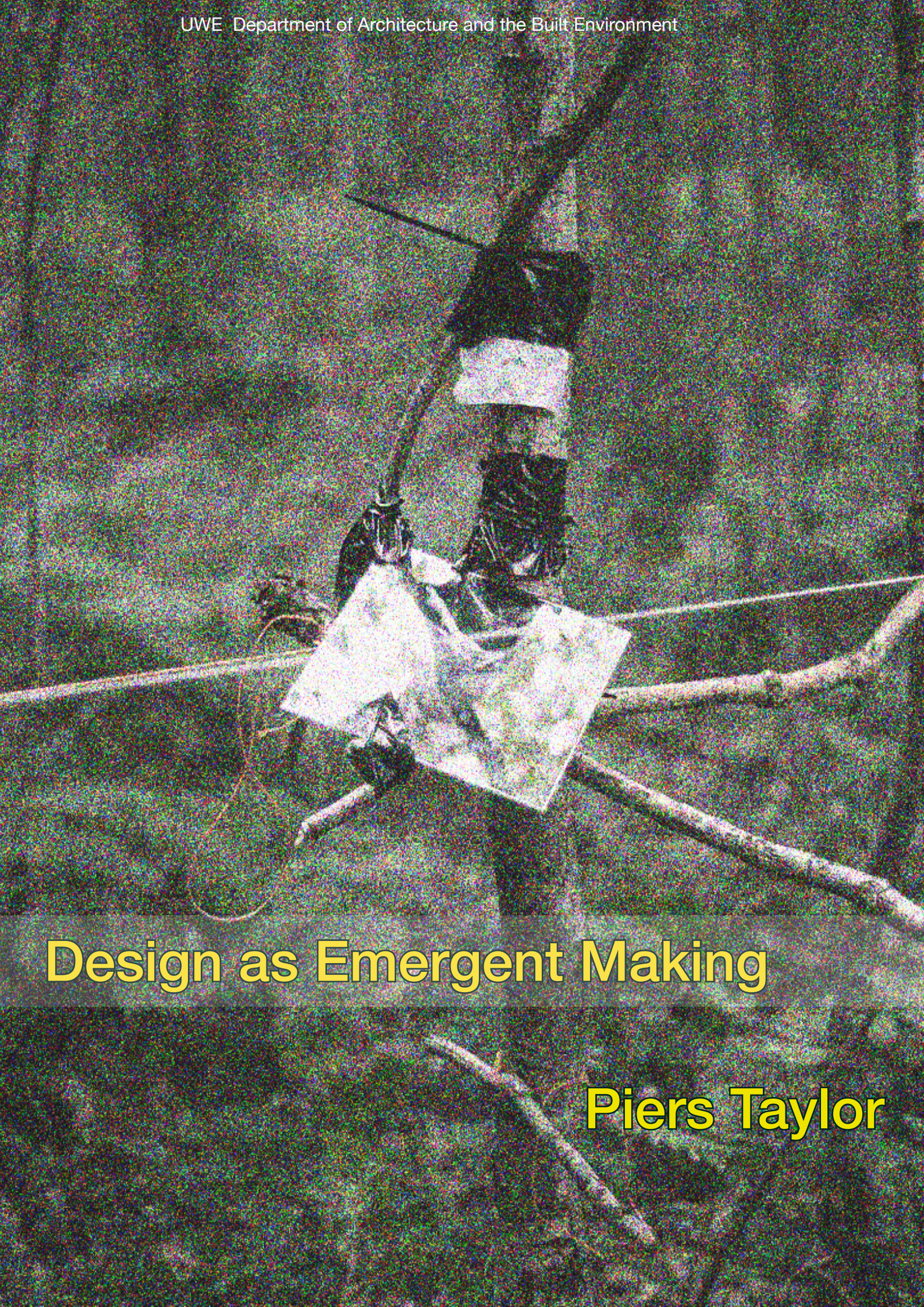
UWE Department of Architecture and the Built Environment



Design as Emergent Making

Piers Taylor

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Design as Emergent Making

Studio in the Woods (Solar Mirrors 2)
Accumulated Watchtower
Bound Canopy

1 Solar Mirrors 2, Studio in the Woods 2019. Kate Darby, Gianni Botsford & Collaborators

2 (Previous) Bound Canopy, under construction.

3 Accumulated Watchtower. under construction

CONTENTS

Biography

Dr Piers Taylor is an Architect, and is Professor of Knowledge Exchange in Architecture at UWE. He was the inaugural Studio Master at the Architectural Association for the Design & Make Programme at Hooke Park, a former Design Fellow at the University of Cambridge, an external examiner at the Arts University, Bournemouth and the Convenor of the annual Studio in the Woods workshop where ideas are tested at 1:1.

Piers Taylor is also founder of Invisible Studio, which is is a multi-award winning architecture practice which aims to be a different organisation from a conventional practice. They operate through collaboration, experimentation, research and education. They work internationally and very locally, in a variety of fields and at a variety of scales. They operate from a self built studio located in a working woodland which they also manage as an ongoing forest enterprise alongside practice, and have pioneered a number of academic programmes that rethink the relationship between design and making, where making is not a mechanism for simply providing us with some new form-making techniques which are inflected by their material realisation, but instead, is interested in making in terms of how material practice can address social and political questions.

Project Details

Author	Piers Taylor
Title	Accumulated Watchtower Bound Canopy Solar Mirrors 2
Output Type	Timber Structures
Projects/Dates	Accumulated Watchtower 2012 Bound Canopy 2017 Solar Mirrors 2 2019
Location	Accumulated Watchtower - Hooke Park, Dorset Bound Canopy - University of Reading, London Rd Campus Solar Mirrors 2 - Wyre Forest, Worcestershire
Teaching Team	Accumulated Watchtower - Piers Taylor, Charley Brentnall Bound Canopy - Piers Taylor, Charley Brentnall Solar Mirrors 2 - Kate Darby, Gianni Botsford
Student Team	Milon Thomsen, Adam West, Hannah Anderson, Adam Bailey, Stefan Gwynn, Paul Smith, Isabel Bazelt, Chanel Goodman, Alice Pitsili, Luciana Espinola, University of Reading Second Year Studnets (2017), AA Design & Make Students (2012)

4 Bound Canopy, 2nd Year Student Team, University of Reading

Statement about the Research Content and Process

Description

This folio considers designing and constructing timber structures in participatory groups both within an academic pedagogical framework at the University of Reading (B Arch) and the Architectural Association (Masters) and outside formal academic frameworks at the summer school Studio in the Woods to explore design through making with architecture students.

Questions

1 How can architects and architecture students using making as a design methodology?

2 How can making act as a vehicle for codesign

3 What needs to be 'framed' in order for design to emerge through making

4 What type of artefacts emerge via making practices

Methodology

1. Preparing conceptual 'starting point'
2. Preparation of materials and tools
3. Iterative and emergent design processes
4. Framework allowing involvement of students

Dissemination

These workshops and structures produced as a consequence of them have been the subject of numerous lectures internationally by Piers Taylor and other convenors including Gianni Botsford, Kate Darby, Charley Brentnall, Barbara Kaucky, Susanne Tutsch, Je Ahn, Lee Ivett, Zoe Berman and others, and has featured in a number of journals including Architects Journal, Architectural Review, RIBAJ and Dezeen. The projects have also been written about / discussed internationally in the context of teaching pedagogy.

Various films describing the workshops have been made for academic and non-academic dissemination. Studio in the Woods was also the focus of Piers Taylor's own PhD

Project Highlights

Since 2005, Piers Taylor has instigated and led numerous architectural 'making' workshops, initially outside of formal curriculum based and assessed academic programmes, and since 2010 within academic degree programmes with the formation of the Design & Make masters degree at the Architectural Association, and subsequently at the University of Reading.

The structures chosen for inclusion in this folio have several things in common. First, they sit outside conventional studio based will-to-form artefacts where objects are conceived of in advance of making, and making is a mute act of translation and realisation.

Second, the artefacts are all co-authored, via a variety of methodologies, via participatory groups with often mixed levels of abilities.

Third, they are all pieces of research in their own right – the structures all represent 'ways of knowing' and are vehicles for discovery, rather than artefacts that exist within their own right, as an end.

Fourth, they all expand current 'live project' thinking where live projects are conceived of as vehicles to expose students to real world situations similar to practice, to expose students to design-as-making methodologies, faced paced and dynamic non studio contexts, and provide opportunities to realise 1:1 full scale 'occupiable' spaces.

5 Studio in the Woods, 2007

Introduction

Through design practice, this research seeks mutually beneficial possibilities and connections that can be made between making and architecture. It asks how space can be discovered and accrued through full scale making, rather than pre-imagined via scale models, drawings and thinking in 'code space' typical of architectural practice, and what this teaches participants in these workshops.

This research also asks what needs to be put in place for these workshops to be framed effectively, allowing groups to work with a shared ambition, and to allow design to emerge via this shared ambition where making is an act of collective discovery. This folio also aims to describe the purpose of making as a process that can inform design, and show how emergent design can offer a new methodology with which to work.

I have spent the last 20 years testing ideas through making with students at 1:1 in a variety of contexts. When I founded Studio in the Woods in 2005, making practices in architectural education – certainly full scale making practices – had limited visibility in architecture schools or even outside them. However, over the last 20 years, architectural education has become increasingly interested in 'making' and what it offers students, and many schools look for opportunities to include making as part of students curriculum design work, although few schools reflect on the purpose of design other than a mere material practice. In this folio, making is repositioned as a social practice, and a research tool.

Three projects are described here, all with distinct and different methodologies.

The first (Solar Canopy) is a project at Studio in the Woods 2019 led by Gianni Botsford and Kate Darby.

The second is a project by Design and Make students at the Architectural Association's Hooke Park Campus led by me as the AA's Design & Make Studio Master (and Charley Brentnall AA Make Tutor).

The third is a project by 2nd year B Arch students at the University of Reading, also led by me with Charley Brentnall.

