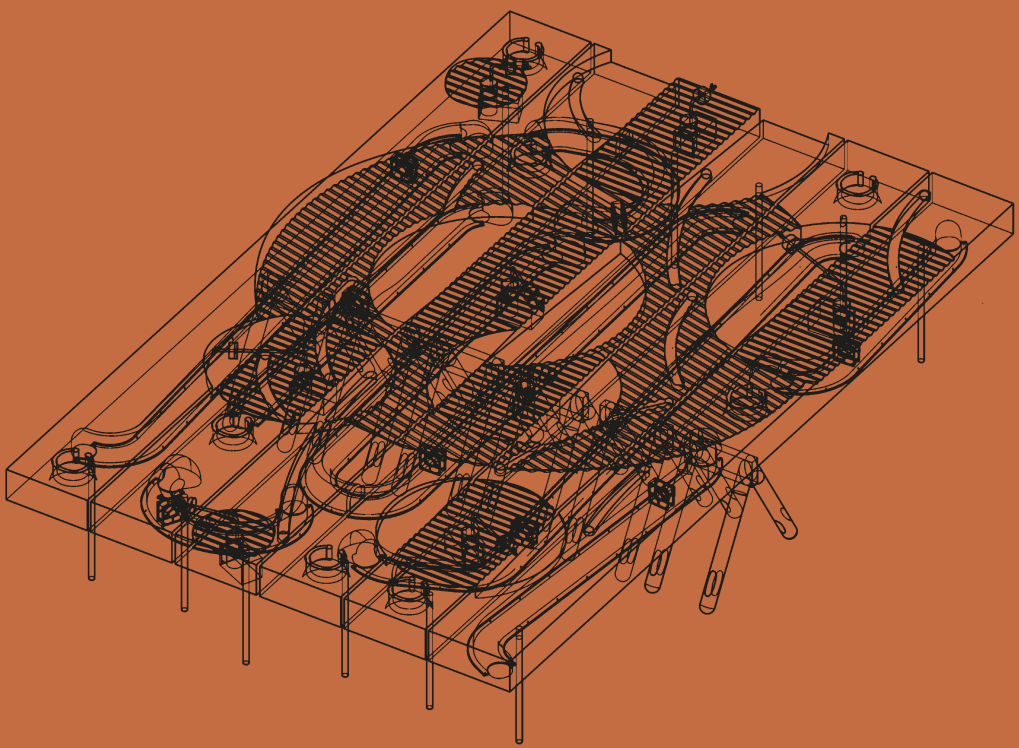
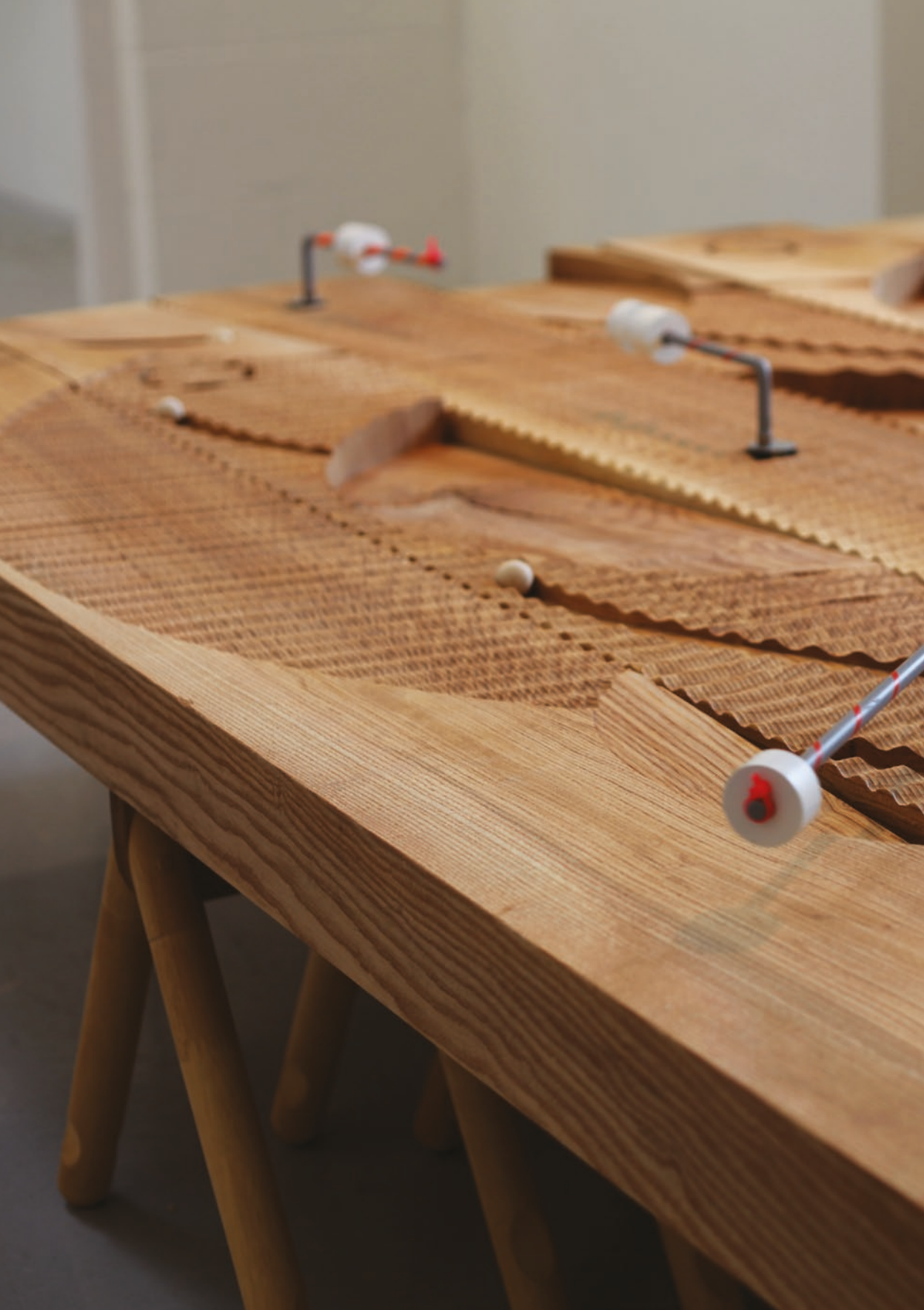
Lunar Wood



by Smout Allen

Project Details

Practice:	Smout Allen
Designers:	Mark Smout and Laura Allen
Title:	Lunar Wood
Output type:	Artefact
Commissioning body:	Ruthin Craft Centre, Wales
Gallery:	Ruthin Craft Centre: The Centre for the Applied Arts
Residency:	Nurturing the Spirit
Exhibition:	*Japanese Style: Sustaining Design*
Curator:	Michael Nixon, MN Arts Associates and the Ruthin Craft Centre
Funders:	The Arts Council of Wales; Llywodraeth Cymru (Welsh Government); Wales Arts International; Denbighshire Council; The Esmee Fairbairn Foundation; British Council; The Japan Foundation, London; The Japanese Embassy UK; ANA Airlines; Wetherspoon; The Daiwa Anglo-Japanese Foundation; Visiting Arts; Japan Garden UK; The Great Britain Sasakawa Foundation; Ruthin Craft Centre; Architectural Research Fund, Bartlett School of Architecture
Budget:	£4,300
Dates:	Ruthin Craft Centre: 1 Apr – 24 Jun 2012; Mission Gallery, Swansea: 19 Jan – 10 Mar 2013
Size:	2,300mm(W) × 1,550mm(D) × 600mm(H)
Collaborators/ fabricators:	Produced in collaboration with the Bartlett Workshop and Rhys Cannon
Other residency studios:	Osamu Ishiyama Laboratory, Waseda University, Tokyo; Matthew Jones and Rhian Thomas, Design Research Unit Wales, Cardiff
Other exhibitors:	Reiko Sudo; Kagure – Urban Research; Takahiro Kondo; Shinsuke Iwami; Kazuya Morita; Tono Mirai; Studio Archi Farm



Statement about the Research Content and Process

Description

This interactive model was commissioned for the exhibition *Japanese Style: Sustaining Design* at the Ruthin Craft Centre, Wales, curated by Michael Nixon. It was completed at a one-week residency, titled Nurturing the Spirit, in collaboration with the Osamu Ishiyama Laboratory at Waseda University, Tokyo, and the Design Research Unit (DRUw) at the Welsh School of Architecture, Cardiff. The installation examines how lunar-felled timber, and crafts-based knowledge of this material from cabinet and instrument makers, might improve sustainable building construction. It emphasises innovative environmental solutions through using wood, in a world of diminishing resources, informed by traditional methods of forestry, wood design and manufacturing.

