

The Art of Engineering after Truth and Beauty

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INTRODUCTION TO THE PROBLEM

One of the charges of theory is not simply to explain things or practices but also to question their conditions of possibility. This task is most complex when the examination does not concern a fixed object but the relationship between disciplines, such as that between architecture, art and engineering. Before analyzing such specific cross-disciplinary issues, it is necessary to scrutinize the conventions upon which that study is premised. In a time when the terms like “inter-disciplinary” are so causally wielded and carelessly elevated — as if we know what it is we attempt to cross or multiply! — it is necessary to begin to theorize this middle ground between disciplines and this requires radically challenging our assumptions that disciplines are constituted in the way convention has it. This is not to say no differences exist, but that these can be thought of and worked with in terms other than as fundamentals, essences and dualisms. Ironically, focusing on crossovers of architecture, art and engineering can reinforce wholly conventional divisions of knowledge and practice, naturalizing their status as distinct, even opposed, discourses of ideas and practices, and moreover the convention that architecture somehow synthesizes a dialectic between art and science. One must therefore analyze these conventions at the level of disciplinarity, and of the *translations* that occur across these disciplines. The conventional divisions of disciplines are not *a priori*, but historically constituted, and I argue, belong to a modern constellation of knowledges and practice. In the past decades, there have been innumerable attempts to re-formulate the conditions of practice and the processes that have configured these disciplines in modernity. This has manifested as attempts to move beyond the modern and as returns to “eternal” and fundamental values, such as beauty and truth. However, I propose a third alternative: an attempt to revise the space of modern knowledge from within, and, as Foucault might have argued, connect our ideas of

disciplinarity itself to their exterior, constructing different relationships of objects of study and products of production. This may reveal the preconscious suppositions upon which our disciplinary categories depend, their historicity and possible reconfigurations. What would be involved in opening an exteriority of disciplines?

In this paper, I explore these broad problems by analyzing specific collaborations between one young engineering firm, *Atelier One*, and two contemporary artists working at the architectural scale. *Atelier One* is useful for an analysis of the relationship of art, architecture and engineering for several reasons. Firstly, since its founding in the 1990, the firm’s work has consistently experimented with cross-disciplinary collaboration. Its founding partners, Aaron Chadwick and Neil Thomas, established the firm out of frustration with the self imposed restrictions the corporate behemoths of English engineering, such as Ove Arup, had unwittingly created for their field. *Atelier One* was designed to be a firm that could expand what constituted an engineering practice into a form of research. Its body of work is diverse in scale, form and type: from the unfolding LCD screens for U2’s world tours, to elegant temporary structures for the Sultan of Brunai’s birthday, to “blue-sky” research into new prototypes, to major cultural buildings, such the facade to the Ljubljana National Gallery extension. Secondly, their projects demonstrate a high degree of commitment to innovation while never succoring technological exhibitionism. *Atelier One*’s work is informed by the *reproductive technologies* of the image, information and smart composite materials more than 19th century mechanisms of factory production. As with Cecil Balmond, their projects are conceived for and within a 21st century frame of reference rather different from the Victorian heritage that continues to dominate engineering ethics.¹ Lastly, *Atelier One*’s associations with diverse contemporary

artists demonstrate these traits with radical implications for the *praxis* of the engineer.

TOWARDS A NON-MODERN ART OF ENGINEERING AND THE ENGINEERING OF ART

An artist usually enlists an engineer when a project approaches the size of building as this entails qualitative shifts in problems of execution, legal requirements and complications of fabrication. Accordingly, these works often depend upon engineering as a technique in the way a marble sculpture depends on the sculptor's chisel. In such cases, comfortably marginalizing the engineer's role as a technical consultant becomes problematic for they are directly involved in mediating effects. The artist's skill is redistributed to other agents in the process and conversely the engineer might be thought of as providing *architectural competencies* the artist lacks. The synthetic practice of the architect, who we are taught combines art and science, is here articulated as two discreet actors and their knowledge and objects of that knowledge emerge from the network of interactions between them.² However, at this moment, the *problem of translation* arises as the artist is displaced from direct formation of the work, which is now mediated through the engineer.

Atelier One's greatest accomplishment in these terms is in *erasing* all evidence of *translation* from concept to built structure. For example, Anish Kapoor's *Tarantara* (1999) appears to have magically emerged, as if the illusionary space of Kapoor's painting instantly manifested as a spatial vortex. Rachel Whiteread's cast of a room, *Ghost*, appears to have grown quite unexpectedly into an entire *House* (1993-4), the techniques required for this massive project as spectral as its namesake. The long process of translation and mediation necessary for such large scale installations is no less complex than that of a conventional building and is filled with the same compromises and contingencies that have ruined many an architecture.³ Yet here this translation from concept to construction seems to have been effortlessly eclipsed—the concept actualized in material space. The art of engineering in these terms is the art of erasure, of covering one's tracks.

