

Thermodynamic narratives in sustainable architecture

Live projects between object and experience

Thermodynamic narratives: the social construction of sustainable design

The opposition between technological determinism and the social construction of technology (SCOT) has inspired many architects to focus on the conscious, 'social' choices of designers, clients and users, empowering them to resist the homogeneous character of universal civilisation and technological progress. Graham Farmer has prepared an illustrated syllogism (*arq* 17/2, pp. 106–119) using three faculty-student projects to demonstrate the architectural challenges of the opposition and its resolution in a hybridised synthesis.

A prefabricated Solar Decathlon house is presented to illustrate the form of practice most associated with sustainable design: a de-contextualised process focused on greater efficiencies of construction and operation. In the words of Moore and Karvonen, it is 'a type of increasingly globalised cultural production in which experts (architects, engineers) design artefacts (based on a formal knowledge), to be constructed by a second party (a contractor or manufacturer) at a distant locale'. In the second, more contextualised example, a straw-bale café was designed and built by a collaborative team to exemplify 'place-based sustainable design', engaging designers, fabricators and the community of users in the process. Finally, a hybrid approach based on the 'complexity and diversity of socio-cultural embeddedness' seeks to move beyond the easy opposition between nostalgia for pre-modern social cohesion and the leap into an ecotopic future. A nursery



1 The Nottingham House, an experiment in low-energy prefab design by architecture students and staff from the University of Nottingham, UK

school designed in England and built by its community in South Africa is used to illustrate the reconciliation of functional optimisation and social meaning.

Each of these projects demonstrates the capacity of thoughtful designers to resist the alienating (to use the old word) tendencies of contemporary technology by working in collaborative teams outside the conventional mechanisms of project finance and professional organisation. The student projects are offered as instructive attacks on 'globalised cultural production', though we know they are dwarfed by the powerful construction industry that has evolved over the last century. The three-part explanation and synthesis makes visible some critical social aspects of technology but leaves unexamined the social construction of sustainability itself. Thomas Hughes, one of the originators of SCOT, might have called the projects 'reverse

salients', a military term for the backward bulge in the line of a military front (the Battle of the Verdun or the Battle of the Bulge). In his metaphor, a reverse salient can either be a lagging component that holds back the general line of advance, or an intentional incursion like the three projects.

Hughes was interested in the evolution of 'large technological systems' such as the electric grid or automobile and road production, which 'dwarfed the forces of the environment not yet absorbed by them' and gave the appearance of technological autonomy that the social constructivists were disputing. Hughes distrusted the concept of evolution, preferring the idea that complex technological systems develop 'momentum' through the sheer number of people involved and the mutual reinforcement of technical, organisational and institutional goals. In his view, it was high momentum that gave the illusion of autonomy, so

the task was to understand the actual interactions of 'inventors, engineers, scientists, managers, owners, investors, financiers, civil servants, and politicians', which produced the momentum. The idea goes back to Mandeville and Adam Smith: large populations of individuals making self-interested choices can produce cumulative counterintuitive results such as 'the invisible hand of the market' or growth beyond environmental limits.

Resource depletion and pollution effects have been a consistent aspect of ecosystem dynamics and cultural evolution alike and both can be seen as mechanisms by which limits to growth are tested. We have only to review the examples explored by Jared Diamond in his book *Collapse* to find numerous cultures whose conscious, social choices led to dramatic environmental degradation. The artistic perfection of the Greek columnar orders developed within the tightly bound societies of city-states that were turning the Greek peninsula into near desert. It is the familiar pattern of cultural evolution and growth beyond environmental limits that sustainable design needs to understand. Hughes used the concept of momentum to avoid the assumption of development-toward-perfection typically bound up with evolution, but non-deterministic understandings of natural selection have been more fully developed since then by systems ecologists and ecological anthropologists studying self-organisation in ecosystems.

Beginning with Alfred Lotka's efforts to reconcile natural selection with the principles of thermodynamics, H. T. Odum and his colleagues developed what can only be called system principles of growth and development. In the briefest form, system ecologists argue that complex systems of all kinds self-organise to maximise their conversion of useful energy and that over time they develop specialised hierarchies of production and multiple, indirect pathways of reinforcement to enhance their power. We can recognise that pattern in the food chains and succession of species that lead to the climax forest which is perhaps the clearest image of sustainable production, and equally in the development of the global, metropolitan system which is seen as its opposite. Forests and cities operate with

very different mechanisms, so transcending the metaphor involves the thermodynamics of social dynamics themselves.