6 Top Left: Bound Canopy

7 Top Right: Accumumated Watchtower

8 Right: Solar Mirrors 2

Aims and Objectives

9 Inverse, Studio in the Woods 2007

1. To examine and advance the role of 'making' in architectural education
2. To examine making as a design methodology
3. To examine making as an effective vehicle for codesign
4. To realise artefacts and structures that could not be 'pre imagined' or willed
5. To examine site and context (social, physical) specific design

Context

Making as a Design Methodology

It is important to state that by 'making' I do not mean fetishistic approaches to material, tectonics, technique or 'craft'. The distinction here in the context of making is that I am not explicitly interested in material practices – and certainly not 'materiality' which is a typically superficial and phenomenological reading of (surface) material qualities.

The Cambridge English Dictionary (2019 edition) defines 'making' as 'the activity or process of producing something'. The term 'making' in the context of this folio typically refers to the full scale making of buildings or exploratory architectural structures – here, as a process of investigation rather than the mute realisation of an already pre conceived idea. This is in the context of architecture where - more than many creative fields - there is a binary distinction between designing and making, where 'making' for the most part happens after design (Oktra, 2021). 'Design' is usually an abstracted process during which an idea is conceived in the mind and communicated to others (non-architects) to make physical via a transaction comprising drawn information, which describes a material artefact in its entirety (Hill, 2008). This has been the norm for architects since the Renaissance, and continues to be formalised by institutions such as the RIBA with its industry-standard Plan of Work (RIBA 2021), which defines segregated work stages between design and construction, with all design work having been completed, and intended artefact fully defined, prior to the act of construction.

If Cross (2006) usefully defined 'designerly ways of knowing' where emergent processes could be harnessed through sketching, there is little reference to making as a design methodology to discover new configurations of form and material or as research to allow new discoveries and new ways of knowing. Making practices are often bound up in conventional notions of received technique or 'craft' – all of the projects described in this folio differ from this notion as they are made (by many standards) 'badly'.

The question of 'skill' in making is an important one, in that many methods of making prioritise and fetishize skilled practice in a manner that both discourages participation and investigation by focussing on technique and received practices, rather than, as (say) Ingold (2000) describes, skilled practice in makers as that which is a manner of sensory awareness rather than a technical applicated of a learned craft.

This is particularly useful in the context of participatory making with people who are not conventionally highly skilled makers. Ingold traces the history of the 'modern dichotomy between art and technology' which is familiar to many architects and designers who typically 'think' in a creative manner and let others 'make' in a technical one. Ingold describes that the emergence of this concept was bound up with the rise of a 'mechanistic cosmology' that separated design from construction, and reduced skilled making to 'merely technical' execution. (2000, pp 217-220).

Ingold (2000) describes a different manner of 'emergent' making where instead of artefacts emerging from the 'forcible imposition' of thought on material, they instead are 'built up' via the processes of making rather than having originated as a fully formed idea in the maker's mind. Ingold (ibid) provides a compelling description of making as a kind of 'dwelling' where he places emphasis on the 'skilled character of the form-generating process' rather than upon the 'final form of the object produced'. Although this is most applicable in Ingold's terms for craft based practices where an artefact emerges from the 'sensorially aware' practitioner, typically from the 'grain' of the materials that he or she is working with, and while this is a different manner of making than many architects are used to, I suggest we have much to learn from Ingold's description of sensorially aware skill if we rethink it as a tool for discovery – or research.

10 Students grading found material at Hooke Park, in the Assembly Workshop

Context

11 Oculus, Studio in the Woods 2017, Kate Darby & Gianni Botsford with Students

Making as a Vehicle for Codesign

Making' research in architecture contexts is widespread (Claypool, 2021), but it is predominately concerned with making as a technical concern, where digitally driven practices can offer opportunities for new formally complex artefacts or opportunities for control for architect/makers.

Social scientists Anderson, Danholt, Halskov, Hansen & Lauritsen's 2015 paper which that suggested there are few explicit discussions of what constitutes participation in participatory design literature. They also described that participants are network configurations (rather than individuals), there is no 'gold standard' for participation and while a variety of methods have been developed to include users and stakeholders in design processes, ensuring participation is complex. Anderson, Danholt et al (ibid) also describe how little attention has been given to developing analytical resources and conceptualising what participation is. Further, they discuss how participation presents three challenges to design.

The first is that participants are not stand-alone subjects but constituted and configured as actor networks. Second, participation is not premised by (mere) intentional action, and third, there is no mechanism or standard for an evaluation of the quality of participation, or indeed even distinguishing between participation and non-participation. In the context of architectural making, there is almost no discussion around effective participation, methodologies for participatory design.

Similarly while there are toolkits for participatory design (UN-HSP 2001, Joseph Rowntree Foundation 1994), most of these focus on participation prior to making, with participation ending once construction starts, and this participation framed as verbal or conversational rather than material based. In contrast, the projects described in this folio show how making can become the shared language of discovery.

Context

Methodological Structures to Allow Design to Emerge Through Making

The projects in this folio place emphasis onto the creative and design processes that give rise to an architectural project where design has a non-binary relationship with making, and to ask – as Ingold has in the ethnographic field - what the productive processes that bring architectural artefacts into being are, and how the generative currents of the materials in which they are made are reconciled and harnessed by the sensory awareness of practitioners (which Schön (1983) has made reference to in a studio context). All designers use 'methodologies' to design with, whether conscious or unconscious. In this context, methodology can be taken to mean the intellectual frame that the designer uses to inform the conceptual (and physical) shape of a project. While some designers are interested in the theoretical concerns of (say) formal modernism or classicism as methodologies that shape what they design, and where these methodologies focus on the aesthetics of made artefacts, for the projects in this folio, making is a methodology that can be used to inform the design process. Consequentially, we need to consider what strategies need to be put in place to allow effective integration of groups of mixed experiences that may contain cross-disciplinary co-designers, or even those that may not be aware that they are carrying out design.

The most conventional of making methodologies is that as typically proposed by the binary, unequivocal and definitive – or prescriptive – information produced to define an artefact in its entirely prior to construction. This is the most banal of making methodologies – particularly dominant in the 'new maker' movement as proposed by computer aided manufacture which, at its most extreme, banishes all discoveries that might emerge during the process of manufacture. For example, former head of the Bartlett School of Architecture Bob Sheil (2005) has an interest in absolute control over the process of making prescriptive information where the 'losses' that were (for him) an inevitable part of the 'negotiated transactions' between designer and maker, can be banished, along with, I would suggest, any opportunity for 'gain'. That there might be benefits in losing control eludes Sheil.

In this context it is useful to briefly discuss Ruskin and his interest in the Gothic. Ruskin made a case for the Gothic as being defined by six key characteristics (all explicitly anti-classical or anti formulaic) and it is useful to see these characteristics as a loose framework that allows the harnessing of contingent occurrences by unskilled workers. The first of these six characteristics as summarised by Spuybroek (2016) is the most interesting for us here, as it aligns with the possibilities suggested by descriptive rather than prescriptive instructions or less controlling methodologies. This is 'savageness' which equates to a form of primitivism, and is useful, perhaps, to think as loosely equivalent to the contingent, or unpredictable. 'Savage', writes Spuybroek describes: The workmen, the rough northern labourers, with their hands freezing, their heads in the mist and their feet in the mud, inevitably making 'mistakes' in their carving because of their 'rude' nature but also because of the open design system of the gothic, which at certain points leaves them to decide what to do, or to hesitate suddenly, and ultimately present us with 'failed, clumsy' ornament. All the same, it is the more beautiful because such savage details are markers of who the workers are, where they live and what they do' (2016 p 54).

What we see here is that instead of undermining the principle of a design or its realisation, these 'mistakes' - this savageness - make it better. In addition, this system of design allows a (design) input from its workers, instead of relegating them to (Ruskin's definition), mere slaves, executing a totalitarian plan. Spuybroek expands on 'savageness' later on (2016, p 150) with a description of how, although Ruskin placed it (savageness) at the top of his list of the defining feature of the gothic, Spuybroek considers it the result of other operations, not

11 John Ruskin: Savageness

their basis. For example, if we desire design to embrace contingency (or be set out with descriptive information that depends on judgment in the maker) as a mechanism for makers to exercise autonomous or at least interdependent judgement, we need to put other operations in place to allow this: we can't simply set out to design something with all relationships left to the contingent event. Indeed: the OED definition of 'contingent' is 'occurring or existing only if (certain circumstances) are the case; dependent on.' (OED, 2020)

In the context of information that is descriptive or prescriptive (or controlling or open), Richard Sennett (2009) provides a useful parallel between two separate practices by the architect Adolf Loos in the design of the Villa Moller, and the Philosopher Wittgenstein designing his own house. Wittgenstein struggles with reconciling the contingent, as things occurred during the process of design and construction, whereas Loos relished them. Sennett summarised the differences between Loos and Wittgenstein as similar as those between a good craftsman and a poor craftsperson, where the good craftsman places positive value on contingency and constraint. Loos made 'metamorphosis' occur by looking at problems on site as opportunities, whereas Wittgenstein neither was minded nor understood how to make use of difficulties. 'Obsession', (as a form of closed rigidity) writes Sennett, 'blinded him to possibility' (2009, p 530). As Sheil above, most architectural 'makers' are blinded to possibility. 'Possibility' is a useful word in the context of design, making and contingency, and the very thing that most reductive systems of manufacture seek to banish.

Context

Artefacts as Products of Emergent Making Practices

If conventional architectural practices seek control via relegating making to pre-prescribed risk free manufacture with design completed entirely in advance, we need to ask what type of artefacts emerge from making processes which are concurrent with design. If the process of making is different from a predetermined one, it could be expected that the artefact should be different.