Yet, it is exactly this slight of the engineering hand that makes these works so challenging to traditional definitions of the "art" and "engineering." In the Western tradition, the discipline of art is often seen as dangerously replicating the *appearance* of nature rather than its essence, creating illusions of the real designed to captivate. Our myths on the origin of painting are filled with ideas of artistry as epistemological *trompe l'oeil*.

As chronicled by Pliny the Elder, the most celebrated Athenian painter, Zeuxis, so perfectly replicated Nature that even birds mistook his painted grapes for reality. In a competition, however, a young artist, Parrhasios, stole Zeuxis's crown by producing a painting of a curtain the latter mistook for an actual curtain that concealed the "real" painting.⁴ Similarly, Plato suspected art of mistaking the "real" with the artificial; the more skillful the artist the more artifice comes indistinguishable from Nature, in the case of the bird pecking at painted grapes, this reality effect encompasses even Nature itself.

Tradition has it that against the dangers of the artist stands the philosopher, or as Heidegger had it, his modern heir, the scientist. This discipline, we have been trained, deals not in appearance and deception but unearths brute facts, reveals truths, finds laws that concern eternal essences. Indeed, in modernity, often the most innovative engineering has deployed the same suspicion of art and depended upon rhetoric of natural beauty. For example, in the late-1980's the distinguished engineer Ted Happold claimed engineering possesses greater creativity than artistry. For him, the artist romantically sees the "world primarily in terms of immediate appearances" while the engineer rationally "sees the world primarily in terms of underlying form." The aesthetic of engineering is ahistorical, "distinct from visual style or fashion" because it depends on truth stripped "bare" of artifice. Engineering is therefore capable of "producing originality" while "art and culture can entrap" and "only...develop existing forms."⁵ Happold replays the old Platonic tradition. Yet, in his modernity, he seeks a natural holism (in Happold's case derived from Zen Buddhism, which the West often imperially romanticizes as a religion of Nature). A synthesis is sought by repressing the illusions of culture and art in favor of natural order.

The philosopher of science Bruno Latour has called this dualism the "modern constitution" through which all practices and disciplines are ordered, opposing Nature and Culture as the two most general categories.⁶ By extension, the traits of Art and Science might be ordered accordingly:

NATURE		CULTURE
Truth (reality)		Lie (appearance)
Science (reason)		Art (intuition)

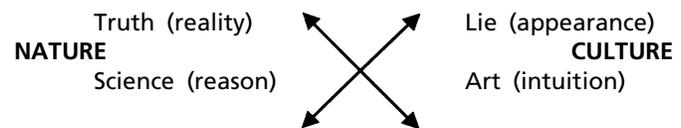
This constitution also defines this split as problematic, as something which must be overcome or unified.

Since the early 19th century, I would argue structural engineering has attempted to re-unify these poles

under the shibboleth of “the art of engineering.” Engineering, as an applied science of material and forces, confronts brute reality; buildings stand up or they don’t. Engineering is teleological in the Kantian sense. Yet more importantly, it is an aesthetical teleology. Like the architect, the engineer expresses this “standing-up-ness” by representing what Happold called underlying forms as signatures of a natural order. Moreover, engineering is over-determined and judged according to economy and clarity of expression of this order. Thus, the art of engineering consists not in making a building stand up (this is trivial in regards to disciplinarity) but in expressing this condition as the truth of building. In practice, this has entailed at least three interlinked doctrines: 1) The doctrine of connection, which requires elaboration and exposure of the “detail” and component logics in both hierarchical and space-frame variants; 2) The doctrine of truth, which emphasizes the expression of structural purpose as the meaning of buildings;⁷ 3) The doctrine of gravity, which does not mean that engineering must deal with gravity but that it takes the expression of weight and the movement of force into the ground as its finality. This finality is not to simply to allow a building to stand up so much as expressing this condition as “heaviness” and more fashionably “lightness.” Representing the force of gravity and other statics as its meaning provides engineering the *teleological* conditions of its modern configuration as a discipline.

Rather than replaying these doctrines, as did Happold, we can question the dichotomies upon which they rest. Bruno Latour has argued that even as modernity places things under either Nature or Culture, it multiplies hybrids that traverse these categories. For a while these monsters could be sublimated but at least since World War Two they have become impossible to suppress. The world is too densely packed with Nature-Culture combinations: cyborgs, statistics, genetic engineering, even green politics all produce objects of knowledge that defy simply categorical oppositions of Nature and Culture. Indeed, Latour argues that such hybrids demonstrate there only ever existed heterogeneous mixtures and networks. The disciplinary purity of Modernity was an empty ideology rather than the nature of practice or experience; it was our picture of truth, not the condition of *praxis*. The latter is nothing other than the network’s that exist and which are forged between actions (natural or cultural, subjective or objective) within an irreducibly complex topography of practices, institutions, and regulations. These networks do not operate through essences but only by relative position, operations and linkages.⁸ The belief in the dichotomy is the Parrhasian curtain that deceived the most “rational” of minds.