The anthropologist Thomas Abel has charted the distribution of resource and energy exchanges within the socio-economic classes of technological civilisation, revealing the thermodynamic basis of the familiar hierarchies of wealth. His work helps to explain how the tremendous gains in technological efficiency of the last two centuries, as well as the increased productivity of specialised economic roles, have contributed to our massive wealth. The most immediate lesson may be the caution that efficiency is primarily a technique for maximising power, not for reducing consumption, so we have to think differently if we are trying to head off our encounter with environmental limits. Farmer has explained the power of architecture to combine technological achievements with their social representation, which I would argue becomes a method for sustainable design when it is used strategically within the social hierarchies of production and wealth.

In *The Eighth Day*, R. N. Adams called the intertwining of technology and representation an 'energy form' specifically to include social and material forms of amplifying and concentrating power. We have been using the term 'thermodynamic narratives' to make explicit the social and cultural dimensions of those forms, which help replace the technical goal of increased efficiency with more complete accounts of wealth and prosperity. Thermodynamic narratives in architecture would include the all-glass skyscraper, which currently reigns as the symbol of the most powerful civilisation to emerge on the planet, and the self-sustaining survivalist retreat, which might be its opposite, a dystopian image of the encounter with biophysical limits. The full-bodied nature of such narratives unites the pursuit of power with the forms of its realisation in a social account of sustainable design.

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From sustainable architecture to live projects: reflections on 'three ways of practising sustainable architecture'

Graham Farmer's paper in *arq* 17/2 (pp. 106–119) provides valuable insights into four main themes of sustainable architecture within a larger theoretical context than is often recognised within both the architectural profession and design educators at large. These four themes are:

1. 'Design as politics': we have a choice to see sustainability as both a human-led and social process as well as a tool that leads to technical innovation;
2. Two views of design: the technical and the aesthetic;
3. Individualism in design: critiquing the popular conception of design as generally limited to individual designers designing individual objects;
4. Live projects: sustainability as an enabling and participatory process within live projects.

While much of Farmer's paper is illuminating in its close dissection of how we might expand our current thinking on sustainable architecture, I am left with no clear impression of what is Farmer's own concise view on the 'sustainability' word or movement, and how this connects to the live project case studies examined in his paper. Without clearer definition of the much lauded (and potentially overused) 's' word, my reflections here are based on two themes: 1) The range of literature currently available in the sustainable architecture field, and 2) The emerging and popular design education model of the 'live project'.

Sustainable architecture

Farmer claims early in his paper that 'there is little scholarship to date on the kinds of design-based practices that might contribute to addressing environmental concerns'. While it is not my own specific field of design research, it is still hard to ignore the plethora of commentators in the design and sustainability field over the last decade. From William McDonough and Michael Braungart's seminal work on ecological design and industrial waste, *Cradle to Cradle* (2002), to Jason McLennan's *The Philosophy of Sustainable Design: The Future of Architecture* (2004) and Tony Fry's *Design Futuring: Sustainability, Ethics and New Practice* (2009), I would suggest that, next to the publication of architectural monographs on

individual architects, books on sustainable architecture crowd the bookshelves and websites of most design publishing houses and bookstores. Whether any of these books are actually contributing to raising global awareness about sustainable development within the architecture profession is, of course, harder to measure. Clearly though, the field has expanded rapidly since my own architectural education in the 1980s when the term ‘sustainability’ had little currency for my generation of students immersed in themes *du jour* of that decade – be that Postmodernism, Deconstruction or the seeds of the celebrity architecture culture that is now so embedded in the public’s view of the architecture profession.

Perhaps of most concern both in Farmer’s paper and much of this literature on sustainability within the architecture profession is the inexplicably limited misunderstanding of the sustainability literature and its confusion with eco-design. Definitions of sustainability and sustainable development are commonplace. Yet most are ignored in the architectural literature. The roots of the most commonly held definitions of sustainable development are found in the Brundtland Commission’s oft-repeated argument:

The environment does not exist as a sphere separate from human actions, ambitions, and needs, and attempts to defend it in isolation from human concerns have given the word ‘environment’ a connotation of naivety in some political circles. The word ‘development’ has also been narrowed by some into a very limited focus, along the lines of ‘what poor nations do to become richer’, and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of ‘development assistance’. But the ‘environment’ is where we live; and ‘development’ is what we all do in attempting to improve our lot within that abode. The two are inseparable.

Thus, the Commission defined sustainable development as ‘the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs [...]’. It went on to add that ‘the concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organisation on environmental resources and



2 The Straw Bale café at the Holme Lacy campus of the Herefordshire College of Technology UK, partly built by postgraduate students from the University of Nottingham, UK

by the ability of the biosphere to absorb the effects of human activities’.