The three case artefacts presented here share a language, derived from the processes that concern their emergence and, importantly, the manners in which contingent or relationships that are not pre-prescribed are reconciled. Culturally, architects have struggled with aesthetic decisions relating to made artefacts that they cannot directly control, as seen in much 'formal' Modernism and almost all architecture that dominates 'high' architectural discourse. Le Corbusier is reported to have been horrified when he returned 30 years later to Pessac, the housing scheme he had designed in France, to find that residents had adapted the Modernist buildings he had designed. When he referred to the dormer windows and pitched roofs and asked what the residents had added, he was reputed to have been told: 'Their needs'. Le Corbusier's initial system was intolerant of change or adaption – being 'concluded' and absolute in the manner of most Classical or Modernist Buildings.

Elemental Architecture have engaged a little with a different manner of architecture. Their 'half a house' housing in Quinta Monroy in Chile attempts to allow an agency to end users and occupiers the houses they designed by building an unfinished project with a gap that encouraged autonomous infilling. However, many architects describe the project as an aesthetic disaster, with comments on Dezeen where the project was published that include: 'The absence of an architect or designer to make the houses more aesthetically appealing struck me immediately… a slum aesthetic… the fate of poor people is to live in junkyards' (Winston, 2021).

Almost every student design presentation is a predictable presentation of a complete 'vision' for a building, where every component can be anticipated and represented, by a single author: very different from the works presented in this folio, and of course very different from many major works of 'architecture' including Notre Dame or the Grade 1 listed Elizabethan St Catherine's Court which sits across the valley from the my studio and of course most vernacular buildings. Culturally, as architects, we cannot easily engage with processes that allow manners of working than are less controlled than pre-imagining and pre-defining every component. If we look at most RIBA Award winning projects of 2017/8/9/10/11/12/13 we can see that almost all of them were delivered in a similar manner: with that of a concluded vision set out in a definitive set of pre contract information designed to be transacted to another with an instruction to build.

12 Elemental Architects, Quinta Monroy Housing, (After)

13 Elemental Architects, Quinta Monroy Housing, (Before)

Three Projects

The three projects described here are all small scale, participatory, conceived in different manners, but all via emergent processes which prioritised design as discovery via making.

Accumulated Watchtower

Accumulated Watchtower was an introductory project led by me (as Studio Master) at the Architectural Association's Hooke Park campus for 5 students in the 1st term of their 16 month programme. A formal 'brief' was issued to explicitly explore the potential offered of designing through making which I felt under explored at AA design & make thus far since its inception.

The project was constructed over 2 weeks, without conventional representation via drawing as part of its conception. The point of a simple one line (to the point of banality) suggestion of programme was to provide an intent of what the structure would do. Other ways in were the provision of the material intent and context (scavenged branches within 30m and no mechanical fixings). There was also a demand (framed as a health and safety concern) born from observations that (often) the most interesting structures are temporary ones – the site works that are born from an immediate necessity such as scaffolding, rather than the premeditated architecture that the improvised and temporary is designed to enable, before disappearing. The demand was also born from observing the conceptual wastefulness of temporary processes not being 'observed' or simply banishing, with the 'beginning' of an architectural life often coinciding with scaffolding being struck, and concluding just prior to occupation.

Because of the framing of the project in these terms, instead of drawing, students found a way in through site, connection, material and process (of construction), and the resulting structure is a three tier tower born directly from embodied engagement without any empirical measurements or setting out. The retrospective drawing is overly simplistic, added as a record, with the digital 'frame' of CAD dumbing down and regularising the members and their relationships. Indeed, the drawing is an expression of the limits of this tool: if it had preceded the built piece as the mechanism of its discovery, there is little doubt the tower would have been regularised. The tool for any discovery is, of course, critical.

14 Accumulated Watchtower (complete)

Accumulated Watchtower

The project was framed by the prescriptive brief (opposite) which was (in turn) descriptive - defining (or framing) an approach and a methodology for deiscovery.

15 Students scavenging material (as prescribed in the brief)

16 Accumulated Watchtower Brief

Core Studio - Proto-Constructions: Accumulated Watchtower

Accumulate: accrue acquire add to agglomerate aggregate amalgamate assemble bring together cache clean up collect collocatecompile concentrate cumulate draw together expand gain gather grow heap heap together hoard incorporate increasel oad up lump make a bundle make a killing mass pile up pile procure profit rack up roll up round up scare up stack up stockpile store store up swell unite

Watchtower: barbican, beacon, landmark, lighthouse, mirador, observatory

The key ambition of the project is to design/make a lookout structure that offers a transformative experience of landscape and is defined by the following:

Landscape

The structure should allow users to be elevated within the tree canopy in the forest at Hooke Park, and ideally allow a long distance view. It could, in part, gain its form from fitting between the existing canopy.

Structure

The watchtower should use a constructional technique whereby it is self-scaffolding – ie it can grow in a piecemeal and organic from the ground up with no (or few) temporary access platforms.

Material

Part of the woodland is currently being thinned of small section broadleaf timber including Oak, Sycamore and Willow. The large sections are being cut and stacked as cord wood for fuel: the smaller 75 mm downwards branches are waste and will be stacked up to rot. This material is potentially strong, versatile and underexploited in construction. You should aim to explore the possibility of this material.

Connection

The watchtower would ideally use no mechanical fixings – but instead use (biodegradable) bindings to connect the members (as traditional bamboo scaffolding).

Process

Instead of there being a merely reciprocal relationship between designing and making – you should aim to work in such a way where there is no distinction between the two. Traditional techniques such as computer modelling is discouraged at the early stages of the project – instead, you are encouraged to work in real time, full scale and exploit the potential of instinct, judgement, visceral feedback and be agile enough to seize the opportunities offered by accidental discoveries. You are encouraged to begin with physical experimental prototypes.

Ad hoc

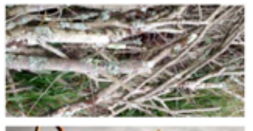
This in not (necessarily) a pure structural form. Structural redundancy is not necessarily, in this context, a bad thing – if it allows the ad hoc accumulation of a structural form that can grow – rather than emerge from a precise cutting list with predetermined relationships.

Consultants

Je Ahn and Maria Smith of Studio Weave will join us at times for debate, encouragement, and tutorial support