Following from Latour’s arguments, I would like to propose a network of translation not based upon dialectical opposition and synthesis but as transposition of values and concepts. To give a figure to this network I will employ what in rhetoric is called a *chiasmus*. One of the more perplexing tropes (perhaps because it is endemic to our way of structuring the modern world) chiasmus performs a double reversal in which the two poles of a dualism are not simply reversed but transposed.⁹ Chiasmus does not offer another fixed schema, but provides a way of tracking the most simple dynamic translations and exchanges across a mutating and heterogeneous networks. It can be diagrammed as a X shaped operation of reflexive substitutions that effectively places the modern schema of knowledge into indeterminate play:



Chiasmus can be employed to describe the dynamic networks that exist between the actors of art and engineering as well as their objects. These, in turn, are revealed not as “natural” categories themselves nor essential and objective principles that must be eternally followed but as the rhetoric of engineering as a discipline—literally, that which makes its work persuasive and the means through which it generates new meaning. Again, the motif of the painted curtain which operates upon desire is relevant.

Atelier One’s collaborations on Whitread’s *house* and Kapoor’s *Tarrantara* depend on a chiasmus, displacing the natural realism of the engineering aesthetic. In Whitread’s case, the artist was faced with an unprecedented scale and degree of complexity. The artist’s work both literally left her hands and was transformed. Traditional casting techniques of smaller spaces—such as the room cast for *Ghost*—would not work; its material, plaster, would never meet environmental and structural demands and casting techniques would never produce the required effect of formal integrity. *Atelier One* proposed a solution in which the interior surfaces of the existing house functioned as a mold itself for a specially formulated sprayed concrete.¹⁰ The house was therefore not simply cast to produce its negative, nor even a space made solid (as with Whitread’s use of chairs). *House* is not true to the art technique of casting. The walls of the house are literally re-coded as a form

work, thus the resulting not-object refers not simply to an absence of the object, but also presents a simulacrum of the presence given to building. In turn, *house* at once encodes and confuses truth values given by the doctrines of engineering. Floors become slots of space upon which apparently tons of concrete precariously perch. The trace of load bearing walls are imprinted upon surfaces that are at once heavy and seemingly suspended. Here is an engineering in the service of phenomenological effects not of truth and reality, let alone place, but of displacing and destabilizing the ordinate vectors of space and the gravity of embodiment. By making air as solid, the surrounding space of *house* is materialized such that it does not operate as an object in a field, but as a vacuum within the metropolitan continuum. The aesthetic effect of the work is thus multiplied by the instabilities its engineering engenders in the uncanny status of the object.¹¹

Something similar is at stake in *Atelier One's* collaboration on the Anish Kapoor's *Taratantara* installation at the site of the Baltic flourmill.¹² This was a crucial project in Kapoor's oeuvre, setting the stage for last year's even more colossal installation, *Marsyas*, at the Tate Modern and engineered (more spectacularly but arguably less successfully) by Cecil Balmond. In the *Taratantara*, the virtual space of Kapoor's paintings and the ineffable formal effects of his sculpture are seemingly turned inside out and magnified such that they encompass the viewer. *Atelier One* engineered the structure with as little visible detail as possible. Most of the engineering in fact occurred in the membrane's surface and its shaping to give the effect of a viscous pigment drawn across space and suspended in time.¹³ The material of the membrane and its transformation of light through color map Kapoor's painterly techniques while never reducing to pastiche. Here, detail, connection and logics of assembly are engineered to be as minimal, or at least as minimally apparent, as possible. Instead, the material was extensively designed and its strengths manipulated by altering the compositions of its surface. The composite material appears weightless, though of course its total mass equals several tons. An extension of Kapoor's own reduction of the evidence of technique as a technique, these effects are also indicative of *Atelier One's* challenge to engineering's traditional aesthetic of natural realism. Rather than express a rational order by articulating structure and connection, *Taratantara* is a worm-hole in the orthogonal space of engineering, represented by the existing structure to which the new work is affiliated. It warps not only the space in which it is physically installed, but the disciplinary space in which is conceptually situated.

