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Internal Consistencies: Regarding Weights and Measures

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Abstract
Rather than seeing a distinction between theoretical discourse and the science of building, Vitruvius, a Roman architect and engineer active in the 1st century BC, argued convincingly for the breadth of knowledge necessary to practice architecture with authority, that "knowledge is the child of practice and theory". The crux of his argument is that a sufficient breadth of training is necessary to appreciate both the theoretical and practical sciences, to lend authority to creative vision and enable discourse "for it is by [t]his judgement that all work done by the other arts is put to test".

In like spirit, a series of workshops in Architecture at UCD has sought to challenge the contemporary lack of sympathy between theoretical discourse and the science of building. Embedded within each workshop are variations regarding intent, from the social/political discourse of the North Atlantic Rim project, to the theoretical concerns of the Ateliers Series or the environmental bias of the Irish Timber course, each drawing upon discourses external to architecture and measuring them against the weight of material and its inherent logic. The resulting evolution in attitudes regarding design process, linking both technological imperatives and conceptual intentions to the creative act, shatters the prevailing distinctions between theoretical concerns and technological explorations in the discipline of architecture.

Keywords: Technology, Material Practice, Design Build, Education

1 Introduction

1. THE architect should be equipped with knowledge of many branches of study and varied kinds of learning, for it is by his judgement that all work done by the other arts is put to test. This knowledge is the child of practice and theory. Practice is the continuous and regular exercise of employment where manual work is done with any necessary material according to the design of a drawing. Theory, on the other hand, is the ability to demonstrate and explain the productions of dexterity on the principles of proportion.

2. It follows, therefore, that architects who have aimed at acquiring manual skill without scholarship have never been able to reach a position of authority to correspond to their pains, while those who relied only upon theories and scholarship were obviously hunting the shadow, not the substance. But those who have a thorough knowledge of both, like men armed at all points, have the sooner attained their object and carried authority with them.

Vitruvius Pollio, The Ten Books On Architecture, Chapter I: The Education Of The Architect

The transfer of information into the discipline of architecture from disparate fields of knowledge is certainly not a new phenomenon, although the rapidity of transfer and the complexity of information on offer may exceed historical trends. Any discussion as to the validity of this transfer should be understood within this context, that architecture, by its very nature as a social, political and material art, necessarily demands a wide spectrum of knowledge on the part of its practitioners, beyond the simply technological, to achieve work both functional and meaningful. The first chapter of Vitruvius provides a succinct argument for this importation from other fields of endeavour, from philosophy to medicine, into the profession of architecture. Rather than seeing a distinction between these subjects, or indeed a lack of sympathy between theoretical discourse and the science of building, Vitruvius appreciates the breadth of knowledge necessary to practice architecture with authority, that "knowledge is the child of practice and theory" [Vitruvius 1].
The real crux of the contemporary debate should lie not in the validity of the transfer but rather its synthesis with the more specific and technical aspects of our discipline. In a recent publication on material based architectural practice Katie Lloyd Thomas argues that architectural practice and the discourse surrounding it have historically and principally been form based, eschewing material resonance, and it is within these discourses that alternative fields of knowledge have had their influence on architecture, yet failing to bring a synthetic unity of purpose to bear on its actual realization [2]. The implicit difficulty in this history, and its radical difference to the attitude expressed by Vitruvius in the first century BC, is the tension that is then understood to erupt between form and its translation and resolution as a material artifact. The severing of the influence of broader frames of reference from the material realization of the project creates a disjunction within the process of design, between the critical imagination and the material imperatives of building that disables the authority with which architecture is practiced. As Lloyd Thomas argues in Material Matters, the potential of reversing this historic predisposition, to focus on material realities not as servant to form but as inspiration, can open up an equally broad field of inquiry and relationships which can influence architectural design. The influence described, of economic forces, material processes, environmental factors, social custom, all “the forces at work in the realization of objects [and their continuing lives] …range from the conceptual to the practical and technical, to the institutional.” [2] describing a similar field of knowledge implicated in form generation yet from a significantly different perspective.