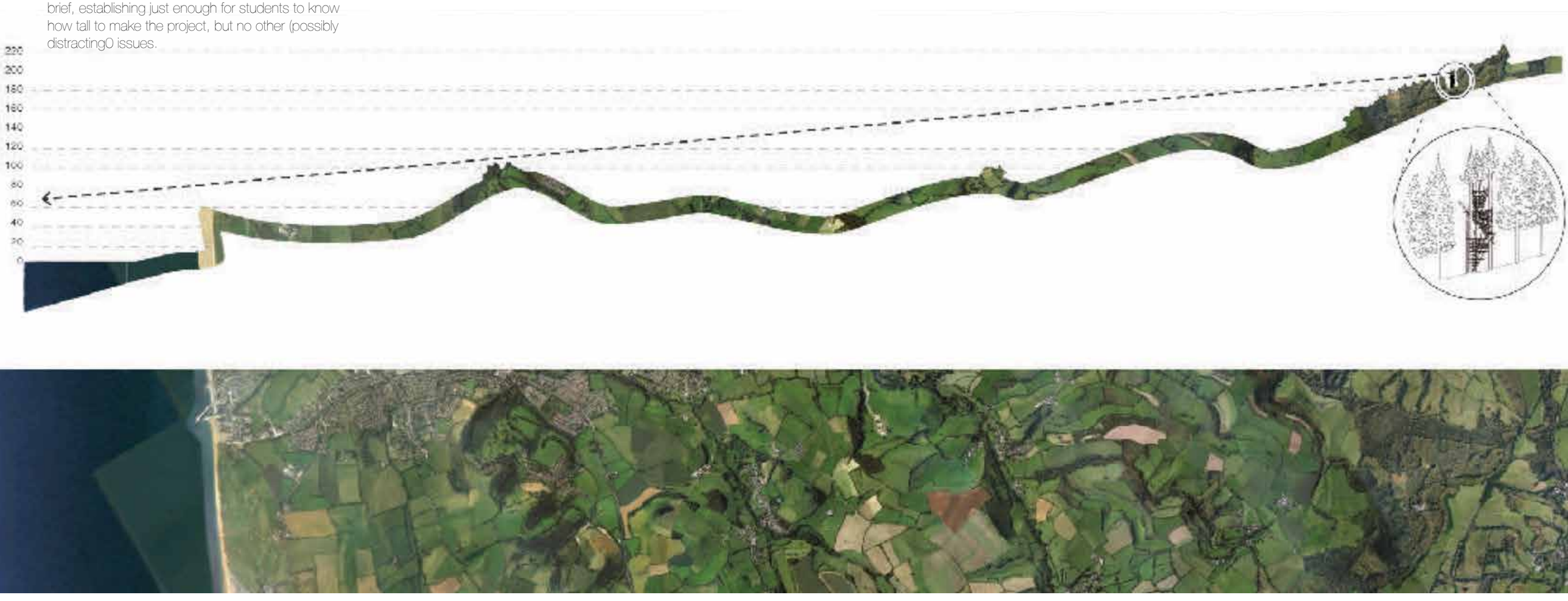
Piers Taylor 2012






Accumulated Watchtower

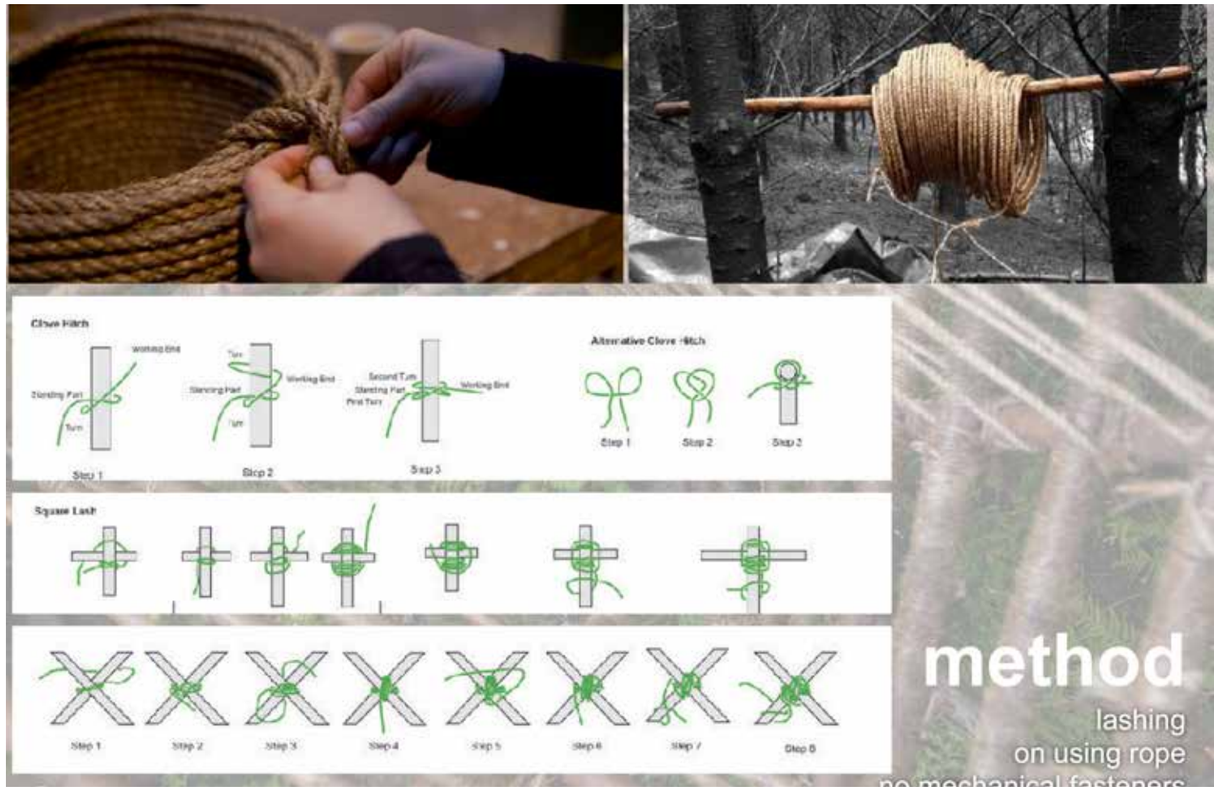
Student drawing produced retrospectively showing ambition for the project, reflecting simple (one line) brief, establishing just enough for students to know how tall to make the project, but no other (possibly distracting0 issues.



17 Accumulated Watchtower: Student produced plan and section

Accumulated Watchtower

Establishing a method for the bingings involved students trialling lashings in Assembly Workshop, before setting out bindings to be used for different members and procedure.



18 Avove: Student drawings of bindings and method

19 Left: Omri (Student prototyping bindings

Accumulated Watchtower

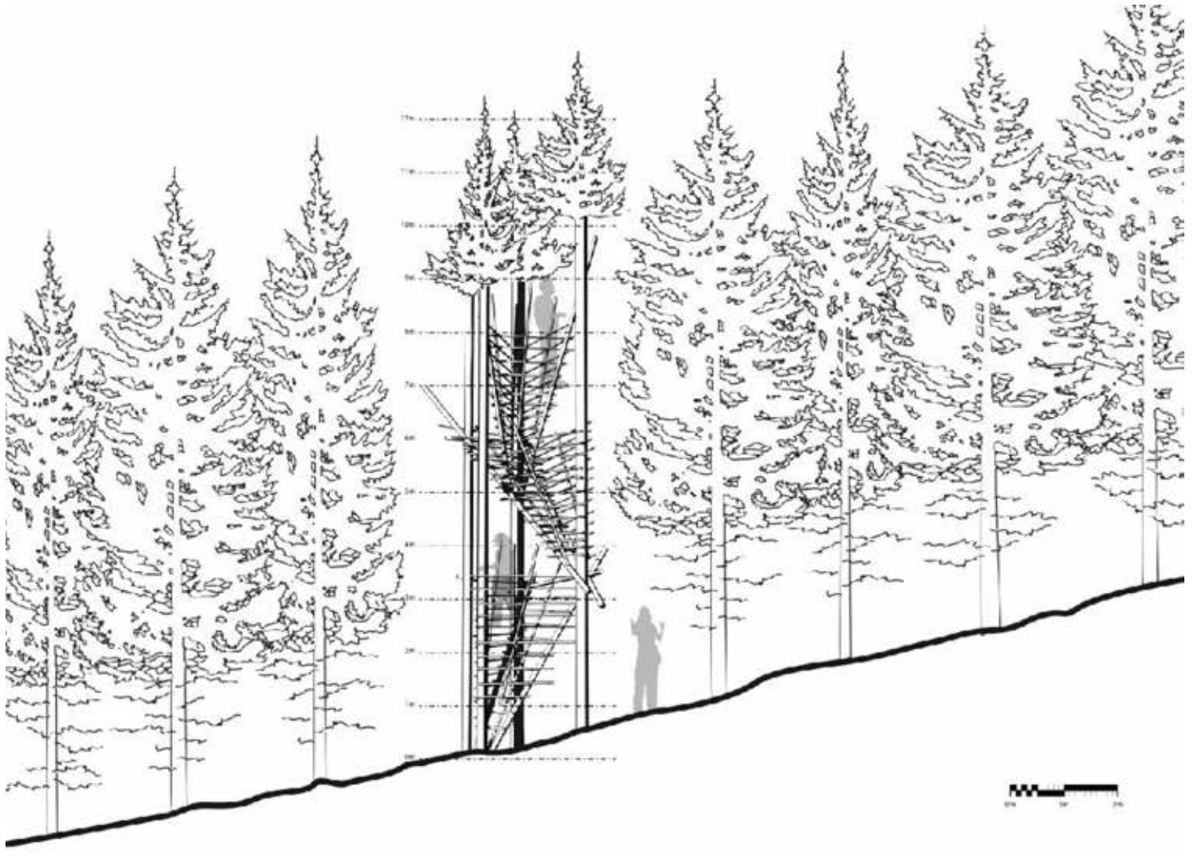
Process images showing how sequence of construction and site context defined emergent form. Forester Chris Sadd looks on.

20 Left: Getting Started - initial tier, showing form beginning ti be generated by process of construction

21 Right: First tier almost complete

Accumulated Watchtower

Final configuraltion -although designed to degrade and question 'finality'. Banal and over simplistic retrospective as-built shows regularised structure, and hints at consequences of 'preimagining' or will-to-form thinking.



20 (Previous) Looking up.

21 Left: Looking doiwn

22 Right: As built drawing

Bound Canopy

Bound Canopy was a four day project led by me with collaborator Charley Brentnall at the University of Reading to provide 2nd Year B Arch students experience with full-scale hands on making at the end of the summer term. Students took part with few expectations and no form agenda. My own agenda was to allow them to experience design through making and allow the entire cohort (45 students) to work simultaneously and safely with few tools or equipment. My initial framing of the project was one of an analogue 'bound' gridshell that could 'fit' an external courtyard at the school of architecture.

In abstract and in advance I had had milled green larch boards in 125 x 12.5mm sections, approx 2400mm in length, and bought numerous cable ties as a 'kit' of inert parts. If most gridhells are optimised for structural efficiency, here, I was interested in the loose template of a gridshell as a framework as a starting point to allow a collective discovery of form and component relationships within an inexperienced student cohort who needed clear direction.

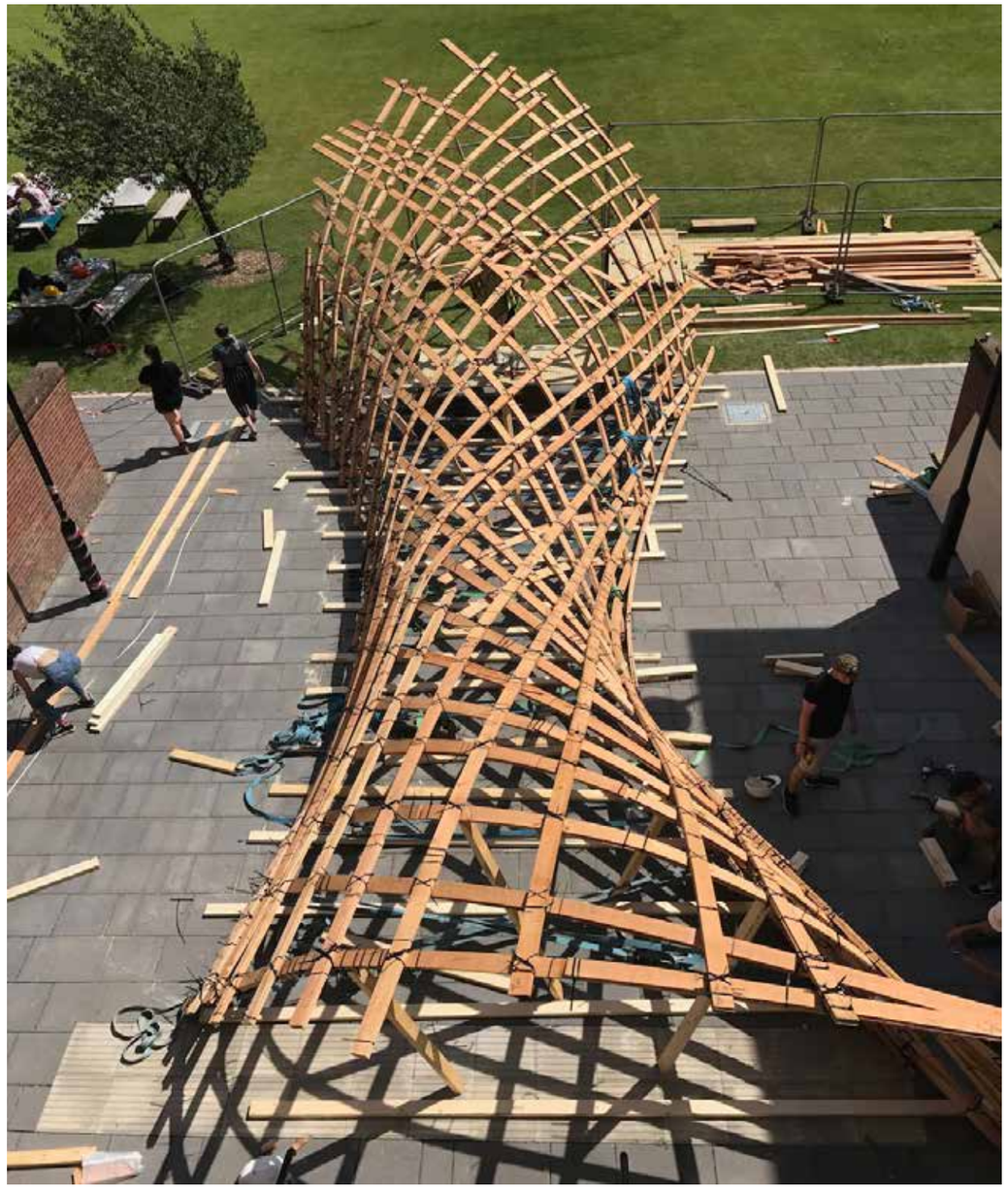
To explain the key idea to the students, unusually (for an emergent design/make project) we used model making as a way in. Under Charley and my direction, we:

- Cut thin strips of card at approx 1:20 to represent timber sections
- Prepared base representing courtyard
- Laid out strips by eye with no measurements, crossing in two directions in two layers
- Bound overlapping connections with wire
- Manipulated by hand 'squeezing edges of flat lath mat together
- Realised form was 'tunnel like' without articulation so:
- Laid flat
- Scalloped edges of set out
- Squeezed edges together and fixed by glue gun onto card base
- Collectively evaluated the 'found' form.

Agreeing we'd use this 'found' form as the basis for the full scale piece we cut the model off its base and flattened, before drawing around 'laths' to create a scale plan, and added a grid to facilitate full scale setting out. Full scale laths were then made by students (twin layers of larch strip with staggered joints, bound with cable ties.

Using the scale plan devised, these laths were then set out on site in two layers, with cable ties where the laths crossed, left loose, assuming that they would tighten as the structure was bent into place.

Working simultaneously, students then lifted the centre of the lath mat onto saw stools, before lifting the centre higher with loose timber members, before attaching ratchet straps across the sides, gradually tensioning the structure into a relatively stiff form. Working slowly but collectively, this process took two days. The structure was then temporarily 'locked off' at ground level, before a floor added to stabilise the gridshell.

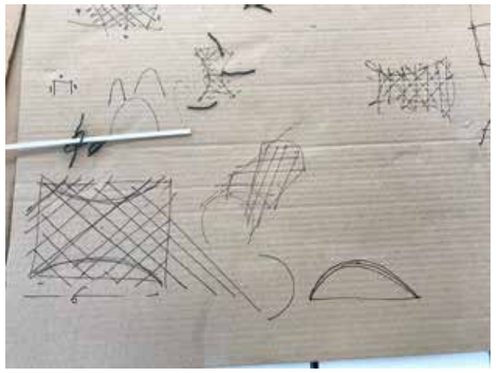


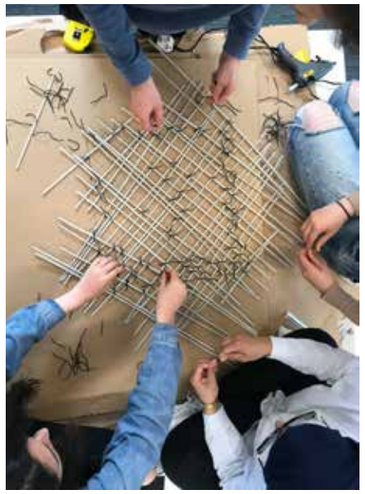
23 (Previous) Completed Watchtower.

21 Initial Workshop

22 (Right) Bound Canopy Under Construction

Bound Canopy Process



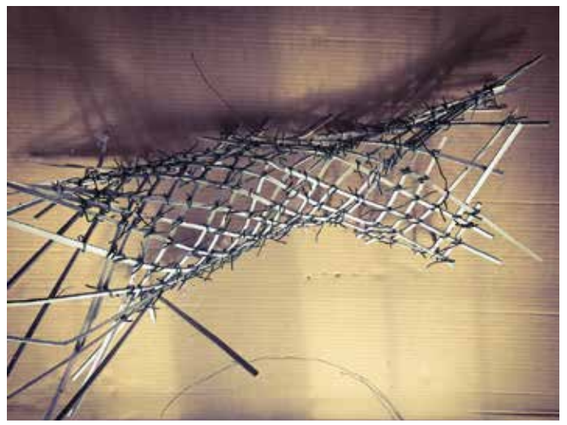


24 Initial sketches setting out process and showng modelling materials

25 Model making - laying out laths

26 Binding lath junctions with wire

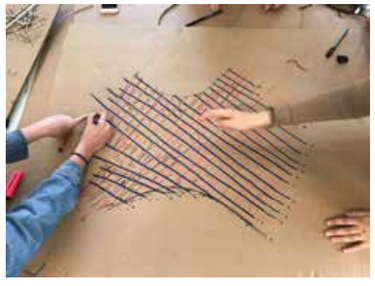
27 Form finding with model

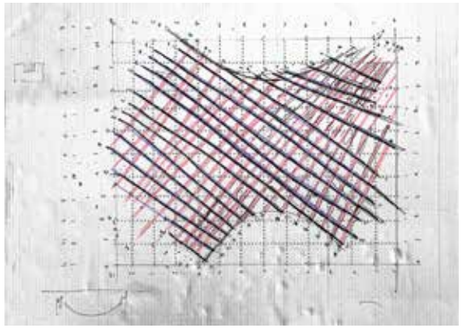


28 Form finding with model while base is glued into position

29 Sketch model glued to base

Bound Canopy Process

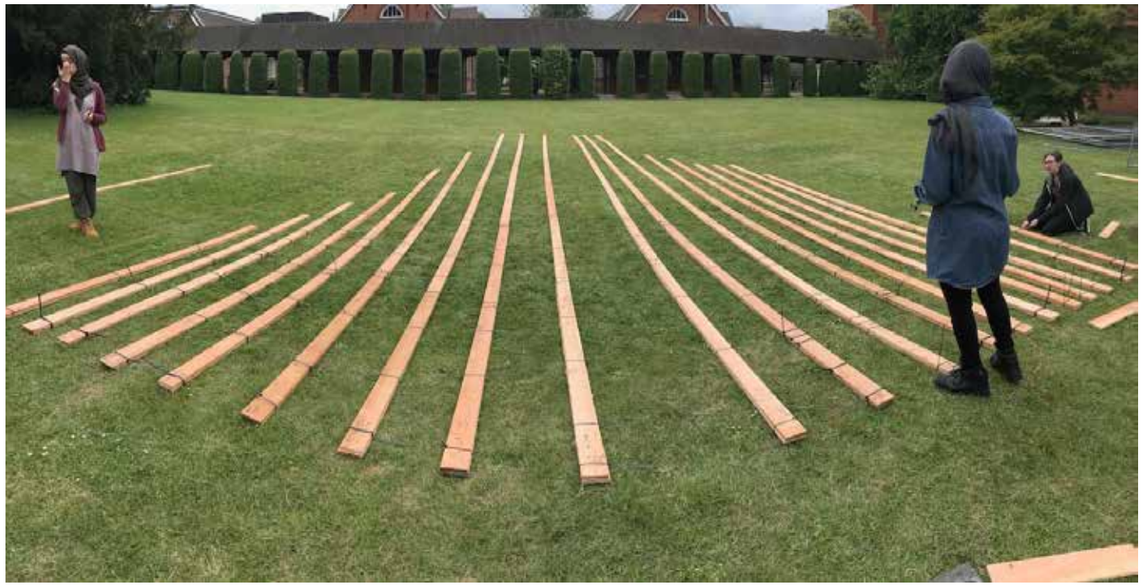




30 Drawing over flattened model to create scale plan

31 Defining layers (top v bottom)

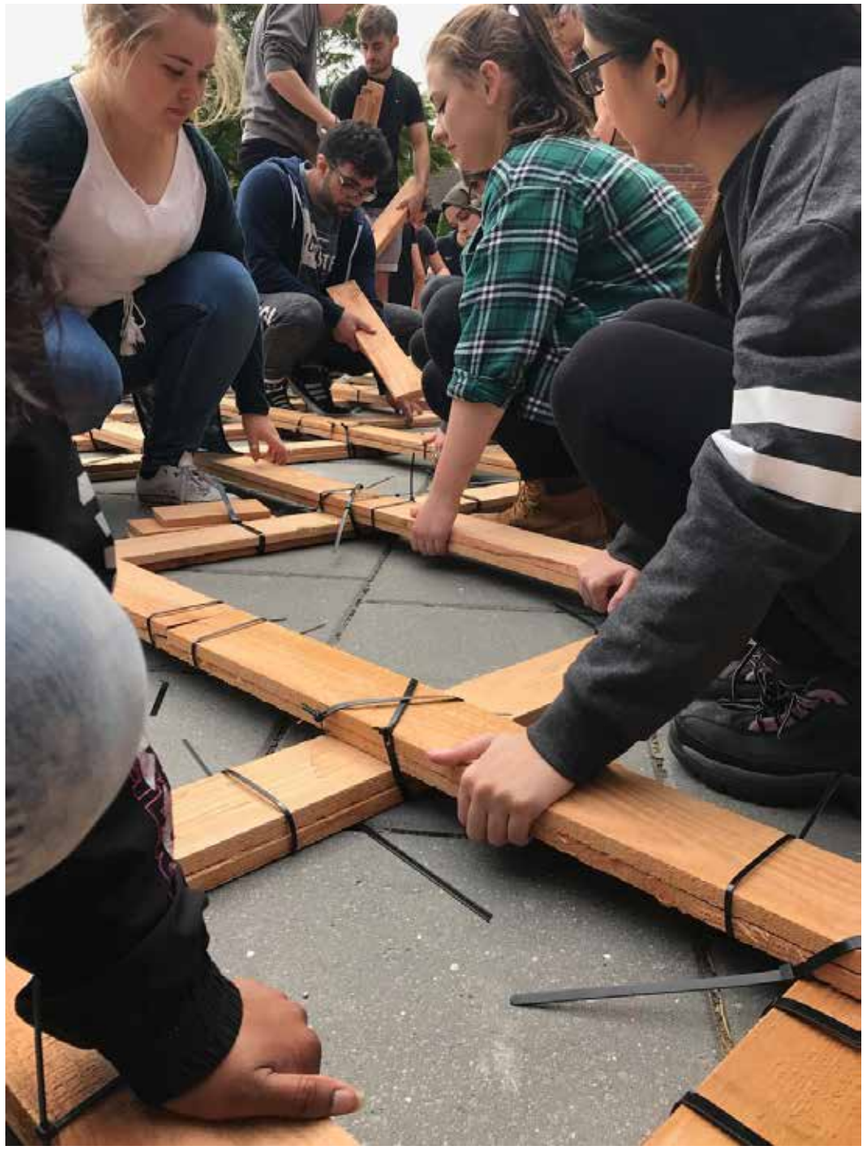
32 Setting out plan with grid overlaid to aid setting out