In these projects, the engineer, like Parrhasios, becomes a master of illusion, playing fast and loose with truth in favor of appearance and reality effects. Both depend on projecting the illusion that no translation or friction has occurred, of maintaining the artist's presence in the work rather than revealing its mediated, compromised, manufactured condition. Moreover, these effects displace the natural realism of engineering, questioning the works' status as real objects (for Whiteread the object is uncanny, for Kapoor's, ineffable). This propels the engineering into a complex relationship between illusion-truth and appearance-reality and in doing so reworks the constitution of modernity. They are willing to abandon the aesthetics of engineering and its modern meaning—that is the fetish of the detail, the multiplication of visible components, the expression of a clear rational logic. By casting aside almost all of the identifying marks of great engineering, their artifacts are no longer constrained by the aesthetics of Truth and Nature. *Atelier One* does not simply specialize in hybrid materials or structure but opens engineering up to the potential for disciplinary hybridity.

Because they exploit this potential, ultimately I would suggest that *Atelier One* is a dangerous engineering firm. It is dangerous neither because their project push technological limits (though they might) nor because they seem unable to stand but because their structures are not compelled to express their structural fact as a purpose or a truth. This unnatural engineering after Truth and Beauty threatens the entire disciplinary edifice that has sustained the consultant engineer and his cadre of high-tech architects. If as Bruno Latour suggests "we have never been modern"—that is, the distinction between nature and culture never really existed—practices like *Atelier One* mark the limits of modern engineering. This entails not a rejection or moving away from modernism, but a revision of our concepts of modernity, a new and more complex version of modernism with new practices and expressions of this condition. Their work marks a threshold in which we may begin to operate upon the disciplines adjacent to architecture in new ways, to proliferate diagrams and intersections that are not simply hybrids but events in the possibility of practice. It is not the birds but us, the architects, are fooled and alight upon these illusionary artifacts.

NOTES

¹ C.f., Cecil Balmond, *Informal*, (London: Prestel, 2002): 12-14.

² There is a vast literature on understanding practice and knowledge through actors and networks, though mostly applied to scientific disciplines. I am merely suggesting it might also be adapted for other practices as a useful way to understand translational effects

while avoid rehearsing trivial truisms and conventions. C.f.: Bruno Latour, *Science in Action*, (Harvard, 1988); Law, J. "Notes on the Theory of the Actor-Network: Ordering, Strategy and Heterogeneity," *Systems Practice* 5 (1992): 379-393.

³ On the complex relationship between what the architect, or for that matter the engineer, actually does-draw-and the problems of building refer to: Robin Evans, "Translations From Drawing to Building," *Translations From Drawing to Building and Other Essays* (Architectural Association, 1997). Here, I am concerned with what might be called translations from the drawer to builder.

⁴ I am indebted to Mark Cousins's account of this myth.

⁵ All quotations from: Edmund Happold, "A personal perception of Engineering" in *Architectural Design*, V 57, n 11/12 (1987).

⁶ The following analysis and diagrams draw extensively from Latour's text, *We Have Never Been Modern* (Harvard: 1991).

⁷ Both Mies' exposed columns (as an expression of structure) and Venturi's decorated shed (as an expression of sign) adhere to this doctrine

⁸ Latour, (1991).

⁹ For a longer exegesis on the use of chiasmus refer to, Paul De Man, *Allegories of Reading* (1988).

¹⁰ Neil Thomas, "The making of *house*: technical issues," *house*, (Phaidon, London, 1995).

¹¹ On the uncanny effects of Whiteread's work refer to: Tony Vidler, *Warped Space*, (Cambridge, Mass.: MIT Press, 2000).

¹² For documentation of the project, refer to: A. Kapoor's, *Taratantara* (London: Baltic Centre for Contemporary Art & ACTAR, 2000).

¹³ The details of the engineering process were described to me by principal Aaron Chadwick in an interview of 21 October 2001.

Notes on the works cited:

Anish Kapoor's, *Taratantara*, Baltic Flour Mill, England. Conceived by Anish Kapoor's, "*Taratantara*" was tem-

porarily installed between demolition of an existing structure and construction of a new art gallery within the empty space of the Baltic flourmill. As calculated and developed by Atelier One, the final membrane is a double conic section which when viewed from different locations acts to alter entirely the perception of the size of the building. The surface is formed in a single layer of PVC coated polyester eventually recycled into book jackets for a publication document the project.

Rachel Whiteread, *house*

House built upon a previous work by Rachel Whiteread, *ghost*, which was exhibited in the Tate gallery. Whiteread cast the inside of a domestic room, reassembling them into a monolithic negative of the room.

house developed this concept by creating a negative cast of a complete house. However the method used for the *room* was not appropriate. Through collaboration with Atelier One, Whiteread altered her methods. Atelier One proposed spraying concrete upon the interior surfaces of every room to create a continuous 12mm thick skin reinforced with a fine mesh. All external surfaces of the existing building were then demolished, leaving an uncanny ghost of the interior space.