Questions

1. **How can an architectural installation transmit the value of craft–science interactions and their environmental benefits?**
2. **How can the 'vulgar' knowledge in the production and use of moonwood inform an architectural language?**
3. **How does moonwood generate structural and engineered environmental benefits?**

1 *(previous page)*
Lunar wood installation at the Ruthin Craft Centre, Wales

Methods

The identification of traditional wood-working and forestry practices and demonstration of these capacities through a dynamic model to highlight tight tolerances, energy use and renewable resource benefits. Design and build of model (timber and Perspex with metal weights and electrical devices), employing manual and digital manufacturing and craft techniques, to demonstrate these cultural and engineering capacities (triggered by visitor movement in the gallery).

Dissemination

Invited residency in collaboration with Waseda University, Tokyo, and the Welsh School of Architecture.

Exhibited in Ruthin and Swansea; presented in a conference paper and panel discussion at Portland State University, Oregon; featured in an exhibition film (with 2,870 views on *Vimeo*).

2

2
Swiss and other alpine forests at over 1,000m altitude produce high-quality timber that grows straight, with few branches. The cold mountain climate and a short growing season result in timber with tight and regular annual ring growth.
Photograph: GOD Timber

Introduction

Lunar Wood is a research-based architectural installation that examines the dynamic and environmental relationship generated between timber growth and lunar cycles. It is composed of a series of horizontal timber planks and populated by devices on its top and bottom surfaces that interact to represent the traditions of empirical versus scientific practice in the timber industry. The model reacts to shifting balances and currents of airflow across its surface. Through these minute forces the installation demonstrates and responds to the fluctuating and reciprocal push and pull of natural cycles. [fig. 1]

Aims and Objectives

The model examines how lunar rhythms can produce structural and physical capacities in timber that have real material and cultural value for the environmental, structural and economic performances of building with timber.

Engineering sustainable tolerances

'Lunar' timber or 'moonwood' (timber felled in winter in the waning phase of the moon, the period between the full and new moon) is considered to possess greater dynamic stability, have a lower moisture content, be more resistant to fungal attack, and produce a better tone for musical instruments. The project explores how moonwood might enable reduced costs and environmental impact in the timber and construction industry for buildings. For example, it examines how microscopic cellular changes within timber, which occur because of the lunar gravitational pull, can enhance its structural strength and economic 'value'. Potential benefits include reduction in $C0_2$ emissions and carbon footprints; reduction in water content and increased resilience to fungi; increase in lifespan; and reduction in the costs of transporting timber globally. [fig. 2]

3

3
Timber quality is related to the felling during the winter season when the tree is dormant as well as subsequent seasoning conditions. (GOD) timber is stacked for air-drying, which takes at least two years.
Photograph: GOD Timber

Local knowledge and sustainability

Indigenous forestry traditions suggest that timber felled at certain phases of the lunar cycle possesses improved qualities compared to timber felled out of phase; in particular, German, Tyrolean and Swiss woodworkers believe that the timber has greater dynamic stability, a lower moisture content, and is more resistant to pest and fungal attack. This timber is used in the building industry[1] as well for historic restoration where it is important to reproduce qualities and attributes of the original building fabric.[2] Moonwood is also favoured for the production of 'tonewoods', which are used for sound boards in stringed musical instrument construction. It is believed that moonwood presents improvements in oscillation characteristics and therefore in acoustic quality.[3] Master and artisan instrument makers lay claim to subjective qualities such as 'feel' in an attempt to describe intangible improvements. Lunar wood attempts to represent the inconsistencies of this embedded wisdom and 'invisible' cultural knowledge.

There is relatively little statistical research into the traditional and technical claims made for moonwood although research that examines relationships between plant chemistry and lunar cycles is well established (Vogt et al. 2002). Dr Ernst Zürcher, Professor of Wood Science at Bern University of Applied Science, Switzerland, has carried out historical research of global practices and beliefs, and large-scale field research experiments in the Swiss Alps using synodic, tropical and even sidereal (astrological) lunar rhythms (Zürcher et al. 2010). [fig. 3]

Embodying craft knowledge in architectural design process

Lunar wood is at once a conceptual artefact and a scaled, engineered demonstration. It is a physical iteration of the 'strange utility' embodied in lunar timber. Operating within the same contexts and to the same tolerances as a 1:1 architectural prototype, it presents an aesthetic physical experience that is designed according to the very same conditions that govern the production, distribution and use of timber in the construction industry. Local, cultural and sustainable knowledge are repurposed to generate an architectural model that communicates in turn the very facts that produced it.

1. Brettstapel solid timber system is made of softwood timber posts connected with timber dowels from which structural wall and floor panels are constructed. Softwood posts are made from European silver fir or Norway spruce moonwoods with hardwood dowels made of beech (Brettstapel 2013).
2. The Marktkirche St Cosmas und Damian, Clausthal-Zellerfeld, the largest wooden church in Germany, has undergone a comprehensive restoration since 2001. After uncovering historic references to its original construction with moonwood, 50m^3 of 'moon spruce' was sourced for the restoration.
3. Bachmann Guitars and Tonewood, Anterselva di Messo, South Tyrol, Italy, use hazel 'moon spruce' from the Dolomites. Ulrich Hinsberger, a master violin maker based in Germany, uses Alpine spruce tonewood felled in accordance with moonwood traditions (Hinsberger 2013).

4

4
(GOD) Commercial forest estates in the Engandin region of Alpine Switzerland supply moonwood as well as timber produced by sustainable, low-impact and traditional techniques such as 'selection' and horse-logging.
Photograph: GOD Timber

Questions

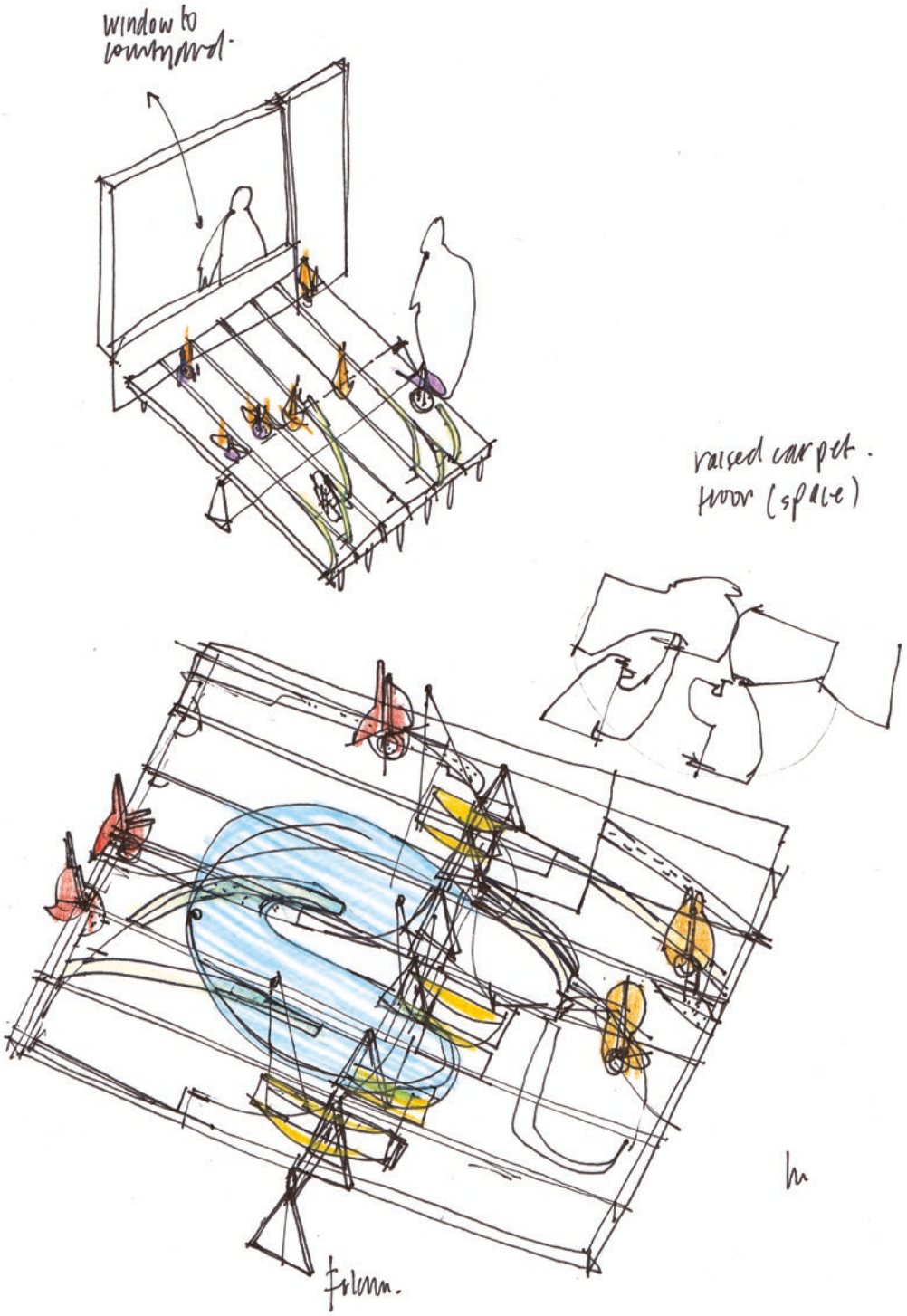
1. How can an architectural installation transmit the value of craft–science interactions and their environmental benefits?
2. How can the 'vulgar' knowledge in the production and use of moonwood inform an architectural language?
3. How does moonwood generate structural and engineered environmental benefits?