There lingers within Lloyd Thomas’ essay some doubt as to whether this shift in priorities achieves any alteration to the oppositional character of formal conception and the material realities of building. A series of workshops developed within the Architecture Programme at University College Dublin has sought to encourage the shift in perspective so aptly described and elucidated in this book, with results which imply that this oppositional condition can be leveled, that the generous image of a marriage between theory and the practical bequeathed to us by Vitruvius is indeed possible and still relevant within a far more complex world and profession.

Embedded within each workshop are variations regarding intent, from the social/political discourse of the North Atlantic Rim [NAR] project, to the theoretical concerns of the Ateliers Series or the environmental bias of the Irish Timber workshop. Notionally all could be reduced to education in the practical art of technology. Yet the reality is more compelling for each draws upon discourses external to architecture and measures them against the weight of material and its inherent logic. The resulting insights, and lasting impact on the students work method is an evolution in attitudes and preconceptions regarding design, linking both technological imperatives and conceptual intentions to the creative act of form-making thereby achieving an internal consistency through the shattering of distinctions between notionally external theoretical concerns and technological explorations.

2 Thesis Research and Les Grandes Ateliers: An Exploration of Pedagogy

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 [92-93]

There are two parallel and complementary objectives to the underlying structure of the current final year thesis program at University College Dublin. The first, and most historically prevailing, is the desire to enable students to define a position within the broader architectural discourse which has personal relevance to them and to successfully pursue the translation of this polemic in architectural form. The second is sympathetic to this objective in that it demands of the student a holistic and thorough exploration of the project, and the underlying polemic, against all of the physical imperatives of architecture. This second objective seeks to enable the students to move beyond the merely theoretical or formal proposition and develop work that has material authority by examining issues of an environmental or material nature [Shotton, 365].

The rational behind the recently introduced sequence of workshops on the theme of materiality was to rectify a persistent lack of technical intelligence within the thesis work. Despite a very thorough four-year technology programme the studio design work was exclusively based on formal agendas, informed by a myriad of disciplines, yet eschewing any material, structural or environmental issues. Kant’s words are relevant here in that they served as a provocation to rethinking the role, and perhaps as critically the timing, which technical imperatives had in the conceptualization of the project.
If the naturally intuitive process of design is, ideally, married to and driven by prior concepts, or rational analysis, our students’ process was suffering from an underlying poverty of analysis and thus reason. As Lloyd Thomas argues, contemporary architectural discourse particularly within the academy understands building form in representational terms, which renders its materiality invisible, aptly describing our school and many like it [7]. The theoretical discourse, which the students had developed aptitude for, was having a generative impact but in what Stan Allen would describe as a hermeneutical, representational and static manner which could not accommodate the more performative and experiential consequences that material and structural imperatives generate. As Allen argues, in favour of practice over the project, it is “Not what a building, a text or a drawing means, but what it can do: how it operates in – and on – the world” [xxv].

To generate a recognition of the difference between representation and performance, as well as their potential alignment within the discourse of architecture, the first term research work has evolved to include two workshop programmes which compel the students to test their polemic against the resistance of material, structural, environmental and economic issues. Both workshops, Material | Structure and Environment | Economy have proven advantageous in enlarging and elaborating the intentions brought to bear on form generation. The Material | Structure Workshop, held every autumn at Les Grands Ateliers in France, has particular relevance to the current debate. Critical to the organization of this five
day exercise is that the students are arranged in teams, a tactic undertaken to enable fabrication within this time frame, but also pedagogically significant to the enrichment of their conceptual position as it necessitates the negotiation of individual concerns into a mutually relevant premise.

Over the past three years of the programme the workshop structure has evolved from a sequence of drawing to building, which exposed the formalist predispositions of the students as the drawing studies bore no technical insights and were rapidly discarded once building was undertaken, to a more promising structure in which material is engaged with immediately, allowing the shape, texture and inherent properties of the physical to influence both negotiated position and resultant form [Image 1]. As Alan Chandler has argued regarding similar work at the University of East London, the power of this form of prototyping is “...its ability to embody a field of ideas, and in the means of testing the interrelationship of these ideas in a single moment” [123]. By working directly with material the constellation of issues brought to bear in both discourse and making expands significantly, embroiling the theoretical, social and political concerns more commonly attributed to form generation with material and technological imperatives, allowing both to contribute to the conceptual positioning of the project.