33 Fabricating laths based on scaling off plan

34 Setting out laths based on plan

Bound Canopy Process



35 Preparing to lift

36 Finalising cable tie bindings

Bound Canopy Process

37 After first lift with centre supported on threstles

38 Using timbers to prop ends

39 Adding in rachet straps to tension edges across base

Bound Canopy Process

40 Continuing to tension rachet straps and simultaneously push up with loose timbers

41 Final form with timbers being added in to fix form across base

42 (Next) Final form with floor covering floor tensioning timbers

Solar Mirrors 2

Solar Canopy was a project constructed at Studio in the Woods 2019 in the Wyre Forest in a group of 12, led by architects Kate Darby and Gianni Botsford. Studio in the Woods is a 4 day summer school that sits outside any academic programme. Participants work in groups led by (typically) a pair of architects, who 'pitch' for students at the beginning of the event by framing their agenda to all participants (as with a unit within an architecture school) who then select a group. Botsford & Darby initially framed the project as not 'designing' but instead using a 'way of seeing' as a piece of built research to discover something phenomenologically about a place. They explained that this phenomenon is usually light, and this year, they would indeed continue to work with light and had an ambition to work with reflected light in the darkest part of the forest.

Botsford & Darby issued each participant in their group with a small mirror, describing that they often used a 'tool' to reveal or see a particular environmental or phenomenological condition. The group visited several sites Botsford & Darby had pre-selected as having potential to be affected by light. The group agreed that the final site, around a mature Yew tree would be where they would work. Botsford & Darby pointed out various holes in the tree canopy that participants could begin to work with, potentially affecting the space under the Yew.

With the mirrors that they had been given, participants began to use them to reflect light from the canopy above towards the space under the yew canopy below. This was a key event that precipitated and instigated 'making' as participants realised that they would need to 'prop' the mirrors accurately to hold them in a position. As such, the group had a conversation about how to begin the following morning. Botsford & Darby suggested that each participant propped their mirror in a specific place where they were able to reflect light, and then (because the sun would be fleeting, and also moving (relative to the earth) to tie string between the mirror and the place under the canopy that 'received' the light The following morning participants began early, locating mirrors accurately with a combination of materials to hand (branches & sticks) and basic equipment provided (battens, cable ties, tape, string, marker pens). No one mentioned 'making,' or discussed how to make, or drew anything before they began to make in this unselfconscious manner. Each participant had a clear road map of what to make provided by Botsford & Darby's very clear but open 'prompt' to work with reflected light at make a change to the dark space under the Yew canopy – not in terms of what their tripods looked like, but what they needed to do. Each participant was able to select a technology and tools to make they felt familiar with. Each tripod was different and very much part of the same 'family' of improvised, ad hoc making. When I asked each participant if they were 'making' anything yet, each said no.

When Botsford & Darby arrived on site on Friday morning, all of the participants were focussed around making tripods to fix the mirrors, and then waiting for the sun to appear behind clouds through the holes in the canopy. When the sun did appear, Kate and Gianni suggested how to mark the time on the string connecting the mirror to the patch of reflected light and how to place the string between the tripod and the Yew instilling a sense of accuracy in what they were doing, and yet allowing all of the supporting artefacts that were being made to be improvised, and never considered as 'objects'.

43 Solar Mirrors 2

Solar Mirrors 2

44 Botsford intrducing his construced analysis agenda at SitW 2019

45 Mirror as 'tool'.

Objectively, however, each of these tripods is an artefacts made with a high degree of judgement, and yet they were each 'discovered' through accrual, rather than 'willing'.

As more and more measurements were made, the group began to make a loose grillage of battens under the Yew canopy to which participants could tie the end of the string from the mirror, and write the time for each measured reflection as they tracked the movement of the sun relative to themselves. As the day progressed, this grillage increased as more and more string was tied to it. At lunchtime, Botsford & Darby led a conversation around what they were discovering, rather than what they were making. As the conversation progressed. Botsford raised the question of what they should 'do' with the information they were gathering (rather than what 'artefact' they should make).

Considering for a moment the artefacts that were emerging, we can see that each of them was highly individual, but more importantly, each was invented by participants in a manner that harnessed their tacit knowledge in a very direct manner regardless of their knowledge, background or skill. None of them felt excluded from the technologies in play, or the process of making, regardless of the skill they had, and each artefact emerged without formal judgement, in a manner that is very different from studio based learning or practice, where focus is often on the nature of artefact rather than the processes that gave rise to it. As the grillage under the Yew began to accumulate the group became aware that they needed a 'surface' to capture the reflected light. The group discussed what this surface should be, and that it needed to be placed precisely (against the ad hoc supports) to define the path of the sun as it rose in the sky. A thin board was used to 'test' the surface and then the group decided to mill a number of thin boards to sue for the surface. Still, by this point, no one had discussed if this was 'the' artefact, or a finished artefact. Every decision was led by discovery, process and expediency, in the frame of the central prompts that Kate and Gianni provided.

The relationship of each batten to one another was not measured with a tape, or cut proportionally to match its neighbour or 'set out' according to any construction standard or spacing. It is possible to see what Botsford meant when I quizzed him on this as 'we're not designing anything'. All participants were equally engaged, working in groups of 2 or three, in four 'sub groups' around the Yew, each making a similar components that reflected light from a different hole in the canopy, with a frame made from battens that 'grew' as the sun moved. When the sawn planks arrived, participants fixed the planks to the backing battens to correspond with the readings they had marked.

The fixing of a 'surface' to the ad hoc frames allowed all participants to be equally engaged with a shared focus yet unstated end. There was no fixed point that was defined as to when the artefact(s) would be 'finished'. Over the next day (Saturday) participants continued to extend the frames as they 'tracked' the sun, and apply the surface, until Saturday evening, when there was no more time. During this period, no one had a 'studio' type conversation that 'judged' the artefact in formal terms, discussed when it would be 'concluded' or finished, or discussed how to have any consistency between the sub groups. There were a variety of different approaches to fixing, spacing and accruing the structures, all of which remain evident in the artefact as built.

There was no conversation about trying to achieve any consistency, or agree collectively what the artefact would be like, at any scale. All participants were focussed on what they were trying to achieve and what they were trying to show, with materials and technologies that were appropriate for each of them. Each sub group continued to 'grow' their frame, and at the end of Saturday there were four parts of an artefact that could be read as one 'whole'.

Solar Mirrors 2 Sequence

1. PROMPTING: Kate & Gianni providing methodology & strategic ambition to group

2. TOOL: Participants beginning to use tool to reflect light

3: PROMPTING: Kate showing how to place a mirror to gain an accurate reading

4/5: FOUND MATERIALS: Participants making tripods for mirrors from found materials and improvised techniques

6. UNCONSCIOUS EMERGENT MAKING: A 'fixed' mirror using tacit knowledge, judgement., materials to hand and no 'prior' image,

7: AUTONOMOUS ORGANISATION: Participants working together as necessary so share knowledge and skills

8: MAKING VIA MEASURING: Participants beginning to 'make' frameworks without realising it is the 'finished' piece

9. NUDGING: Kate with participants as the measuring sticks are adapted into a framework to support a surface

10: AUTONOMY: Participants 'muddling through' within the conceptual framework they have been provided

11: EMERGENT MAKING: A structure is beginning to be accrued, with no 'prior image' of what it shoud be like

12: PROMPT: Kate discussing 'surface' with participants

13: PROBLEM SOLVING: Participants working out for themselves how to solve a structural issue

14: ADAPTING: Measuring framework becoming a support for the surface

15: NUDGING: Kate describing what the surface needs to 'do' - receive light - rather than describing what it should be 'like'.

16: EVALUATING: Kate showing participants that the surface 'works' as it receives the sun from their mirrors

17: MAKING: With the confidence that they know what their structure needs to do, applying surface to receive light.

18: SHARING KNOWLEDGE: Participants designing 'together' without realising they are designing.