Context

Environmental design

The project seeks to positively engage with environmental use of timber for building and instrument construction. It operates between the territories of myth and scientific knowledge that sustain local practices embedded in the forestry industry for centuries. Traditional foresters in Alpine Switzerland and the Tyrol harvest and process timber by the lunar calendar as well as observing associated sustainable practices.[4] A protected 'quality label' (GOD)[5] has been established, although their claims are yet to be scientifically verified. Much of the evidence presents diverse or contradictory statements based on arbitrary 'rural rules'. However, environmental sustainability claims persist, including reduced timber weight, which can lead to significant savings in haulage and transport costs, reduced drying time in industrial kilns, and a reduced need for harmful chemical fungicides and insecticides such as chromated copper arsenate and micronised copper to preserve wood. [fig. 4]

4. Commercial forest estate in Styria, south-east Austria, produces spruce tonewood by lunar cycles (Peuker 2013).
5. (GOD) moonwood is a protected quality label for certified (GOD) forestry offices which sustainably manage woodlands and fell in accordance with the lunar calendar at commercial forest estates in the Engandin region of Alpine Switzerland, producing larch and arolla pine moonwoods (Engiadina-God 2013).


window to
courtyard.
raised carpet.
floor (space)

Methods

The model uses both hand and three-dimensional digital design and manufacturing techniques to represent the integration of environmental, cultural and design methods in an architectural and instrumental use of moonwood. The research is design led and includes hand sketches and tests of performance functions in the form of prototype devices and sketched and measured drawings. This process is removed from the specific and unique materiality of the timber planks and assumes consistent timber quality. A digital 3D model is made where formal and performance-related decisions about the placing and degree of cutting are fixed and these digital scripts are used to rout the timber planks via CADCAM machining. However, this method is accompanied by a process of hand-making and finishing where discernment and empirical knowledge are used. [fig. 5–11]

Limit testing

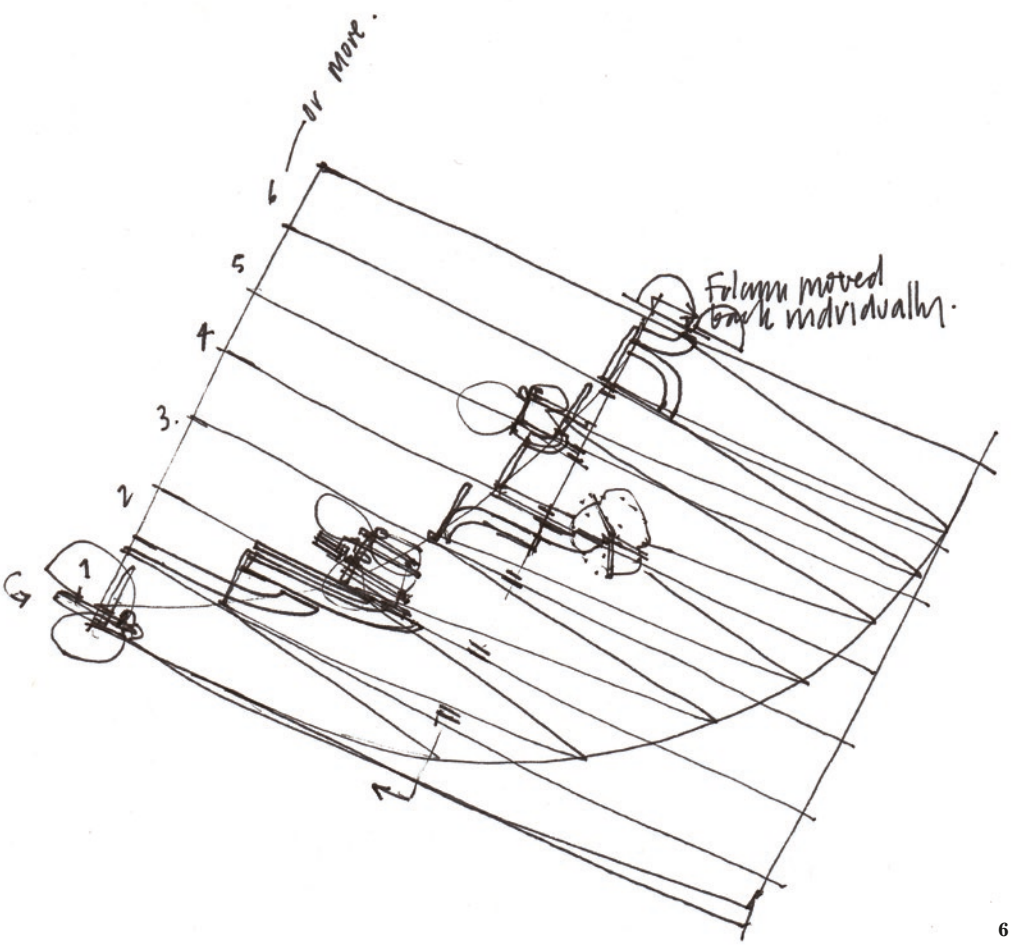
The CADCAM fabrication process produces a fast and perfect reproduction of the complex form prescribed by digital drawing and therefore the consistent repeatability of the artefact. However, throughout the making process there develops a 'live conversation' between the computer model and the finished object where both operator and designer re-evaluate and effect design decisions and alter the cutting process to account for the grain and imperfections of the timber revealed in the process. A bias toward either the digital or the handmade is constantly rebalanced. Orbits notated on the top surface of the planks are inscribed with an undulating surface produced by the single pathway of the routing tool. [fig. 12–14]