What has become clear in these experiments is that the positioning of the influence material imperatives have in the conceptual framework of the design process is critical, that students, and by implication practitioners, need to develop an attitude regarding these issues, informed by their specific intentions, prior to design. This approach has enabled the students to use these issues as strategic initiatives in formulating a more precise definition of the polemic of their thesis. Implied in this conclusion is that this initial phase of thesis definition, of research, is in some measure the rational side of design where issues are confronted, be they theoretical, social, material or contextual, and carefully analyzed as to content and relevance. In contrast the design process itself is, in the best case, an intuitive process responding to a latent or unconscious understanding of related issues with its success being wholly dependent on the depth of prior analysis. In principle then we have aimed to broaden the reasoned, analytical framework of the research portion of the thesis to encompass material realities in an effort to underpin and liberate the intuitive design process to follow [Shotton].

Work generated subsequent to these workshops has been, on the whole, more synthetic in its resolution of competing discourses where conceptual models, previously form driven, now explore attributes of form, structural resolve, tectonic expression and theoretical concern simultaneously. Equally, development of design drawings has begun to show more intelligence in the use of this representational technique as mediator between concept and building or, as Chandler has so clearly expressed, that this “…immersion into the act of building is the only means by which their line can become more relevant and purposeful.” [121].

3 North Atlantic Rim Research Collaborative: Culture and Landscape

Nature is an enigmatic object, an object not entirely in front of us. Nature constitutes our ground, not what is in front of us, but what holds us.

Maurice Merleau-Ponty, La Nature; Notes, Cours du College de France, Paris: Editions du Seuil

The drawing, as intermediary between creative thought and building process, is a critical tool for both investigative and communicative purposes and requires, as Chandler suggests, training which can leaven it with greater intelligence and purpose. This process of leavening has been one of the many mandates behind the cross-cultural landscape studies undertaken each summer through the agency of the North Atlantic Rim Research Collaborative. Since 2004 this project, representing architects, academics and students from Ireland, Norway, Iceland and Eastern Canada, has undertaken a systematic documentation of representative landscapes and settlements in these regions, with the first phase of work concluded in 2006 in Nova Scotia, Canada. The documentation has taken the form of local drawing investigations, from the scale of landscape to building form and detail, to identify salient architectural aspects of landscape that inform culture, building and settlement patterns.

Imperative was the way landscape was recorded, using orthographic representation to translate experienced realities to measurable and comparable data. The insistence on the use of these conventions compelled participants to examine the landscapes and buildings more carefully, engaging with measure, proportion, scale and materiality – with the emphasis on the underlying materiality of the land - which informed the secondary layers of the built. The consequences of this slow, deliberate process of documentation by hand were made explicit in a design build workshop, which concluded the studies last year in Nova Scotia.
Initially design studies for the negotiation and resolution to the contested territory of the local school, a summer theatre camp and a retirement home were undertaken in model and drawing across three groups of students. Evident in these studies was a singular lack of regard for the constraints a two-week building project implied - material, technical, economic or process based – with some notable exceptions among the students who had participated in the drawing studies. Amongst these was apparent a lingering attention to the natural features of the landscape and references back to construction typologies noted in the earlier studies. Nevertheless, when assembled and reviewed as a set of alternatives it became clear that pre-conceived formal agendas, inattentive to either the specificity of the physical or social context, prevailed.

