‘Kielder Probes’ – Bespoke Tools for an Indeterminate Design Process

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Abstract

Sixteen*(makers) are a group of practicing architects, academics, designers and makers who assemble when key questions surrounding design, fabrication, use and adaptability in architecture emerge. Initially, the group was formed out of a motivation to engage as designers with the physical and tactile aspects of production without a dependency upon drawing. Now, in the post digital age, the age of digital fabrication, boundaries between drawing and making, between the designer and the maker, have dissolved. Consequently sixteen*(makers) work is now engaged with questions of knowledge transfer, expertise, and innovation where modes of investigation are equally embedded within the analogue and the digital world. This article relates to our latest ongoing work which is due for completion in 2005/06. The work has been developed as a specific response to the award of an architectural residency by the Art and Architecture Partnership at Kielder Park, Northumbria, England. From the outset, it has not been a requirement of the residency that an outcome is identified early on. In fact, as I write, the outcome remains open.

Presented with an extraordinary site and coinciding with a time of rapid change the work has begun by exploring a design process that is adaptable, indeterminate, and informed by site conditions. In October 2003, sixteen*(makers)\textsuperscript{1} were awarded an architecture residency by The Art and Architecture Programme at Kielder (AAPK) of Northumbria, UK. This organization is well known for commissioning works such as the ‘Belvedere’ by Softroom and the ‘Skyspace’ by James Turrell. Coordinated by Peter Sharp, AAPK consists of a number of large public bodies, including The Forestry Commission, Northumbrian Water and Tyndale District Council. Together they manage a land area of 62,000 ha’s centred on the UK’s largest reservoir and surrounded on all sides by one of Europe’s largest managed forests.

\textsuperscript{1} Sixteen*(makers) were formed in 1995 by Nick Callicott and Bob Sheil, the practice now includes Phil Ayres and Chris Leung.
Responsive Architecture and ‘Paraforms’

Allied to the research of automated making processes, sixteen*(makers) are also concerned with the integration of constructs, the environments in which they reside, and the related audience. Such integration has the capacity to evolve buildings and building elements not only into customised passive constructs, but such constructs within active and responsive customised environments we call ‘Paraforms’.

Paraforms are responsive composites with highly adaptable behaviours designed to recognise audience needs, patterns of use, and modes of communication. Paraforms can respond to these elements by altering form and behaviour according to the acquired and specified knowledge of embedded microprocessors. Those that encounter Paraforms are met with something strangely familiar, an interactive architecture that invites users to shape and alter their environments. Paraforms may demonstrate interactivity through associated responsive behaviour, for example changes of physical property such as light emission, sound or form, or changes of content such as text or image. The making of interactive works is focused upon two principal aspects: the production and design of its responsiveness, and the conditions upon which the work is encountered.

Sixteen*(makers) present exploration of interactivity is informed by the broad manner in which audiences typically encounter physical works of art and architecture. In particular, it is critical of the ‘secondary’ experience of reproduction in which the majority of audiences acquire or supplement their immediate knowledge. Even the ‘actual’ experience of encountering works is commonly paralleled by the availability of elaborate catalogues, posters, and mass-produced copies of the material on view. However, interactivity in art and architecture has the capacity to dispel the distinction between an actual and a secondary experience and open up the potential for multiple ‘original’ experiences of no hierarchical value to both a local and remote audience.

Interactivity in physical constructs offers the work as ‘a system of parts’ for audiences to reassemble and manipulate in accordance with other events, contexts and needs. By validating their personal experience of the work, the audience’s reading is one of equal or even greater importance than that of the maker. The role of the artist or architect therefore has a shifted emphasis from one who prescribes to one who provides, and as many artists, and nearly all architects, do not make their work, such works also address the emergence of the designer/maker in future works in the public realm.

The Blusher Project

‘Blusher’ was composed of two systems, one a set of structural components for varied configuration of the form: The Skin, the other an integrated system of sensors and responsive elements: The Feathers. The first consideration for this experiment arose through ideas of behaviour.

‘Blusher’ was named in recognition of the common human response to an unexpected moment of contact, be it either one of pleasure or disgust. Such a response is particularly active in spaces where behaviour is, by tradition or habit, coded; such as a gallery, especially the pristine and white variety. Galleries, of one sort or another, were the elected venues for the national tour of ‘Making Buildings’ and so, during the initial phase of design ‘a gallery induced blush’ became the generic character to induce behaviour in the paraform.

‘Blusher’ would glow and ruffle its feathers if anyone came close, and intensify this behaviour if they came even closer. Its skin was sturdy enough to invite the uninhibited to climb or walk upon it (although this was only ever attempted by the very young). Such irreverence to the ‘look but don’t touch attitude’, was generated by our concern that ‘Blusher’ should be understood as a work of investigative Architecture rather than Art or Craft. Furthermore, it was intended that ‘Blusher’ should be considered as a work of potential for the making of buildings rather than a statement of absolute intent, a question rather than an answer.

‘Blusher’ second consideration was one of adaptability to site specific conditions. Prior information on each exhibition space was either too minimal or too slow in arriving and time constraints did not allow a cross country reconnaissance mission. ‘Blusher’ structural skin was therefore developed for a range of
approximate conditions; tall spaces, narrow spaces, low spaces, convoluted spaces, indoor spaces, and outdoor spaces. Decisions on how to assemble and install the work were taken on site in a few hours a day or so before each venue opened. This resulted in a unique configuration at each venue, either forming a singular construct, or by fragmentation a series of scattered pieces in accordance with the volumetric, institutional and organisational character of its host space. ‘Blusher’ would have a local and a generic state, in some way a demonstration of the process of making buildings.