Performativity design

a. Balance and invisible flows

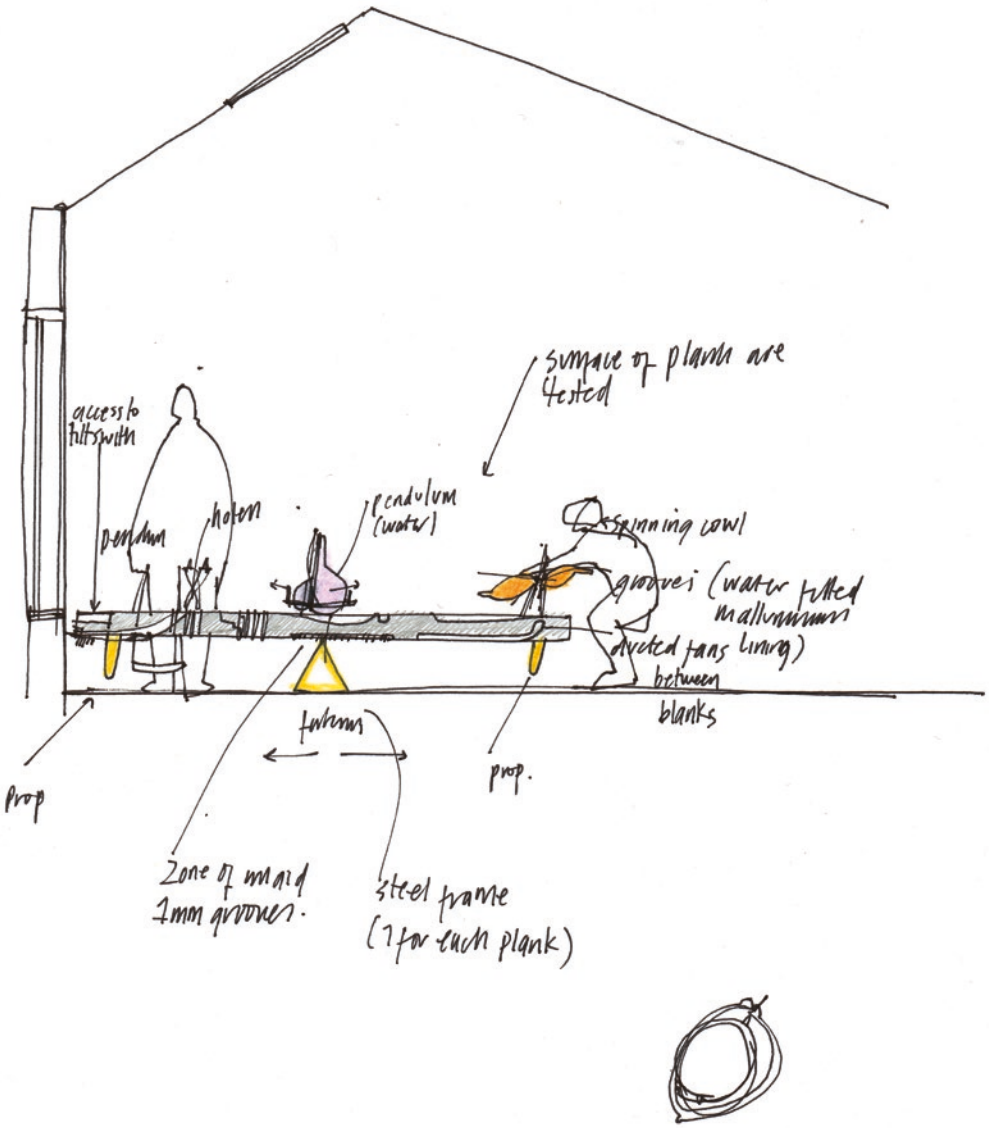
Surface-mounted rotating weights disturb the equilibrium of the model. The planks rock back and forth in a rhythmic performance, carefully balanced over timber trestles. Interconnected air channels are formed in the underside of the model that circulate air from small fans to link along and across the planks. The channels direct gentle wafts of air that readdress the stability of the model. The invisible movement of air and its effect on stability represent the traditions and 'unknown' realities of lunar cycles and their effect on timber growth. [fig. 15–19]

5
Sketches showing the model performance and use sited in the residency studio at Ruthin Craft Centre

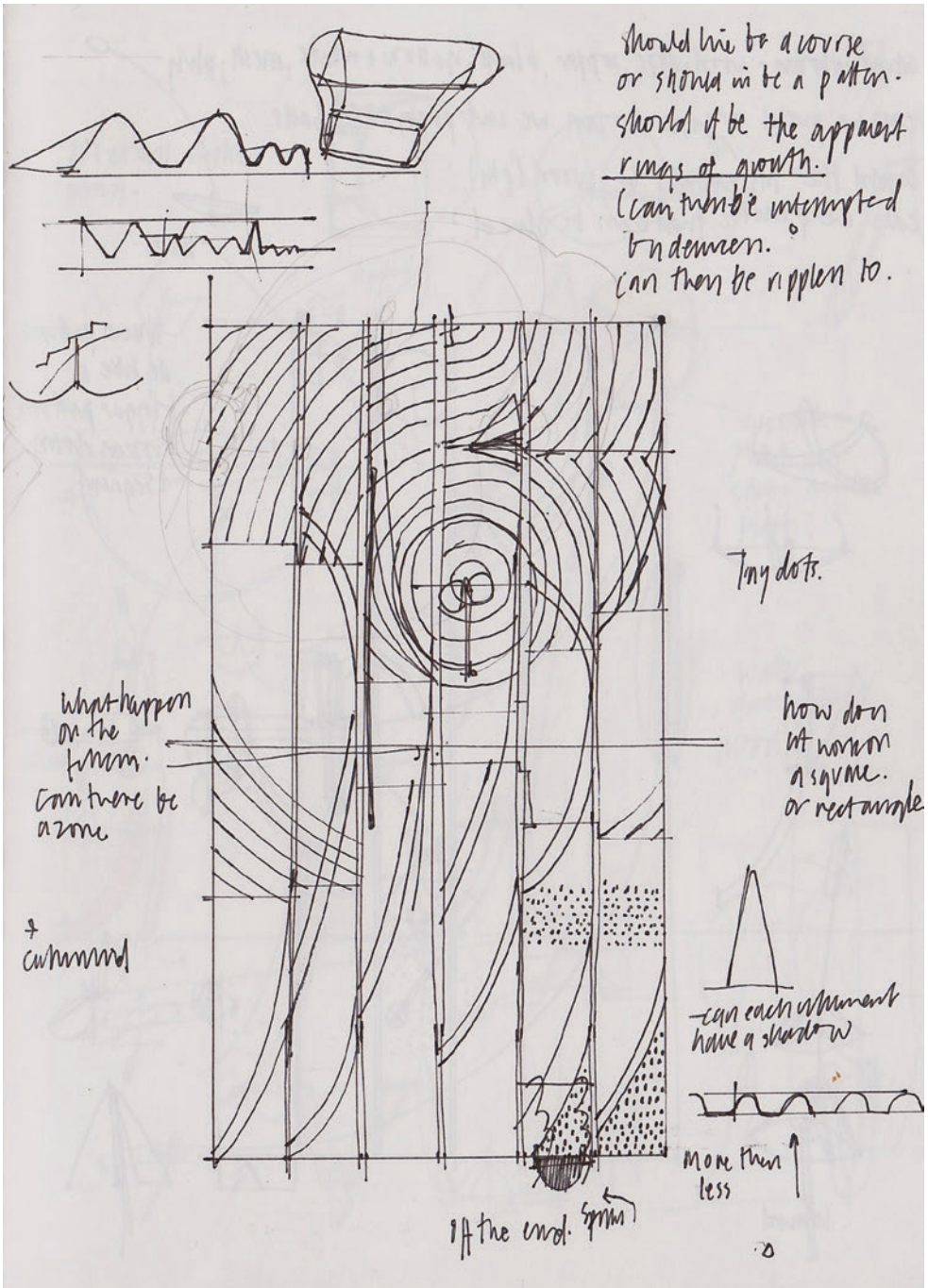


6

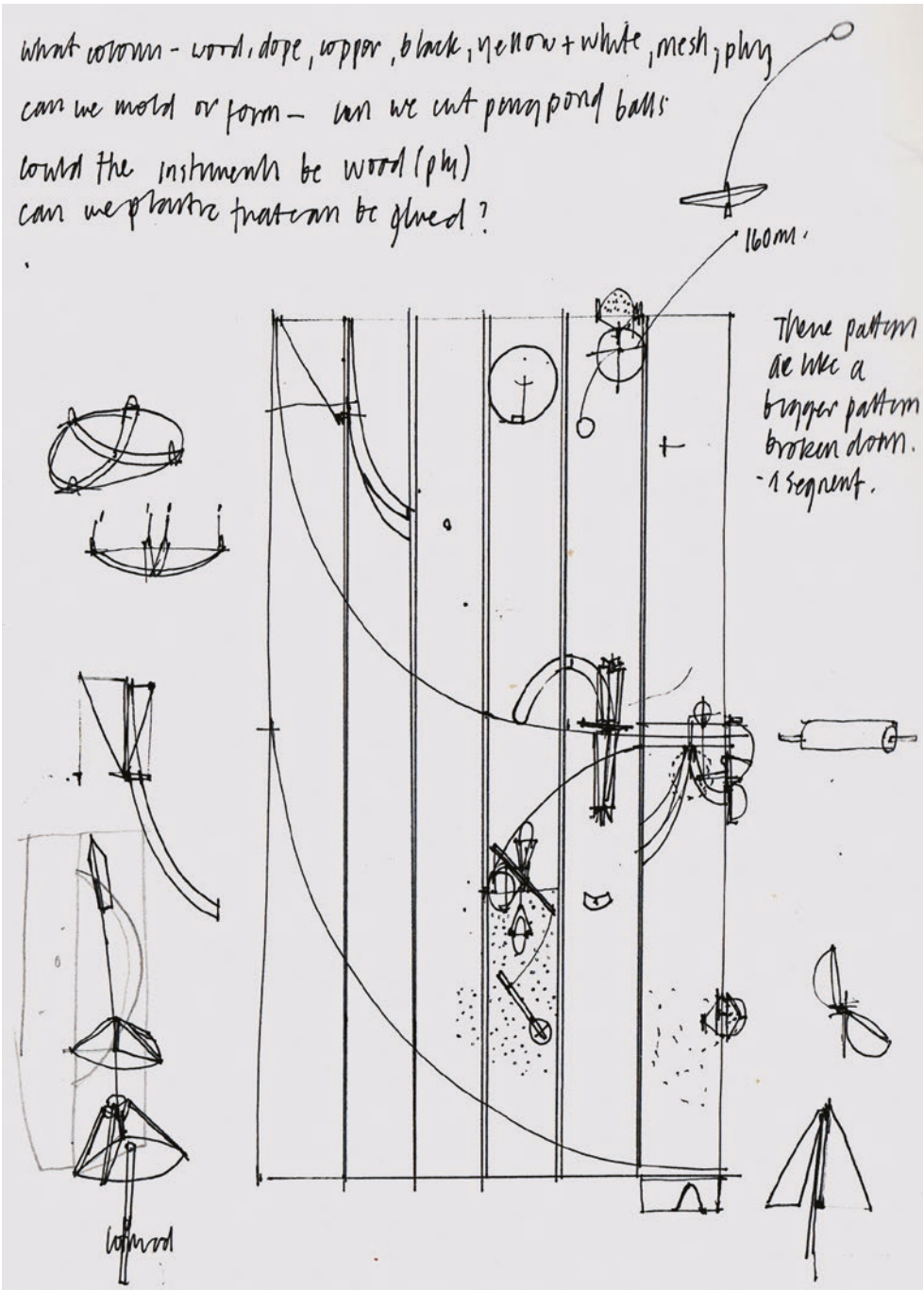
6 & 7
Sketches showing the model performance and use sited in the residency studio at Ruthin Craft Centre


