily analyzed, continue to operate on the basis of material properties, the means of assembly, the environmental context and of course scale. Is it truly necessary to address each possible material and technology in a course given that the underlying principles remain constant? Is it even possible? And perhaps most critical to the discussion at hand, is it even advisable?

At the heart of the discord between design studio and technology, from the studio perspective, is the conventional detail. It is this convention that creates such unease among design studio staff. And it seems the natural output of a technology course intent on teaching as many materials and systems as possible in the time given. And why should conventions inspire such misgiving? Because students, without a more fundamental knowledge of building science or structures on the *level of principles*, will default back into the detailing taught to them in technology courses, conventional or otherwise, if required to develop their design studio projects to this level. Without a more sophisticated understanding of the underlying principles which have governed the development of these standards the students have no means of evolving these details to suit a different design project, much less an experimental design project. Thus the potential of experimentation across all scales of the design project is reduced to accepted conventions, is reduced to the level of their competence in technology and their facility in rethinking these details based on a their understanding of the underlying principles involved. If we are to educate our students in a manner which encourages continual development as our material and technological choices increase then surely the key is to ground their learning in principles rather than specific solutions in an effort

to liberate their imaginations and creative freedom. This strategy has not only immediate benefit within the studio but a longer-range influence on practices as they attempt to accommodate ever-changing technologies and an increasing array of material choices.

Likewise for the design studio. While the depth of exploration in design studio can be fundamentally compromised by a lack of understanding of the basic principles underlying building science and structures, confidence and fluidity in these areas of knowledge can only be positive to any design process, particularly one intent on serious research driven exploration. But it is equally critical to reformulate the manner in which these material imperatives are introduced into the design process, how they are understood to relate to the design concept. All too often these issues are, if not abandoned entirely, addressed subsequent to the fleshing out of the design as a form, as a type of end-game tactic. A strategy which inevitably leads to mutations and compromises in form, conceptual intent and material resolve during the final stages of design whether in school or in practice.

The counterpoint position postulated by this paper is an approach which would recognize these material imperatives as inspiration in conceptual thinking, thus positioning these imperatives as early as possible in the design process, in fact prior to a schematic design phase. This approach enables students to use these issues as *strategic initiatives* in formulating a more precise definition of the polemic, which they are to test in a project. Implied in this model is an idea regarding design as research, or perhaps *research by design*. For while research is traditionally undertaken prior to a design project in studio in the form of theoretical readings, contextual studies or precedent studies, rarely are technological issues given the same pre-weighting in the development of the initial design conception. This is perhaps due to a misgiving regarding the limitation of choices far too early in the design process. Yet it could engender an opening out of possibilities if understood as preliminary research through design studies, the results of which inform the design process on the same level as other forms of preparatory research. This does not imply a lack of detail exploration in design at later stages but rather an awareness of their relevance from the outset.

### UCD Thesis Program

The proposal is actually a model of the role which our rational and intuitive facilities play in the design process; developing the rational side of design as preliminary research where issues are confronted, be they theoretical, social, material or contextual, and carefully analyzed as to content and relevance which then liberates the design process itself to be intuitive, responding to a latent or unconscious understanding of these related issues with its success being wholly dependent on the depth of prior analysis. This model of investigative research and intuitive design was formulated and tested as part of the redesign of the fifth year thesis program at University College Dublin. The current structure of the final year is a slight recalibration of the previous model, adding additional layers which specifically address the ideas of research, the individual polemic and *the thorough investigation and translation of the polemic to material form*. The objective was to make explicit the material imperatives of architecture and its impact on the conceptual formation of the design.

## Competencies and Skills

Though *competencies and skills* were not specifically addressed in our internal discussions these were implicit and are useful to extract for discussion. Our principle objective, to mature the students intuitive design skill, is a goal seemingly unrelated to technical competencies and skills. And intuition, as any design instructor knows, is a dangerous driver of design unless it has the capacity to draw on a wealth of information. Thus the means to enable the fluidity of this form of creative endeavour was to redress the lack of knowledge and skill which informs it, including those of a technical nature. This began by amending the form of research undertaken which would underpin the later design phase.

What often passes as research in architectural design studios would be more accurately described as superficial survey work which lacks both rigorous analysis and any critical conclusions which could translate to other design work. To achieve either one must first establish clarity regarding the questions being asked. In a thesis this takes the form of positioning one self within the broader architectural discourse and to establish this clearly enough to underpin critical research studies which would follow. Thus the first skill would be intellectual clarity which can be made explicit through verbal, textual or graphic medium, but must be underpinned by a depth of knowledge gleaned from literature searches, precedent analysis and, most critically, summarized into a conclusive argument.

From this one can establish a series of research studies which would test this position against the multiple imperatives which face any architectural project. This testing not only further clarifies the position but also establishes the relevance of each imperative and the possible means by which its astute manipulation can forward the design. This is perhaps the moment where the connection to technology teaching becomes clear. For the imperatives established in our program went beyond the traditional context, site and brief, the general cultural issues typically addressed in studio, and demanded a testing of technological imperatives such as environmental mediation, material use, structure and even economics, this being implicit within each of the previous three. Required to undertake these studies, in addition to clarity regarding the research hypothesis, are competencies with a variety of investigative tools as well as an ability to critically analyze the results in order to transform these studies into design principles.