19: (Left) TESTING: refining accrued structure and seeing how it 'works'
20L (Above) Almost completed structure

20: Participants, completed structure

21: (Below) Completed Structure

Solar Mirrors 2

46 Directing mirrow to reflect sunlight under canopy

47 Making tripod - using materials to hand

Solar Mirrors 2

48 Accumulated Tripod - Making without 'Making'

49 Tripod

Solar Mirrors 2

50 Tripod

51 Tripod

Solar Mirrors 2

52 Tripod, made without baggage of will-to-form thinking

Solar Mirrors 2

53 Accumulated tripod

54 Applying surface

Solar Mirrors 2

55 Directing sunlight

56 Surface, receiving sunlight

Solar Mirrors 2

57 Fixing surface

58 Final presentation

60 Accrued surface structure
s

Discussion

Each of the three projects described here is similar in that they were discovered via making, with a different framing method structuring the development of each. Accumulated Watchtower was defined by a written brief that encouraged a collective discovery defined by a process of construction and material sourcing. Bound Canopy was more directed given students inexperience, but again, the final form and component relationship of the canopy could not have been accurately predicted due to the analogue nature of the setting out and 'raising'. Solar Canopy was never framed as an artefact at all, and yet is a series of constructed pieces (individual mirrors, frames constructed in small groups, followed by surfaces, reading ultimately as a 'whole'.

Bound canopy was the project where the principle of final form was most apparent, but still, the final configuration of the form was unknown – contingent as it was on the timber, the bindings, and the ability to coordinate and manipulate the lath mat. The relationship of laths to each another was entirely analogue, as set out by eye, and the final form unknown and judged in real time, contingent on time, material capabilities and collective will.

To return to the questions posed at the beginning of this folio, each of these three projects shows how architects and architecture students can use making as a design methodology – specifically here, as a methodology that allows design to emerge in 'real time' rather than as a consequence of will to form thinking. This differs from emergent craft based processes where form can emerge from the maker's attentive relationship with the sensory grain of material. Emergent making is not scale dependent – Bound Canopy began with a scale model, for example, before being developed to a larger scale structure. However, it is presented here as an alternative to linear design methodologies where an idea is formed in the mind before being translated into prescriptive instructions for others to make (whether human or robot).

As shown with the three projects presented here, making as design is also a methodology that allows, encourages and mandates co-design – indeed, making at full scale is typically dependent on co-design, expanding the possibility for discovery beyond the singular imagination.

In the context of planning permissions, building regulations and structural liability, none of the projects here are presented as concluded artefacts, but as products of processes which have been established as vehicles for discovery. However, in terms of its eider applicability, I have embedded these processes into projects that have navigated regulatory bodies and achieved compliance – in, for example, two permanent projects for the Forestry Commission at Westonbirt Arboretum.

The first, the Community Shelter began in a similar way to the bound canopy with a scale model, but differed in that the model showed a design intent rather than a structural approach. In two groups as part of subsequent workshop, participants were encouraged to 'find' their own form (at a larger scale) using thin timber lath and improvised setting out. These large models were digitally scanned and analysed, before further analogue scale models were made, which were also 3d scanned and analysed, before being structurally optimised and resolved, before testing again a several rounds of making with communities at a variety of scales before a final form was discovered, documented, submitted for regulatory compliance and constructed absolutely as the drawings. Another, the green woodworking shelter, emerged from two rounds of full scale fabrication with students to establish a design language before being evolved into a final configuration that was documented for construction via conventional reactionary processes.

Gianni Botsford uses similar processes to Solar canopy in practice. He describes his way of working at Studio in the Woods as 'constructed analysis' – giving shape to something that is not apparent. Botsford described making in this manner as research to 'discover' rather than 'will to form' made artefacts. He does not know what shape or form a project is before he begin to make

61(Previous) Solar Mirrors 2

62 Community Shelter, Westonbirt

63/4/5 Process Models, Community Shelter, Westonbirt

67 House in a Garden, Gianni Botsford Architects - the product of a process of constructed analysis

68 House in a Garden, Gianni Botsford Architects - the product of a process of constructed analysis

it, and uses the process of (emergent) making (often within a group of differing skills) to create built structures.

All of the three projects in this folio were 'framed' in a manner to allow emergent making. Perhaps one of the misunderstandings concerning codesign is that convectional verbal language or discursive framing provides an easy way 'in' to a project. Making as a social architectural practice is a useful language that an build connections in disparate groups of missed abilities, but – as shown in the projects in this folio – needs 'framing' to provide a starting point.
Botsford and Darby's framing at Studio in the Woods was extremely controlling, in some ways, but this control forced an alternative way of seeing. Botsford and Darby established a 'frame' in terms of a working method whereby the project could be 'discovered' by participants. Constructed analysis is the method that they have been working with for approximately 15 years at Studio in the Woods, where – unlike every other group – they do not 'design' something so much as design a way of working.

This is an important distinction that needs to be stated: it is this that is key for their methodology. Typically, this is through measurement – whereby a natural phenomenon site is 'measured' by participants and these 'measurements' are then 'constructed'. This freed the project from divisive value judgments, or 'design' where the most experienced and the most versed with design 'language' frame the project in their terms. Constructed Analysis removed the 'What are we going to make' type questions that are typical of many design/make live project workshops that use general, unstructured and uncritical looking at phenomena (Salama, 2006) as a design method, meaning 'students do not realise what to see and what to look for' (Salama 2006, p66). Botsford and Darby's methodology is explicit and highly controlling, and they described it in Solar Mirrors as 'not designing'. However, this overt control at a high level encourages and allows autonomy on a different level.

If 'Constructed Analysis' of light was Botsford and Darby's frame at Studio in the Woods, Accumulated Watchtower was more explicit in its making intent from the outset – with a brief stating that a project was to be discovered through accumulation via the constraints of site, material, safety, connection and not drawing or measuring, while Bound canopy used a structural system set out in an analogue manner as its method. None of these projects provided a linear, repeatable methodology, fitting with Galdon, F., & Hall, A. (2022) idea of transformational processes embodied around the notion of world-making involving the 'generative interweaving between practices and forms, methodologies and phenomena, doing and knowledge'
None of the artefacts presented here have a controlled 'rational' or orthogonal series of relationships, and yet still have a clear order, logic and defining strategy that underpins their design and allows contingent events to influence their form. This fits with Ruskin's idea of the 'savage': without a guiding strategy, the 'savage' is incoherent and illegible: with a guiding strategy, it can thrive. These projects are not necessarily 'better' than artefacts that could be pre-imagined, but serve an example of how the process of making allowed a different manner of artefact to be configured and realised, and allowed a genuine model of co- authorship. As an alternative model to the concluded Modernist object, these projects offers a model of artefact and constructional system that is less finite that could be adapted, extended or modified without undermining the initial idea.

The technology used in the projects required no specialist skill, no specialist tools, and no prior knowledge of 'making', making the project unthreatening for those with no making experience, but at the same time, not dumbing the project down for those who did. The tools were 'brought into use' through dexterous activity and were used were part of what Tim Ingold (2000) has described as 'ecologies of action' – where skill is imminent in the practice itself, rather than in the prior properties of agent and instrument. The use of tools is critical, and where often the conventionally 'unskilled' are excluded. The selection of tools in these projects was important in that they were non 'specialist' and familiar to those even with no making background, but did not 'dumb down' what those with skilled making backgrounds could achieve. From a technological perspective, the projects all used material and construction techniques that were accessible and non-specialist. Everyone, regardless of their practical constructional experience, could work with the materials, fixing and tools supplied in an immediate and unselfconscious manner, to the point that initially, they hardly realized they were 'making'. Rather than overwhelming participants new to construction, they could begin to construct in a manner that was familiar and easy. At the same time, the technology did not 'dumb down' the skills of those who had more experience.

This fits with an idea where none of these three projects demonstrate the projection of a ready-made thought onto raw material or a projection of form onto matter, but instead, of making as the ongoing binding together of material flows and sensory awareness. In thinking through making, and making in this manner, nothing is ever 'finished', and instead of thinking of artefacts as the 'end' or finished products, every artefact might be considered a 'station' on the way to somewhere else. This is a model of making where instead of an artefact being the product of the logic of projection, an artefact is instead the outcome of a performance such as Solar Mirrors. The artefact (such as it is) at Studio in the Woods can be considered an open structure, rather than a bounded one. Ingold (2011) makes the point that artefacts conceived of through making rather than the projection of an idea onto inert form can be considered as a knot, with every strand trailing off somewhere else to be potentially bound up somewhere else. If we think of an open structure as Solar Mirrors, we need to think of it in terms of the histories that make it up, where the surfaces describe the interchange of materials and environment, where the makers have followed the materials and joined their lives to the materials that they worked with through a process of improvisation. There can only be improvisation necessary to feed the processes of construction through performance if the projects are structured with opportunities for contingent to events to occur, and makers to seize these contingent events as opportunities to shape the project, rather than 'risk' items to be feared.

As a set of concepts, we can see how they provide frameworks or 'boundaries' (Tang & Mitchell, 2016) for participants to use their own autonomous judgment to make decisions, rather than following instructions or fixed procedural ideas that limit individual freedom and autonomy. In Solar Mirrors, there were, however, fairly constrained frameworks as to what the project was 'about', what tools would be used, what the process for discovery of artefact was, and so on, but these strict concepts allowed enormous personal freedom, and this sense of freedom is important if empowerment can happen for an entire cohort with different backgrounds and skill sets. The tradeoff is that the artefact that emerges is less predictable than that which follows a more defined set of literal instructions. While there are many working within the architectural field which might resist this manner of working, the difference from a more controlled path with this more a more open manner of working is that design can happen in a truly collaborative manner, skills can be levelled, and participants in this process can feel agency

These projects also suggest that making itself is potentially a creative and empowering act when used by groups as a mechanism for co-design. Historically, material culture considers that in order to be 'creative', a maker has to produce something new, and in order to make this artefact, the maker has to hold this form at the forefront of their mind while they are making it, and only when the last piece is in place can it be said that the artefact is finished. All of the creative mental work comes before its application: theory leads, practice follows. In architecture, we do not have systems of processes that encourage emergent making – making in a manner that is not pre-determined – I suggest that making that it is emergent making is empowering for those that take part – [providing them an agency, an authority, and a key role in the process of conception that transcends the articulation of formal verbal design concepts expressed through language – indeed, rendering verbal language (at times) redundant).