surface of planks are tested
access to tiltswitch
pendulum
motor
pendulum (water)
spinning cowl
grooves (water filled aluminium riveted fans lining) between blanks
fulcrum
prop
prop.
Zone of waxed 1mm grooves.
steel frame (1 for each plank)

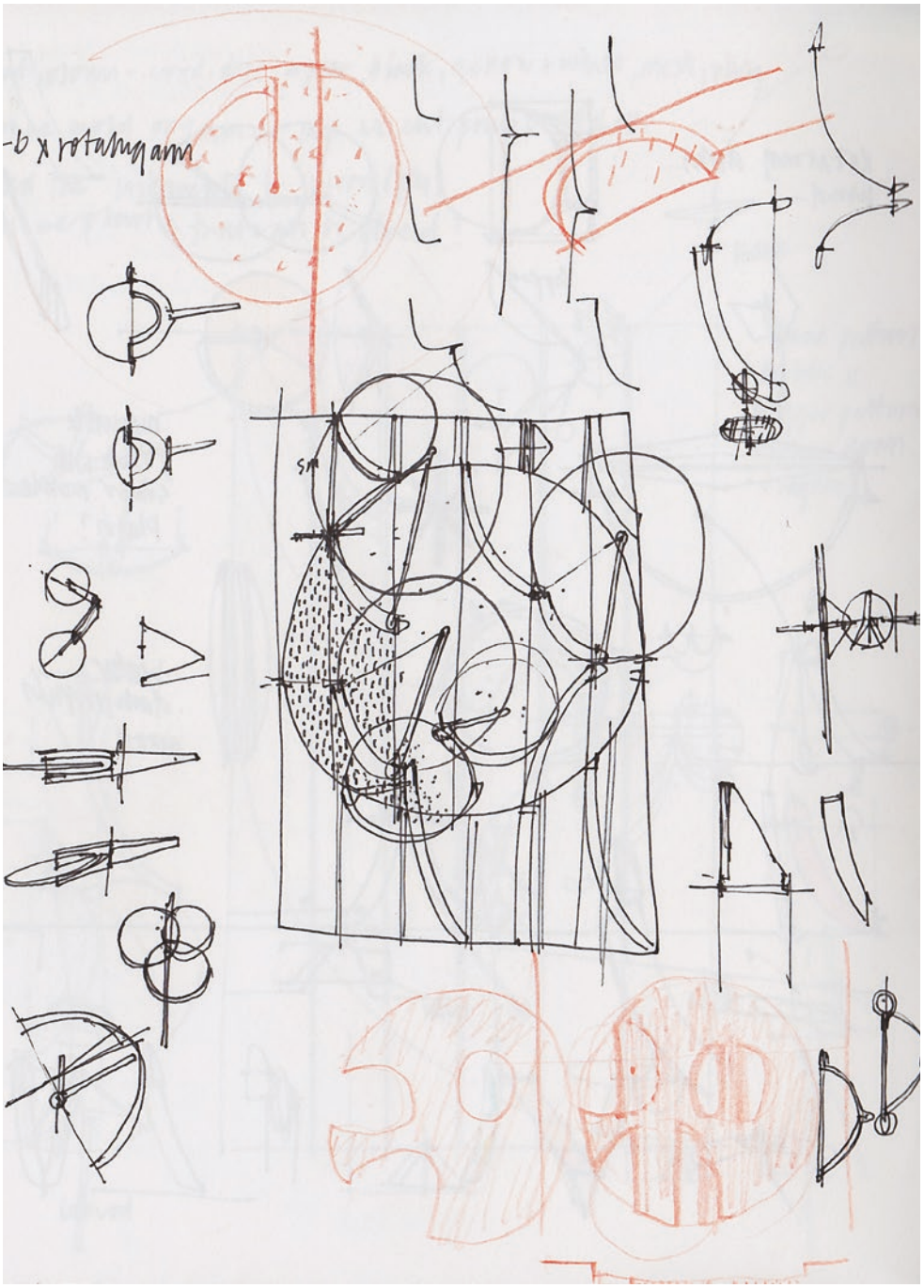
7


should this be a course
or should it be a pattern.
should it be the apparent
rings of growth.
(can this be interrupted
by demeen.
can there be ripples to.
Tiny dots.
what happen
on the
frame.
Can there be
a zone
how does
it narrow
a square.
or rectangle
+
curvature
can each element
have a shadow
more than
less
If the end. spins

8


what colours - wood, dope, copper, black, yellow + white, mesh, ply
can we mold or form - can we cut ping pong balls
could the instruments be wood (ply)
can we plaster that can be glued?
160m.
These pattern are like a bigger pattern broken down. - 1 segment.
copper

9



10

8–10 ***(previous page)***
Sketches developing wood surface detail and cyclical patterns

11 ***(overleaf)***
The installation was completed at a one-week residency at the Ruthin Craft Centre and fabricated in the courtyard, where we were able to interact with the public visiting the gallery.