Competencies with a variety of investigative tools are critical, with the emphasis on variety. The studies in our program were undertaken as design, thus used the fairly conventional investigative tools of models and drawings in the first instance. But equally important was recourse to other means of investigation which could inform this work such as photographic and video analysis of environments, computer modeling tools which could simulate thermal, sound or light environments, or full scale studies to achieve similar simulations. Without these tools for simulation the impact of design studies could not be successfully or fully interpreted. But neither could these simulations be valuable without recourse to the traditional tools for exploration to evolve the studies. Thus the greater range of tools we introduce our students to expands their facility to investigate more fully and creatively.

Finally the work requires analysis and transformation into design principles which can then be applied to a variety of conditions, in the same manner

perhaps that facility with the principles of building science or structures can be used more creatively in design than preordained solutions. Analysis of this kind is not a traditional strength among architectural students, perhaps due to a lack of experience in research, and can perhaps best be developed by demanding more rigorous research at an earlier stage in their design studies.

The results of such a structure have a direct bearing on the students' attitudes towards technical issues not simply in their studio work but in their future role as practitioners. Rather than teach specifics regarding technological knowledge we have invested the students with a critical attitude toward their relevance in the creative design process which has the capacity to provoke a continual pattern of research and experimentation and to encourage a form of *technical intuition* in their design process. And it is this perhaps most of all which is necessary to engender in our students if they are to address ever-changing technological realities, an attitude of curiosity and exploration which is supported by competencies in underlying principles, research tools and skill in critical analysis.

### **Educational Strategies and Methodologies**

The 5<sup>th</sup> year program developed was based on a sequence of research workshops loosely described as; *thesis; precedent study; environment and economy; material and structure; context and brief* carried out in the first term of a three term thesis. These workshops were used as instigation for students to research these imperatives relative to their thesis intention through both reading and small design studies with the intention to both deepen and broaden the polemic and to equip students with strategic design skills which could be brought forward to their primary design study in the following terms.

The first week of the term was reconstructed as a *thesis* workshop as an encouragement to the development of research skills, and involved both year staff, invited lecturers and graduates of the program in a discussion of both the meaning of an architectural polemic and the nature of architectural research. This was followed by 4 weeks of intensive research in which students explored the territory of their stated intention through readings, precedent research and small design studies. The work culminated in a more precise statement of polemic, grounded in the context of existing research and theory on the topic, which was then tested against a noteworthy building as a form of direct precedent investigation.

The workshops which followed were structured on a two week cycle where 3 lectures on the particular issue were given and followed by seminar discussions on the thematic as well as the students own research work. The intention behind having a trio of lectures was to encourage a diversity of opinion and outlook, to broaden the discourse as much as possible, rather than establishing a preordained position which could mitigate against individual research. This was followed by a focussed two week design exploration, which was reviewed collectively with students, staff and, significantly, a critic representing the particular thematic in question. Thus the workshop on environment and economy was given by an economist, an architectural educator and a practicing architect with

sympathetic leanings while the review was attended by an environmental specialist.

The design research undertaken during this period involved the use of small scale briefs and sites identified by students as temporary vehicles for studying the relationship of certain imperatives which could enlarge their polemic stance and equip them with design strategies for the main thesis project to follow. Models were the typical medium for exploration and were used at two different scales, building massing and detail, in an effort to discover the appropriate scale at which the thesis could be tested. Thus the studies pictured here identified environmental factors as the principle issue which could inform the thesis proposition. The thesis premise, described as *depth of field and motion*, as tensions which inform the perception of space, explored the environmental issues of light and view as a design tactic to direct the exploration. [fig 2 & 3] Likewise, the studies on material | structure were used in a similar manner by the same student to extend his understanding on the strategies for manipulation of light through the development of a structural form on a narrow urban infill site which could support and enhance the diversity of light qualities within the deep recesses of the building. [fig 4-5]

Though not specifically 'technological' in their manifestation, as neither study was investigated at the level of construction detailing, these early research studies did firmly imbed into the student's thesis framework a preoccupation with controlling light in a building as well as an awareness as to the role that issues of an environmental or structural nature may play in the exploration and development of the design. This project was particularly interesting as the student, having been provoked to think in terms of different models of research and research tools, used a wide range of media to investigate his premise as well as to develop the project itself. Starting from an investigation of physiological, cultural and art theory texts on perception, as well as his own painting studies on depth perception, he moved fluidly across different traditional media to finally learning an advanced computer modeling system called Ecotech. This system, in combination with traditional models, enabled a more comprehensive study of the light conditions of a generic office space in an urban infill site, allowing a continuous evolution, evaluation and remodelling from early schematics to final proposition. Both issues of light quality and structural imperatives remained present throughout the work, being refined and clarified relative to each other to achieve the final form of the building. [fig 1]