Scott Poole, in his assessment of design processes among his own students, has suggested that “Rapid simulation of mental images detached from the veracity of matter and the means of production can have an illusory effect on the imagination and foster constructive naiveté. When the real conditions of everyday life are suspended there is no limit to formal preconception. Everything appears possible.” [111]. His argument regarding the virtue of slow deliberation seems apt, but it is not simply digital media, to which he refers, which suspends realities in form making. Rather it is the lack of physical engagement and the over dependency on abstract representations which so often precludes a more intimate reading and authoritative translation of a context. It is well documented that children learn kinetically, through touch, but what we fail to appreciate is that touch is the principle means of perception generally. Deprived of this experience our visual imagination remains uninformed as to the weight and measure of our reality.

In response to the improbable propositions put forward a shift in design process was necessitated. The building material, consisting of heavy timbers, rebar, concrete block and plywood, was distributed across the site by the students as a means of measuring both the scale of the site and the quantity of building material, the latter constrained by issues of budget. From this position material was redistributed and subtracted in a repetitive process to assess the potential of the site against the measure of the body and the scale, not to mention weight, of the material. The outcome was a far more sophisticated reading of the site, both physical and social, which when represented initially in plan [Image 2] bore no recognizable form yet when finally built established a complex network of social spaces which negotiated a difficult terrain [Image 3] using a simple but sophisticated language of pin connections, with timber and rebar, inspired by local heavy timber wharf constructions. It was within the physical and urgent pressures of construction that these earlier lessons, so carefully observed and absorbed through slow documentation, were able to surface in an imaginative and unexpected manner, not derivative as so often results from exclusively visual analysis, but by an intelligent recasting of material, technology and cultural history.
This exercise bears lessons similar to the Ateliers projects, that an immediate engagement with material enables a form of learning to occur which can inform the creative design process. The differences are significant however, and especially relevant to a discussion of the synthesis of the technical and material to the theoretical or cultural inspirations in the design process. While the use of prototypes in short design studies enables students to recognize the potential marriage between theoretical concerns and material constraints it fails to open up the broader discourse to which Lloyd Thomas refers, that material and technology have more potency than the merely aesthetic. Implied within materials and their assemblage into form is a vast network of discourse, from the economic to the cultural or the regulatory, which influence the outcome of a project, such as at Cheticamp, which are too easily overlooked in the controlled environment of the studio.

4 Irish Timber & Sustainability: Material Use and the Environment

Building materials...are social and cultural constructs, produced through the complexities of legislation and regulation, through techniques of production and fabrication, through language and use. In turn they create possibilities and limitations, ways of working and experiential conditions which are specific and individuated.

Katie Lloyd Thomas, Material Matters [8]

Shifting attention from the formal to the material in design practice should not imply the loss of a broader discourse and intelligence being brought to bear on the creative process. In truth, if we can but suspend our culturally insinuated predisposition to limit material relevance to the aesthetic and the techniques of assemblage, there is a vast network of associated fields that are embroiled in the building materials with which we negotiate, as Lloyd Thomas so clearly articulates. Contemporary issues of environmental degradation, for instance, have forced our global community to become more cognizant of the weight of many of these related issues that factor in the production, use and reuse of materials used to realize our architectural aspirations. Unfortunately too many advocates of sustainable building practice reduce its potential through broad pronouncements and overly generalized principles which, when applied to specific regional contexts, undermine the basic intelligence of the proposition.

Current imperatives regarding sustainable building practices, having been applied in too generalized a fashion within Ireland, has encouraged an expanded use of timber construction. Of concern here are the inherent contradictions in the use of timber as a sustainable building resource in Ireland as the quantity, quality and diversity of timbers available locally is limited thus leading to the importation of material, carrying with it significant embodied energy costs. A more positive scenario would be to develop a means to use the local timber more effectively in construction, as well as to consider the species currently under cultivation. Operating on the premise that architects are responsible to practice in a sustainable manner within their profession and much of their influence resides in their understanding and use of local construction materials, the recently initiated course, Irish Timbers & Sustainability, aimed to examine the timber resources available across a range of
diverse but interdependent issues such as historic changes to forestry over the centuries, including the associated ecological, social and economic causes and effects, to more specific issues such as the appearance and workability of several types of timber. This served as a foundation for individual student research on specific issues and informed the 1:1 collective design/build investigations undertaken by the class [Image 4].