12

13

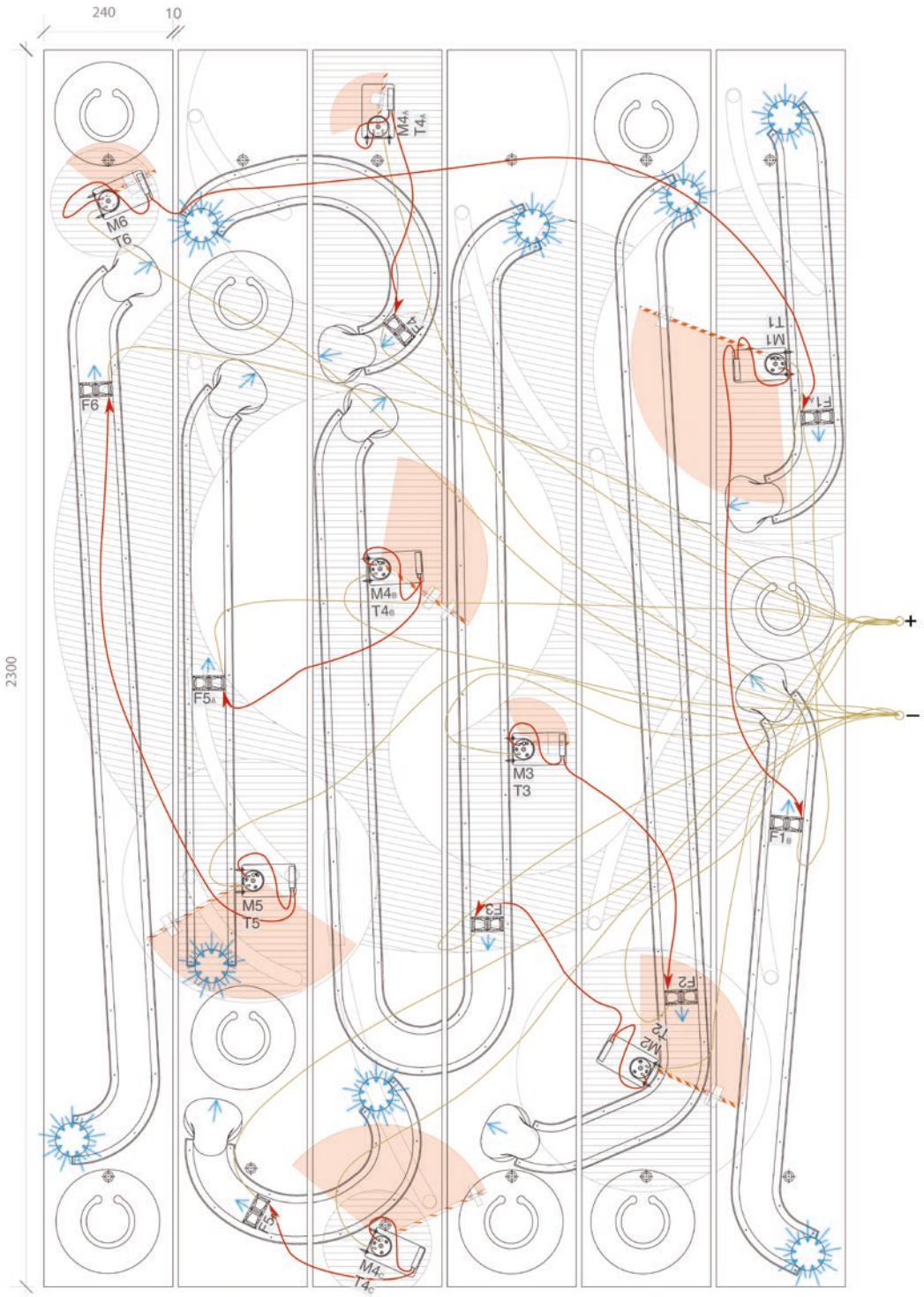
14

12 ***(previous page)***
CNC routing. The planks are joined together and routed, combining numerous separate drawings and cutting paths for the top and bottom surface.

13 ***(previous page)***
Hand-finishing and fabrication

14
Hand-finishing and fabrication

15
Plan drawing (bottom) showing wiring loom and electrical components with air channels illustrating interconnectivity across planks