The Kielder Residency

At the core of architectural practice is the gathering of information from which spatial and formal interventions are proposed. In itself this is the first act of design.

The territory of the forest possesses a variety of spaces with particular architectonic qualities. These qualities are continually redefined through changing edge, canopy, ground conditions, and varying degrees of density. These dynamic qualities are the result but also affect the strategic moves in the management of the territory as a whole. In turn, the management of such forests is emerging as a highly sophisticated and manipulated process where the consequences of mass harvesting are considered for their impact on the visual nature of the landscape as a whole.

The residency project will attempt to decipher and respond to these qualities. In this sense we are interested in exposing such issues as key concerns in architectural design practice. In doing so, it is anticipated that the work will question how a site, a sequence of sites, and components that define a site, may respond to configuration, patterns of occupancy, use and environmental cycles. In Kielder, of course, these cycles are both managed and unmanaged.

Aims, Objectives and Questions

To develop a design methodology in which built artefacts have the ability to become increasingly specific to location and purpose. To explore the inherent potential of manufacturing techniques to produce variety and difference in built artefacts.

1. Can notions of ‘growth’ and ‘adaptation’ become processes that actuate the design, manufacture and use of artefacts in the built environment?

2. How can architectural practice adapt to non-linear design strategies?

Kielder Probes

The first built output of the project will be a series of ‘smart’ surveying instruments or ‘probes’. The design of the probes is driven by two principal factors of the site. Firstly, the qualities of the site that interest us are in a perpetual state of change that requires surveying tools to measure difference rather than the static characteristics of any given instant. Secondly, the change that takes place varies in time-scale and speed, thus the surveying tools must be embedded on the site for a sufficiently long period of time to capture those changes. For long periods of time they will be on their own in which case they must be remotely accessible both to collect their data and possibly to reprogram them. These criteria necessitate the design and fabrication of new instruments, instruments that seek out rather than simply measure. Their data-acquisition strategy is a balance of opportunity, possibility and time with which to observe, measure, log, store and transmit site-specific data as information that can usefully inform a future architectural strategy. Exactly how the balance is weighted will only become apparent once the probes are settled on the site.

Kielder is an environment of exposure and isolation that demands some self-sufficiency for those that live and work there. To achieve their objective and cope with such an environment they must be robust and occasionally exercise autonomy, to this end their operating system will be delegated a degree of decision-making needed to balance work with ‘survival’.

In addition, for the broad purpose the residency, the installation of the probes is also planned as an architectural action. Their presence as customised objects designed and made for specific surroundings will present the first evidence of an initial design process. Connections with local conditions such as ground, vegetation, exposure and so on, will recognise uniqueness. It will be apparent they are made for Kielder and the dense repertoire that forms its identity and sense of place.

Sites to position the probes will also be chosen for varied character, aspect, proximity to a location.
of interest, and so on. So not only will they function as survey instruments, they will also perform a purpose of physical interventions. They will enclose a territory and alter its status from a seemingly random plot of topography into a place that anticipates future action. The probes are therefore being designed to elicit change by altering their own physical character; they will unfold, they will move, they will leave a trace, and after time they will be replaced by a new generation of architectural elements.

The time-based measurement of the behaviour of the probes on each site captures metadata (information about information) that is mapped onto a spatial-temporal representation of the site and the probe’s location within it. It is this representation that drives a virtual simulation environment to model the behaviour of the probe in the computer. It also provides information in real-time for the probe’s operating system to control its internal behaviour in the face of the changing conditions of its microclimate. The Kielder Forest and Reservoir present a territory of such scale that potential sites of interest can each have their own distinct microclimate. To capture the characteristics of each site with individual spatial-temporal maps is the focus of the probe’s design and will be the rationale for how each probe is sited. The study of the data they collect and the results of the virtual simulation will potentially inform their adjustment in-situ, re-location within their vicinity or replacement with a revised or entirely new intervention.

Unlike a conventional architectural survey that will produce a representation of a site with optical instruments such as a theodolite, the probes will embody a formal response to their respective site articulated by passive thermo-hydraulic pistons that move the probe’s body. The piston’s actuation is proportional to temperature within a specific range. There are two arrangements of the piston, one responds primarily to ambient (dry-bulb air) temperature and will be similar wherever the probe(s) are sited at a particular point in time, in some ways this will be deterministic because of the average climatic temperatures experienced in the region. The second is solar heated using a parabolic reflector which is more unpredictable as it is at the mercy of the site-specific characteristics of shade or exposure in the forest, minute-by-minute changes in cloud cover and self-shadowing by elements of the probe itself. There will be unpredictable availability and timing of the energy source(s) that drive the thermo-hydraulic pistons as conditioned by the weather and site microclimate, in addition the probe’s operating system will be programmed to have different responses (for and against) to harness the availability sun-light.

These are compelling reasons to expect each probe to exhibit unique behaviour at any given time on a specific site. We anticipate this will add a quality of uncertainty and delight for a visitor who comes across one of the probes while walking amongst the forests of Kielder.


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Figure 1. Kielder, Northumbria, England, April 2005

Figure 2. The Blusher, Venue 7: The Bartlett School of Architecture, UCL

Figure 3. The Blusher, Venue 7: The Bartlett School of Architecture, UCL

Figure 4. The Blusher, Venue 5: Aberystwyth Art Centre

Figure 5. The Blusher, Venue 4: Turnpike Gallery Leith
Figure 6. The Blusher Venue 1: The New Art Gallery Walsall

Figure 7. The Blusher Venue 1: The New Art Gallery Walsall

Figure 8. Kielder probe: ambient air temperature trace from thermochron®.

Figure 9. Kielder probe: simulation sequence of thermohydraulic piston actuation.