In a thematically similar project, another student equally interested in light studies but with a focus on the ramifications of the material qualities of space, used a similar programmatic vehicle and site condition to achieve a significantly different interpretation of light as form giver. Rather than focusing on the scale and orientation of space to manipulate light conditions the intentions of the project were deeply rooted in the investigation of light quality through the manipulation of material assemblies. This was undertaken using a wide range of modeling techniques simultaneously, from Ecotech for accurate measurements to scale models and large scale wall/floor/ceiling sectional drawings to explore techniques of assembly to model light. [fig 6 & 7]



Fig. 2-3. Francis Matthews, *Depth Of Field And Motion, Generic Office Space In Urban Infill Site, research model light*



Fig. 4-5. Francis Matthews, *Depth Of Field And Motion, Generic Office Space In Urban Infill Site, research model structure*

Fig 6-7. Fiona Hughes, *Light as Form Giver*,  
*Generic Office Space In Urban Infill Site*,  
research model light and material



Fig 8-9. Shane Meehan, *Time Cycles*,  
*Boooterstown Marsh Dart Station*,  
development model material



Fig. 10. Paula Kelleher, *Making Place*,  
*Speculative Warehousing*, research  
model material

Light was not the only aspect of the environment which became central to thesis work as a result of these studies. A thesis with aspirations regarding the evocation of the spiritual in architecture developed into a study of time cycles of degradation and wear in building materials as a result of a sequence of small design studies which attempted to elucidate the ephemeral relative to our series of technical imperatives. The final project, a boardwalk cum parking lot which housed both a train station and a hostel in an estuary condition was carefully specified and detailed to wear out relative to patterns of use, a study which involved the exploration in scale models of typical materials used in unconventional ways throughout the building. [fig8 & 9]

More conceptually based projects bore similar results. As a function of testing Heideggerian philosophies of place-making against the imperatives of environment, economy, material and structure through a sequence of design studies another student's polemic was successfully broadened to encompass the critical realities of economics and environmental issues in measuring a landscape through architectural form. Though the early studies leaned towards the improbably romantic, the final project took on the difficult program of speculative warehousing in rural landscapes, successfully developing an alternative model which embraced all the economic constraints but altered the modeling of the form through judicious use of site characteristics and sustainable strategies. [fig 10 & 11]

Perhaps the most striking success of the program was the 1:1 scale modeling of a wall section undertaken by a student interested in Freudian theories of disconnection. From initial research in theory, filming technique and precedent studies in collective housing this student found, on testing the polemic against material imperatives, that the modeling of spatial adjacencies could be achieved most successfully through articulate modeling of wall assemblies to inform visual, textural and thermal qualities. Though the project began with very aesthetic notions of form-making the final exercises revealed technological sophistication as the critical issue in achieving her thesis ambition. [fig 12]

Of course the structure of the year had its flaws, as every course does. The workshops were neither long enough nor sufficiently focussed to achieve serious work across the entire class. These are now being restructured into 3 week cycles which will incorporate a sequence of group research projects to initiate individual studies. Nevertheless the work from this preceding year was suggestive of the manner in which technical imperatives can be researched in small design studies in an effort to test the meaning and



*Fig. 11. Paula Kelleher, Making Place, Speculative Warehousing, final project image*

clarity of the polemic, to extend the students range of thinking on their chosen topics, and to imbed a sense of material thinking in the theoretical premise which can be successfully extended forward through a more liberated and mature intuitive design process. It is worth noting that most of the students did not bring the specifics of their research studies to bear on their final project development but rather an awareness as to the relative significance of particular technological issues to their thesis which encouraged further experimentation to unfold during the final design stage.

The lessons gleaned from this thesis structure are now being folded into the 4th year curriculum for the coming year. In an effort to collapse the misleading boundaries between both studio and technology as well as between the specialist technologies themselves, the fourth year courses of building technology and structures have been aligned into a single course on integrated design practice which will also encompass environmental science issues. The project work from this course will be directly linked to studio design projects and structured as a series of research studies on particular technical thematic.

In addition to the discussion of skills and methods which were the theme of the conference there is another fundamentally important component to the enablement of a student's learning and continuing development as a professional which is about latent attitudes. Though not specifically a skill which can be taught nor related to any particular methodology of teaching, they are critical to how one engages in the design process. An attitude of open-mindedness, confidence and curiosity are the forerunners to sincere and critically minded experimentation and it is within our power, as educators, to encourage these attitudes among our students by the degree of respect we show them as individuals and the latitude we allow them in developing their own peculiar talents and often more peculiar interests. This is a critical a factor in teaching both design and technology in a fashion which sustains continued exploration, whether at school or in the profession. For while respect and latitude breeds confidence to experiment, to debate and to challenge conventions with authority, a lack of both closes down conversations, inhibits experimentation, renders research invalid by preordaining acceptable results and forces a level of conformance on individuals which breeds similar attitudes within the profession. Perhaps the most important thing we can bring to our teaching is this attitude of creative latitude, both within our courses and across the boundaries between courses, to encourage a more fluid, interactive and integrated approach to design in our students.



*Fig. 12. Mary O'Niell, Disconnections - the Space Between, Gymnasium, research model texture, view and thermal calibrations*

## Attitudes and Conclusions