In their books *A Short History of Progress* (2004) and *Collapse: How Societies Choose to Fail or Succeed* (2005), Ronald Wright and Jared Diamond respectively remind us there are all-too-numerous accounts of how once-prosperous societies have collapsed. While I do not hold to such a doomsday philosophy for society or the future of design, the reality is that we are moving globally into uncharted waters and almost certainly not all current societies are likely to be sustainable into the future and will be ousted by the laws of nature they intentionally or unintentionally flout. Instead of the collapse that Diamond predicts, we can choose to accelerate the transition to a sustainable future. How this applies to design has yet to be fully explored and might have been an interesting addition to Farmer’s musings on alternative ways of designing sustainable architecture.

Artists-architects

Farmer frames a common view of design as one that ‘is an autonomous and intentional activity carried out by individual proximate designers’ leading to the ‘aesthetic thinking of “artist-architects”’. While such a view is commonly held by the general public and design media, perhaps this is a fairly limited reading of contemporary architecture. There is now a significant critique of this self-serving model of practising architecture within both the profession and by design educators. From Bryan Bell’s work with the Design Corps and the Public Interest Design movement

to Cynthia Smith’s *Design for the Other 90%* exhibition and book, design is seen by many leaders, educators, writers and practitioners as both process and product and, first and foremost, as an ethical decision-making system, rather than a manufacturing one.¹

Live Projects

In the book *Live Projects: Designing with People* that I edited with Melanie Dodd and Fiona Harrison (2011), we defined live projects as a ‘teaching model actioned through the medium of the “live project”’: the live component of the project being the implementation of a client brief into an actual built product by design students, thus linking the often-contradictory worlds of abstract design pedagogy with a socially based design practice that literally ‘hits the ground’. Again, the live project model was also extensively explored in the work of Jeremy Till and Tatjana Schneider in their work with Sheffield University students and referred to in their innovative book on ‘other ways of doing architecture’, *Spatial Agency* (2011). Farmer explores three live projects: the Nottingham House, the Straw Bale Café and the Noah’s Ark Nursery School. All three projects involved students in the design and construction of structures that involved innovative construction techniques and design solutions. However, unclear in Farmer’s description of these projects are the following four issues: first, was the Nottingham house actually ever inhabited or was it a design prototype for an abstract client and, if so, is it really a ‘live project’? Second, how were users consulted in any of the three projects? For example,



3 Students constructing the prefabricated straw bale walls of the Straw Bale café

in the Noah's Ark project outside Johannesburg. Farmer admits that most of the consultation and design actually took place far from the actual site and community. Third, was there any evaluation of any of the live project studio models by/with the architecture students, staff or end users? And, fourth, what did students learn from the live project experience (after all, they were all learning experiences)? While Farmer describes the Straw Bale House Café project as leading to a process 'where sustainable design practice might be considered as an enabling, transparent and participatory process that is adapted to, and grounded within particular local ecological conditions', would not most architects make the same claim for most of their projects?

Finding ways to practise truly sustainable architecture is a laudatory aim. However, after reading Farmer's paper and his detailed dissection of STS scholarship, I am still

left wondering about his own definition of sustainable design and how this connects to the live project model that he has explored (with impressive results). The possibility of connecting sustainability concepts embedded through the pedagogic model of live projects is a powerful one. Such a connection in this paper, however, has yet to be fully argued.

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Many shades of live projects

Nothing warms the heart of a recent doctoral graduate more than the realisation that the subject of one's research has become the focus of increased academic attention. Recent years have seen a resurgence in research and discourse surrounding the live project in architectural education, including two UK symposia dedicated to live projects – *Live Projects 2011* at Queen's University Belfast and *Architecture Live Projects Pedagogy* at Oxford Brookes University in 2012 – and several books: Esther Charlesworth, Melanie Dodd and Fiona Harrison's *Live Projects: Designing With People* (2012), Robert Mull et al's *Intercultural Interaction in Architectural Education* (2011) and Harriet Harris and Lynnette Widder's *Architecture Live Projects: Pedagogy Into Practice* (in press). There has even been the odd Ph.D.²

The difficulty with advancing our understandings of architectural education through the critical evaluation of live projects – especially those with built outcomes – is that, as a profession, we tend to prioritise and valorise product over process.³ Until recently, academic literature surrounding live projects in architectural education has sadly been limited by papers that are either descriptive in nature (e.g. 'our students have completed this live project, and here are some photographs of them building it') and/or promotional in their intent (e.g. 'look at our students benefiting less fortunate Third World citizens during their summer vacation'). It is significant, however, that the discourse surrounding live projects has now matured to the point that they are no longer discussed as the subject of academic research but as a medium for broader discussions about architectural theory, research and practice.