The intent is to enable students to engage in a more specific way with material choices and potentials, to experiment with practical technological applications or innovations and to begin to understand the meaning and value of construction materials within the framework of the sustainability mandate with direct reference to the design process. In short “an insistence on examining materials as part of a network of forces and actions” as Lloyd Thomas so aptly states in order to generate more informed and enriched decision making relative to design intentions, beyond the merely formal or aesthetic [8].

Currently in its first year, this research project is intended to evolve yearly as a broader base of knowledge of the local resources is developed, with the intention that each session would focus on different potential applications and experiment with alternative construction typologies through the medium of a design build project each spring. In 2007 the indigenous and exotic species currently under cultivation in Ireland was researched,
underpinned by lectures in historic trends in woodland development and depletion on the island, contemporary silviculture and forestry management techniques, issues of biodiversity, and properties of soft and hardwoods locally available. These discussions alone raised awareness as to the complexity of economic, environmental, regulatory and cultural issues influencing the management and distribution of timber resources, the implications of which were underlined in the design build projects which followed.

Sitka Spruce, considered an exotic in Ireland, is actually the principal species currently under cultivation for timber due to its accelerated pattern of growth in wasteland thus making it the ideal candidate for this initial project. The disparity manifest between the stocks of lumber supplied to the project was sufficient lesson in and of itself regarding the implications of sourcing locally. Irish spruce is significantly more porous and flawed due to both provenance and growing conditions, lowering its structural properties significantly. As stocks are harvested quite early the scale of available timber was also limited resulting, for this project, in the importation of Baltic spruce which proved both larger, more materially stable and structurally reliable. Though one can describe in classroom settings the quality and scale differential between imported and locally grown spruce, in practice this lesson rarely holds for longer than the duration of the course. In this setting however these differences compelled the students to make choices that had significant consequences on form, detailing and the sheer workability of the timber during construction.

The peculiar artifacts, which now occupy the college green, are welcome additions that sponsor continual occupation by the student body. Equally, their construction using traditional wood joinery, with metals and adhesives being wholly absent as a matter of principle, serves its own educational purpose. But the critical knowledge acquired in this course was the breadth and complexity of issues raised when one examines any building material closely, expanding an awareness well beyond notional ideas concerning appearance, material properties or assembly to encompass the social and cultural constructs so often associated with more formalist concerns.

5 Conclusions

When a poet's mind is perfectly equipped for his work, it is constantly amalgamating disparate experiences; the ordinary man's experience is chaotic, irregular, fragmentary. The latter falls in love, or reads Spinoza, and these two experiences have nothing to do with each other, or with the noise of the typewriter or the smell of cooking; in the mind of the poet these experiences are always forming new wholes.

T.S. Eliot, Metaphysical Poets

As a young student of architecture I was told, with some authority by a professor, that architects were poets, thus were born into, rather than trained for, their profession. I remained unconvinced, viewing it as an attempt to shed the responsibility of providing an adequate education. My position remains little changed to this day, despite being more sympathetic to his real meaning. It is in the constant amalgamation of disparate experiences, or knowledge, into new wholes that the practitioner of architecture shares an alliance to the poet. But like a poet one must be educated in the tradition and technics of one's craft, as Eliot argues elsewhere. Likewise, tradition and technic are insufficient without a breadth of knowledge and experience with which to inspire the creative imagination.

The transfer and appropriation of diverse fields of knowledge within the discipline of architecture is essential to the meaningful practice of our craft. But to be truly valuable it is essential that a synthesis occur between the practicalities of building and the insights of experience and knowledge from other traditions. A synthesis perhaps easier to achieve by understanding the complex network of relationships which underlie materials and their use within our society.

6 References

Allen, Stan, Practice: Architecture, Technique and Representation, London: Routledge, 2000


Shotton, Elizabeth, Strategic Initiatives, Spiridonidis, C., ed. Monitoring Architectural Design Education in European Schools of Architecture, Transactions on Architectural Education No. 19, Greece: European Association For Architectural Education, 2004