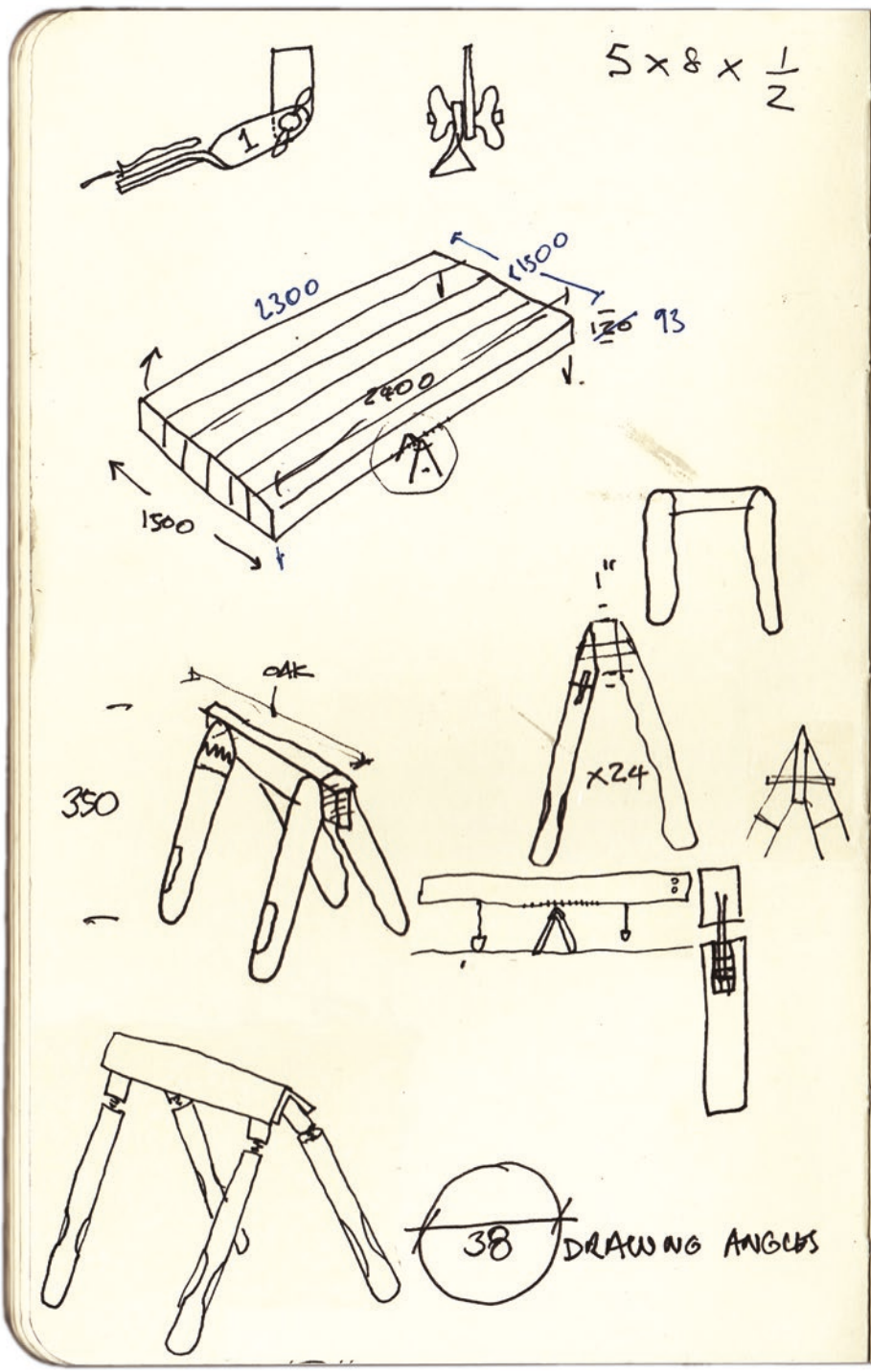

240
10
2300
M6
T6
F6
M4A
T4A
M4B
T4B
F5A
M5
T5
M3
T3
F3
M2
T2
F2
M1
T1
F1B
+
–
6
5
4
3
2
1

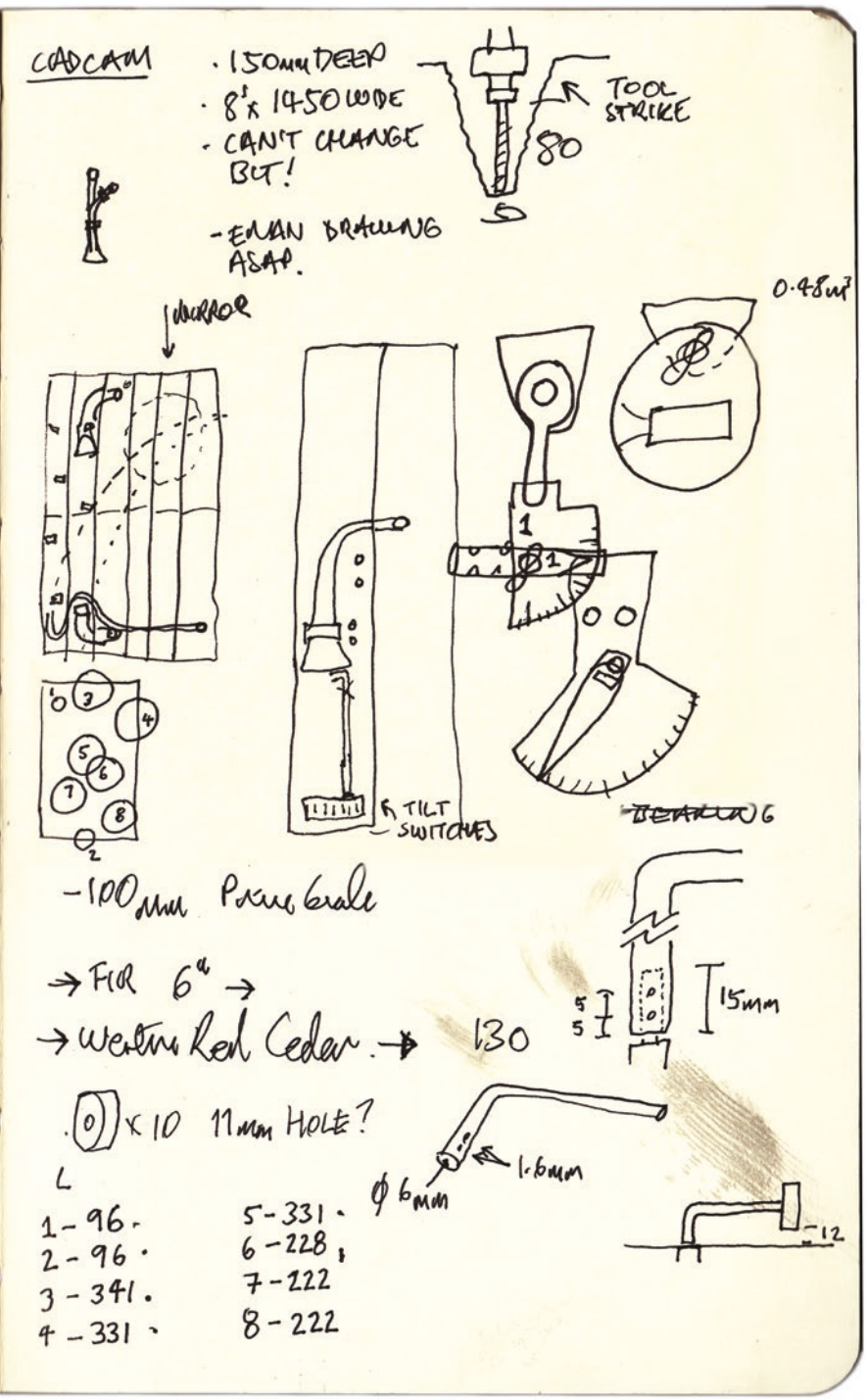
16

16
The planks are set on timber trestles with an aluminium balance blade.

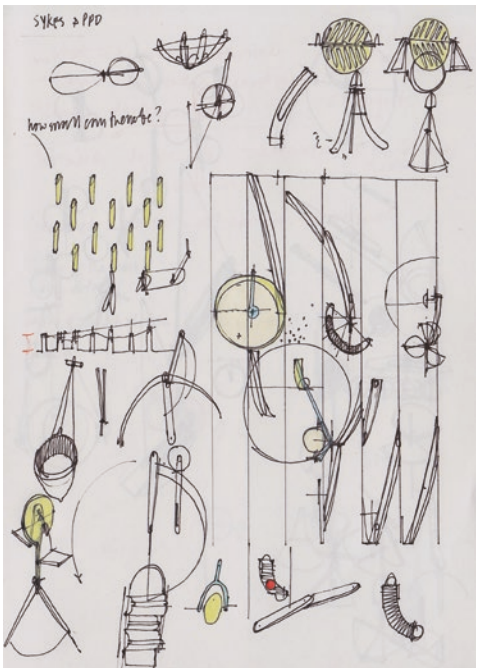
17

17
The underside of the model showing wiring loom and trestle arrangement

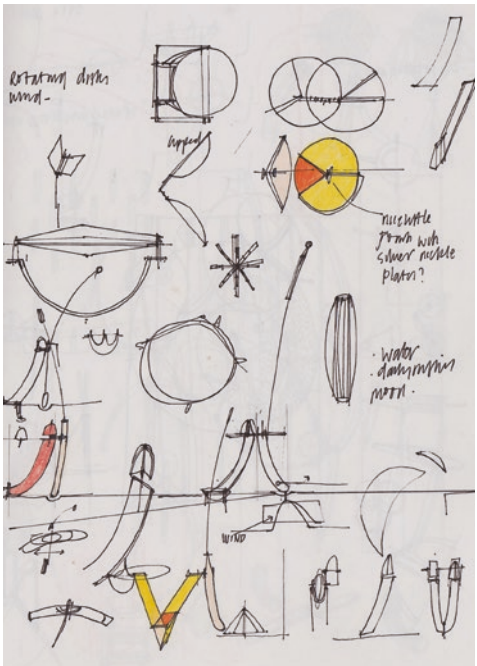

5 x 8 x 1/2
1
2300
1500
93
2400
1500
1"
OAK
350
x24
38
DRAWING ANGLES



18
Sketches developing trestle and balance components



20



21

19 *(previous page)*
Rotating arms with adjustable weights which represent diurnal cycles make visible the physical relationship with lunar cycles and movement in the model.

20 & 21
Sketches developing resonance features and percussive devices

b. Acoustics

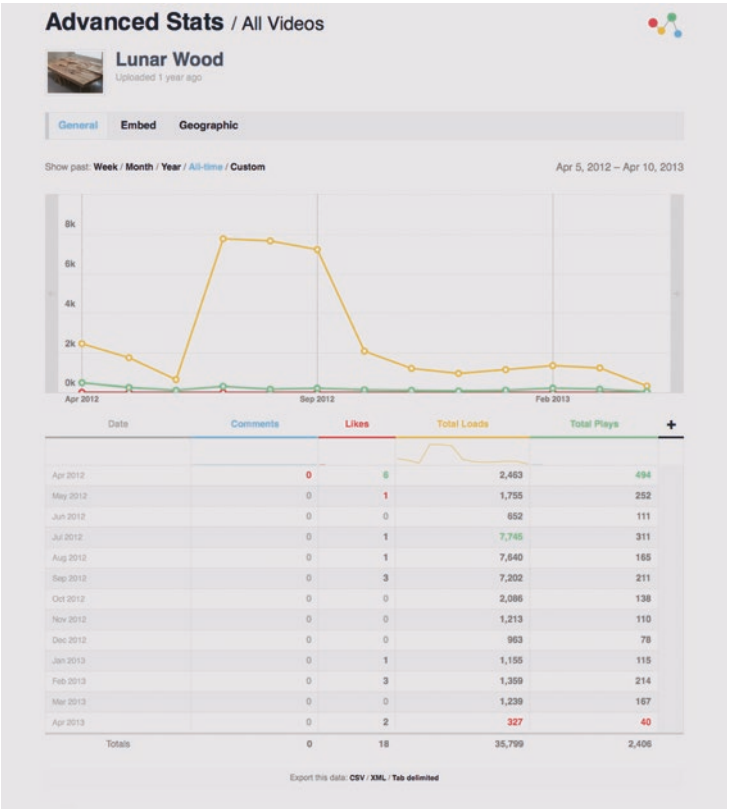
The installation is designed to behave like an instrument with percussive qualities in the manner of a xylophone or wood block. Bell-shaped resonance chambers are cut into the lower surface and a corresponding channel cuts through to them from the upper surface. On each tilt the balance of the plank is checked by a dowelling stave that returns it to horizontal and strikes to resonate sound. Through these forces and forms the model can be seen and heard to respond to the fluctuating and reciprocal push and pull of natural cycles. [fig. 20–22]

Conceptual engineering/ prototyping

Lunar wood operates within the same contexts and to the same tolerances as a 1:1 architectural prototype. It can be seen to offer seductive/aesthetic engagement through a physical analogy while also being subjected to the very same conditions that govern the production, distribution and use of timber in the construction industry.

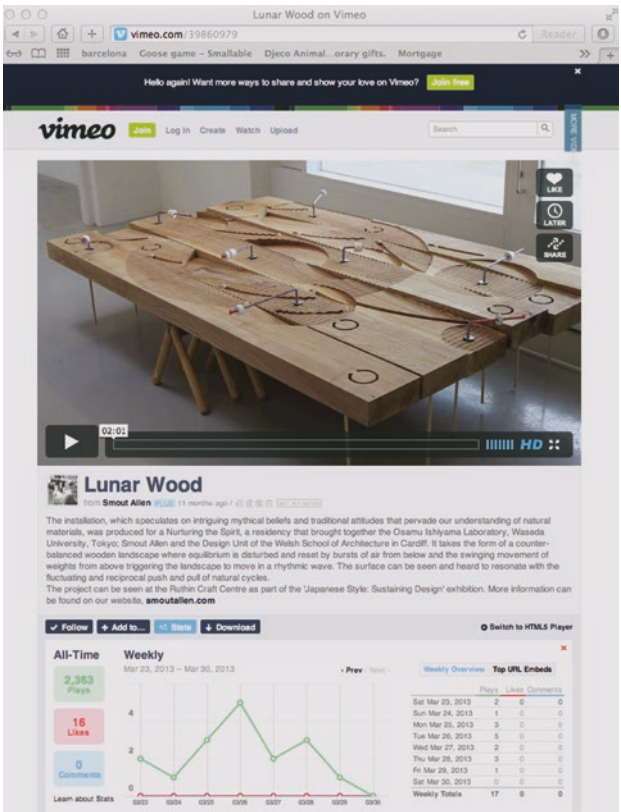
It is an initial prototype of a proposed body of research that will examine, trial and perform the tested and contested relationships between timber and lunar cycles, from the microscopic cellular changes that occur within timber to the impact that timber production has on the global environmental condition.

22 *(overleaf)*
A bell-shaped resonance chamber and air channel outlet are sculptured on the underside of the model.



23

23 & 24
The lunar wood installation at Ruthin is documented in film on Vimeo.