In a *JAE* article with Simon Guy, 'Reinterpreting Sustainable Architecture: The Place of Technology' (54:3, 2001), Graham Farmer observes that 'the search for consensus that has hitherto characterised sustainable design and policy making should be translated into the search for an enlarged context in which a more heterogeneous coalition of practices can be developed'. Writing in *arq* 17/2 (pp. 106–119), Farmer uses three very different live projects undertaken by students of varying academic levels at the University of Nottingham as illustrations of an

argument for the theory-informed research, teaching and practice of sustainable architecture. These projects are presented not as three examples of what live projects can look like but instead as three illustrations of how just such a heterogeneous coalition of practices might be realised in architectural education.

Farmer's tripartite distinction between sustainable design as de-contextualised practice, context-bound practice and contextualising practice brings to mind Timotheus Vermeulen and Robin van den Akker's definition of metamodernity. Metamodernity, they argue, is 'characterised by the oscillation between a typically modern commitment and a markedly postmodern detachment [...] situated epistemologically with (post) modernism, ontologically between (post) modernism, and historically beyond (post) modernism'. Whereas postmodern theory provides a certain theoretical slipperiness for practitioners and pedagogues alike, emerging post-postmodern theories (whether Charles & Lipovetsky's 'hypermodernity', Alan Kirby's 'digimodernity' or Robert Samuels' 'automodernity') seek to grapple with not only postmodern subjectivity but also an essential fluctuation between tendencies that are clearly both modern and postmodern. So, rather than conceptualising sustainable design as either the development of predetermined and de-contextualised standards or context-specific responses, Farmer favours instead a particular disposition to hybrid practices of sustainable design – what Vermeulen and van den Akker might describe as oscillating tension, a *both-neither*, between scientific positivism and social constructivism.

How can we in architectural education prepare our students for such an approach to sustainable design practice? As architectural educators engaged in the delivery of live projects have discovered, the hands-on engagement with a client external to the academic institution, and the realisation of a tangible outcome for that client, brings unparalleled opportunities for critically reflective learning about sustainable design. The difficulty is that live projects can be difficult to integrate within institutional frameworks, especially the academic calendar itself. My own research has found that the immense complexity of live projects, both social and architectural, can become an



4 Construction of the timber structural frame of the Noah's Ark Nursery School in Jouberton, South Africa by graduate architecture students from the University of Nottingham, UK

obstacle to learning. In the words of one architectural educator describing a discontinued end-of-term live build project, 'they [the students] were so obsessed with the construction and the literal nuts and bolts, that that's what they would end up discussing rather than the real architectural discussion'.⁴

Many architectural educators resolve this constraint by separating out the realisation of live projects from their academic assessment, marking a critically reflective document submitted a period of time after the completion of the project. Although architectural education is primarily assessed through the portfolio, and although RIBA Validation Criteria emphasise that at least 50 per cent of all assessed work at RIBA Part 1 and 2 is to be executed as design projects, most academic institutions require educators to assess what a student has shown to have learnt rather than what a student has shown to have produced. The intersections of different academic and non-academic value systems are particularly visible in a live project. In the words of another architectural educator, live projects remind us that while the client who is external to the academic institution will value 'the thing', the architectural educator should value 'the experience'. Between these two, the student must negotiate their own live project.

We are now at a point where a number of British schools of architecture have been running regular live projects as part of their core curricula for more than a decade. The time has come to draw a line beneath mono-dimensional celebrations of live projects as instances of experiential learning and move towards a position in

which the many shades of live project become opportunities for educators, students and clients to engage in social constructivist pedagogies that fluctuate, as Farmer proposes, between de-contextualised standards and context-specific limitations.

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Notes

1. See <<https://designcorps.org>> and <<http://www.designother90.org>> [both accessed 1 December 2013].
2. James Benedict Brown, *A Critique of the Live Project*, Ph.D. thesis, Queen's University Belfast, 2012. Available online at: <<http://issuu.com/jamesbenedictbrown>> [accessed 18 November 2013].
3. Ruth Morrow, 'Creative Transformations', in A. Salama and N. Wilkinson (eds.), *Design Studio Pedagogy: Horizons for the Future* (Gateshead: Urban International Press, 2007), pp. 269–84.
4. Brown, *A Critique of the Live Project*, p. 218.

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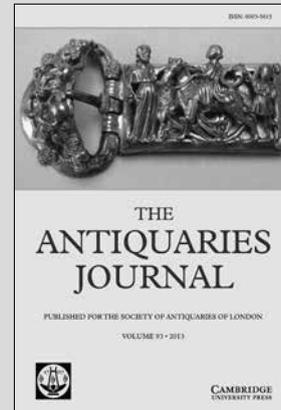
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