I have described in previous chapters how the role of making which is so dominant in architectural discourse and represents the a priori basis for practice is one that leaves out the creativity of processes where ideas can be generated in flows and transformations of materials, and in sensory awareness in the act of making. It also often dis-empowers and diminishes makers, reducing them to mere fabricators, unable to use any judgment or skill to contribute to the form or emergence of an artefact. In the histories of material cultures, the processes of making are diminished in importance when compared to the 'final' artefact. The artist Paul Klee, however, said 'Form is the end – death. Form making is life' (On Form and Formation, 2021). In order to develop a generalizable framework for empowered (form) making, clearly, we need to find a mechanism to guide (rather than limit) creativity and making as it moves forward, particularly in the context of emergent making, which is the type of making that is potentially the most empowering. I suggest that emergent making - where makers did not know what they were making in advance of 'doing' it – is the most empowering, because of the procedural discoveries (rather than will-to-form 'designing') that allow makers to use their own judgement in an autonomous manner.

69 Light House, Gianni Botsford Architects - the product of a process of constructed analysis

70 Constructed Analysis at Studio in the Woods - Oculus, Gianni Botsford & Kate Darby & SitW 2017 Sudents

'Making' is rarely engaged with by architects as a practice. However, project such as the ones presented here can provoke change in terms of how (culturally) we architects often see' our role as 'creators'. To find the creativity within material artefacts, we typically move from the finished artefact to the idea that gave rise to it. Ingold terms this a 'backwards reading' (2000, p 272), where the attribution of form to an unprecedented idea in mind underpins our commonplace identification of creativity with innovation – or novelty. It the 'novel' idea that is creative, rather than the processes of making – or craft, via empowered making such as I have described. Thinking through making lies in the improvisation (which I have described extensively in terms of how emergent making can incorporate and take advantage of contingencies that arise) rather than the innovation that is the dominant narrative in material cultures such as architecture. I would suggest that novelty alone (the creation of artefacts) has little to do with creativity – instead, it is the processes of emergent making that are creative. As with the three projects in this folio, the creativity lies in the improvisation of the processes of making rather than in the novelty of ephemeral products, which are typically evaluated on the basis of what went before.

This fits with an idea where, in thinking through making, we should no longer regard making as a projection of a ready-made thought onto raw material or a projection of form onto matter, as the dominant hylomorphic model, but instead, of making as the ongoing 'binding together of material flows and sensory awareness' such as Ingold (2000) describes and as I have outlined in this folio. In thinking through making, nothing is ever 'finished', and instead of thinking of artefacts as the 'end' or finished products, every artefact might be considered a station on the way to somewhere else.

This is a model of making where instead of an artefact being the product of the logic of projection, an artefact is instead the outcome of a performance. The artefacts (such as they are here) can be considered 'open' structure, rather than a bounded one. Ingold (2011) makes the point that artefacts conceived of through making rather than the projection of an idea onto inert form can be considered as a knot, with every strand trailing off somewhere else to be potentially bound up somewhere else. If we think of an open structure as (say) Solar Mirrors, we need to think of it in terms of the histories that make it up, where the surfaces describe the interchange of materials and environment, where the makers have followed the materials and joined their lives to the materials that they worked with through a process of improvisation. There can only be improvisation necessary to feed these processes if the projects are structured with opportunities for contingent events to occur, and makers to seize these contingent events as opportunities to shape the project.

In the search for relative certainty in post renaissance architectural cultures, we often think of materials as those with properties that can be objectively measured, or being overtly predictable. If we look at the three projects in this folio, the materials were not those which can be objectively measured or subjectively attributed as with specification-controlled making: instead, they are practically experienced. Central to David Pye's (1963) description of craft is the idea that a craftsperson does not impose a form on materials, but uses his or her skill to 'find the grain' of things and allow a form to emerge. In architectural cultures, this idea does not sit comfortably with the dominant narrative of logical determinism, but I would suggest we can borrow from Pye's notion of craft and expand it to include processes such as those that I have discussed in this folio, where makers enter the metaphorical grain of the materials, and bend this 'grain' to their evolving purpose. Certainly, in the three projects here, participants did not impose a form, and instead, 'found the grain' in the materials, in themselves, the site, the mirrors, timber, found items, and so on – the tools that allowed the discoveries.

If many technically determined investigations proceed by setting up encounters between a defined hypothesis and facts on the ground (Shavelson and Towne, 2002) these projects suggest an alternative where knowledge is emergent. There is a type of knowledge that western civilization is familiar with that emerges from techno-science: ideas are generated, a hypothesis formed, which is then tested and in a process of conjecture and refutation. This procedure is to effectively place the knower outside the world that they wish to know about. While clearly this is a type of knowledge generation (that we are accustomed to), thinking through making is also a type of thinking that generates knowledge, albeit a different manner of knowledge from the empirical knowledge gained through conjecture and refutation.

Thinking through making as in the projects in this folio reverses this way of creating knowledge. Rather, it is a way of knowing from inside, where knowledge is not created via the creation of concepts held exclusively in the mind as abstract ideas and delivered into a material world. Instead, knowledge gained via a practical and observational engagement with materials, places and processes grows instead from the 'inside'. Currently, this type of knowledge is devalued in architectural cultures, and yet academics such as John Shotter (1993) and John Forester (1985) have been arguing for many years for a 'knowing from within'. The type of project represented in this folio are good examples of what Forester has called for, in suggesting that architects replace the normative metaphor of design as the search for a solution with the idea of design as 'sense making'. Forester (ibid) asks that we make sense together – architect and non-architect, expert and non-expert. This resonates with Till's (2006) idea of 'transformative participation', and in the three projects here one could describe this transformative participation as empowerment through the application of skill in five separate categories of Ingold's (2010) summation of the different components of making related skill, even when makers are 'unskilled'.

The method of working through transformative participation also fits with Bruno Latour's desire (Björgvinsson, 2012) for design to be less exclusive and more participatory. If, as Latour suggested, most design has purified, deleted and made the contributions of stakeholders and participants invisible in the design process, these three emergent projects were the reverse. Indeed: the architecture is an explicit manifestation of the contributions of the stakeholders and participants. I have described earlier in this folio that much focus in architectural contexts is on the technical aspects of making. Indeed, Bob Sheil's (entire writing output focusses on making as technical practice, rather than one that can have social or participatory consequences. Indeed, as a discipline, architectural practice is founded on a notion that 'others' make and design always happens in advance. But, as I have shown, a simple shift suggests benefits for both buildings (they get more interesting, and more open to being adapted and changed over time), people (they get more empowered) and also architects (we are less marginalised and contained to one phase in the conception and making of buildings, and able to extend our agency. Critical to this, is rethinking making as a process of and framework for participation, rather than a mechanical or technical exercise where 'losses' are minimised.

In addition, making has the potential to be rethought as a 'language' for communication alongside other languages – verbal, and pictorial (drawings and images). I have seen for example in participatory projects such as the Community Shelter at Westonbirt Arboretum how groups with serious learning disabilities have engage in a much more active manner using making as a language rather than words or drawings. If making in the context of architectural education has become hijacked by a degree by macho techo-focussed 'build' scenarios, I hope these projects show how making is diminished by it being exclusively framed as a technical act subservient (intellectually and creatively) to 'design' instead, can be a process of inquiry that can help with social change in the form of changing and enhancing people's lives.

Perhaps more important than any direct application in a specific context is what the projects described in this folio might offer for practice generally – in particular, the nature of reflective practice for architects, or rather, the kind of 'knowing' with which practitioners need to engage with, particularly in the context of 'action'. If much literature in this field concerns the mechanics of practice, emergent making projects show the kind of knowing which practitioners need to develop to deal with fast changing and uncertain contexts where situations are almost invariably unique and often unpredictable. Schön (has termed this 'value conflict' where the 'multiplicity of conflicting views poses a predicament for the practitioner who must choose among multiple approaches to practice or devise [their] own way of combining them' (1983, p 16). This folio demonstrates how practitioners can steer a path through the unpredictability and conflicts in a situation with uncertain outcomes, typically by not focusing on the outcome (which is often the norm in practice and workshops) but by focusing on the process through which a project may be discovered though a stringent manner of problem setting, rather than mere problem solving. The three projects also show how complexities, contingencies, uncertainties and conflicts implicit in practice contexts can be resolved through a very specific description of the problem, rather than the 'solution'.

71 Embodied Accrual, SitW 2017, Piers Taylor, Meredith Bowles, Charley Brentnall & Students

72 Embodied Accrual,
Amateur Studio, Invisible Studio

Perhaps more interestingly, this shows the conflicts between professional knowledge and the practical application of professional knowledge. Schön suggested that the knowledge base of any profession is considered to have four essential properties, being 'specialized, firmly bounded, scientific and standardized' (1983, p 22). If this is the case, these projects and their associated methodologies show methods for the application of this knowledge in practice contexts in a research field which offers limited guidance. The type of unbounded 'skill' that Botsford & Darby showed as practitioners is often not valued in professional contexts in that it is described as a kind of ambiguous and secondary knowledge, rather than a primary theoretical and bounded type of knowledge., However, these projects and their methodological structures show the importance of this 'secondary' knowledge in a field which prioritizes the teaching of principles rather than the development of skills in their application.

Further than this, the projects in this folio also throws into question the long-held idea that the teaching of 'principles' should always come before the development of skills in their application. The projects included participants with either no formal architectural or making 'skill', and yet were able to work as equals, 'make' and apply skill in context where they might be presumed to have none. They were able to develop skills quickly and unselfconsciously because of the manner in which the experienced practitioners running the workshop framed the project and 'judged' though action. This is unusual, and I would suggest, important for the fields of both education and practice as it challenges the often held belief that practice is exclusivity the application of knowledge rather than a manner of knowing that is more than knowledge as suggested by Barnard (1938) who distinguished 'thinking processes' from 'non logical processes' which are not capable of being expressed in words or reasoning, In my case study project, we saw within a practice of architecture both thinking processes and non-logical processes in the form of rapid unconscious judgments which are (Barnard, 1930 suggests) essential for effective practice.

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