Lunar Wood on Vimeo
vimeo.com/39860979
Hello again! Want more ways to share and show your love on Vimeo?
Join free
vimeo
Join
Log In
Create
Watch
Upload
LIKE
LATER
SHARE
02:01
HD
Lunar Wood
from Smout Allen
The installation, which speculates on intriguing mythical beliefs and traditional attitudes that pervade our understanding of natural materials, was produced for a Nurturing the Spirit, a residency that brought together the Osamu Ishiyama Laboratory, Waseda University, Tokyo; Smout Allen and the Design Unit of the Welsh School of Architecture in Cardiff. It takes the form of a counter-balanced wooden landscape where equilibrium is disturbed and reset by bursts of air from below and the swinging movement of weights from above triggering the landscape to move in a rhythmic wave. The surface can be seen and heard to resonate with the fluctuating and reciprocal push and pull of natural cycles.
The project can be seen at the Ruthin Craft Centre as part of the 'Japanese Style: Sustaining Design' exhibition. More information can be found on our website, smoutallen.com
Follow
Add to...
Stats
Download
Switch to HTML5 Player
All-Time
2,363
Plays
16
Likes
0
Comments
Learn about Stats
Weekly
Mar 23, 2013 – Mar 30, 2013
Prev
Next
Weekly Overview
Top URL Embeds
Plays
Likes
Comments
Sat Mar 23, 2013 2 0 0
Sun Mar 24, 2013 1 0 0
Mon Mar 25, 2013 3 0 0
Tue Mar 26, 2013 5 0 0
Wed Mar 27, 2013 2 0 0
Thu Mar 28, 2013 3 0 0
Fri Mar 29, 2013 1 0 0
Sat Mar 30, 2013 0 0 0
Weekly Totals 17 0 0

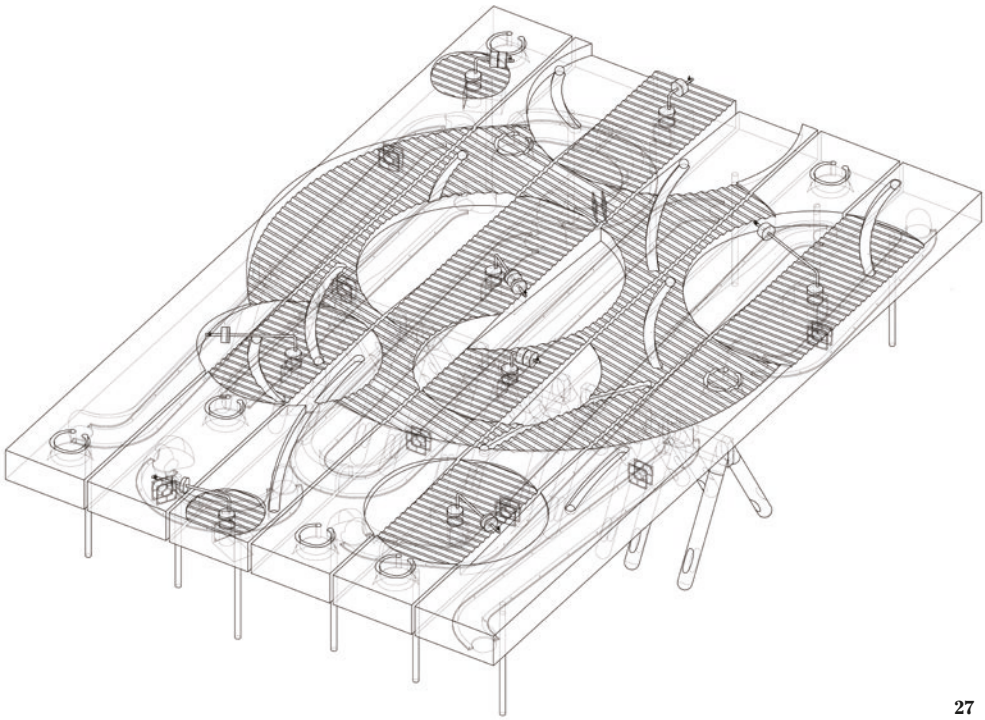
24

25

26

25
Lunar Wood

26
Installation in the Mission Gallery, Swansea, Wales



27

27
Axonometric drawing

Dissemination

Invited residency and exhibitor

Japanese Style: Sustaining Design, curated by Michael Nixon for the Ruthin Craft Centre, Wales (1 Apr – 24 Jun 2012) and the Mission Gallery, Swansea, Wales (19 Jan – 10 Mar 2013).

Panel discussion

Do Architects from Japan and the UK have more in common than a shared planet?, Ruthin Craft Centre, Wales.

Exhibition film

Lunar Wood: http://vimeo.com/39860979 (2,870 hits as of Sep 2013). [fig. 23 & 24]

Refereed conference paper

'Strange Tolerance', *A Strange Utility: Architecture Toward Other Ends* Symposium, Portland State University, Portland, Oregon, USA. 26 April 2013. [fig. 25–27]

Interview

Peter Cook and Will Hunter, 'We move between drawings and 3D and both show the qualities of the other', *Architectural Review* 233.1395 (May 2013): 62–71.

Bibliography

Brettstapel Construction (2013). www.brettstapel.org/

Engiadina-God (2013). www.engiadina-god.ch/

Hinsberger, U. (2013). www.geigenbau-hinsberger.de/en/workshop.php

H. Peuker (2013). Forestgut Peuker. www.peuker-holz.com/index.php

K. Vogt, K. Beard, S. Hammann, J. O'Hara, D. Palmiotto, J. Vogt, N. Scatena and B. Hecht (2002). 'Indigenous knowledge informing management of tropical forests: The link between rhythms in plant secondary chemistry and lunar cycles', *Ambio* 31.6: 485–490.

E. Zürcher, R. Schlaepfer, M. Conedera and F. Giudici (2010). 'Looking for differences in wood porperties as a function of the felling date: Lunar phase-correlated variations in the drying behavior of Norway Spruce and Sweet Chestnut', *Trees* 24.1: 31–41.

Related publications by the researcher(s)

Exhibition film

p. 43
***Lunar Wood,* Ruthin. http://vimeo.com/39860979 (2,870 hits as of Sep 2013).**

Bartlett Design Research Folios

ISSN 2753-9822

Founding editor:
Yeoryia Manolopoulou

Editors:
Yeoryia Manolopoulou,
Peg Rawes, Luis Rego

Graphic design:
objectif

Typesetting:
Axel Feldmann, Siaron Hughes,
Alan Hayward

Proofreading:
Wendy Toole

Bloom
by Alisa Andrasek and José Sanchez

House of Flags
by AY Architects

Montpelier Community Nursery
by AY Architects

Design for London
by Peter Bishop

2EmmaToc / Writtle Calling
by Matthew Butcher and Melissa Appleton

River Douglas Bridge
by DKFS Architects

Open Cinema
by Colin Fournier and Marysia Lewandowska

The ActiveHouse
by Stephen Gage

Déjà vu
by Penelope Haralambidou

Urban Collage
by Christine Hawley

Hakka Cultural Park
by Christine Hawley, Abigail Ashton, Andrew Porter and Moyang Yang

House Refurbishment in Carmena
by Izaskun Chinchilla Architects

Refurbishment of Garcimuñoz Castle
by Izaskun Chinchilla Architects

Gorchakov's Wish
by Kreider + O'Leary

Video Shakkei
by Kreider + O'Leary

Megaframe
by Dirk Krolikowski (Rogers Stirk Harbour + Partners)

Seasons Through the Looking Glass
by CJ Lim

Agropolis
by mam

Alga(e)zebo
by mam

Chong Qing Nan Lu Towers
by mam

ProtoRobotic FOAMing
by mam, Grymsdyke Farm and REX|LAB

Banyoles Old Town Refurbishment
by Miàs Architects

Torre Baró Apartment Building
by Miàs Architects

Alzheimer's Respite Centre
by Níall McLaughlin Architects

Bishop Edward King Chapel
by Níall McLaughlin Architects

Block N15 Façade, Olympic Village
by Níall McLaughlin Architects

Regeneration of Birzeit Historic Centre
by Palestine Regeneration Team

PerFORM
by Protoarchitecture Lab

55/02
by sixteen*(makers)

Envirographic and Techno Natures
by Smout Allen

Hydrological Infrastructures
by Smout Allen

Lunar Wood
by Smout Allen

Universal Tea Machine
by Smout Allen

British Exploratory Land Archive
by Smout Allen and Geoff Manaugh

101 Spinning Wardrobe
by Storp Weber Architects

Blind Spot House
by Storp Weber Architects

Green Belt Movement Teaching and Learning Pavilion
by Patrick Weber

Modulating Light and Views
by Patrick Weber