DESIGN MUSEUM
LONDON &
RMIT DESIGN HUB

v2.0

THE FUTURE IS HERE

TEXTS

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Welcome

From the Vice Chancellor and President, RMIT University

It is with great pride that RMIT University presents *The Future is Here* at RMIT Design Hub. *The Future is Here* comes to Melbourne courtesy of London's renowned Design Museum and with a valuable opportunity to present this international exhibition alongside the work of our local research community.

The Future is Here clearly articulates that the world is currently experiencing a transformation in the way that design is conceptualized, made and consumed. Digital processes such as CAD software, CNC routing, 3D printing and robotic manufacturing along with platforms such as networked manufacturing and crowd funding are transforming the way that many contemporary designers are working.

The exhibition also provides a springboard for the Design Hub curatorial team to draw from its own research community. Displayed alongside internationally sourced works are a series of local, speculative projects that highlight the impact of new technologies upon research innovation. A 'live' Factory forms an interactive zone of the exhibition and is equipped with a range of machines including 3D printers, robots and a CNC milling machine so that students and the public can see these new technologies in action and participate in programs throughout the exhibition.

As an exciting addition to *The Future is Here* exhibition, RMIT Design Hub will also host special guest and internationally celebrated architect Alisa Andrasek, in partnership with RMIT University's School of Architecture and Design.

Working with RMIT architecture students, Andrasek will install a version of her large-scale, interactive installation *Bloom* in Project Room 3 at Design Hub. *Bloom* was first installed in London, as part of the capital's citywide celebration during the 2012 Olympic and Paralympic Games. The students will use their experiences working with Alisa on *Bloom* to inform and expand upon design projects throughout the year.

We hope you will join us in celebrating *The Future is Here* at RMIT University's award winning Design Hub and be inspired by the exhibits from London's Design Museum, learn more about Melbourne's innovative research projects and take an active part in the programs on as part of this compelling international exhibition.

— Professor Margaret Gardner AO
Vice-Chancellor and President, RMIT University

Towards a New Way of Making

Methods of design and manufacturing are constantly in flux. New markets, new materials, new technologies and new ideas all lead to changes in the way that our products are conceived and made. These changes usually happen incrementally, and often independently of each other. However, every so often there is a perfect storm of events that leads to a period of change so profound that the processes of making are forever changed. While these periods of extreme and tectonic change are rare, they lead to changes in areas as diverse as socio-economics and geopolitics.

If we were to trace the journey of a manufactured object at different times in history, we see an interesting pattern emerge. Take the example of the dining chair. A pre-industrialisation chair would have typically been made by a local village or town carpenter. Manufacturing was splintered and fragmented, and each community had the knowledge, skill and resources to produce the goods they needed. Production would have been slow, but handcrafted and even bespoke for the user.

Soon after this the first Industrial Revolution took place, predominantly in Britain. Within a few decades either side of the eighteenth and nineteenth centuries, advances in mining, metal working and steam power transformed the country from what was a predominantly agricultural nation into the world's manufacturing heartland. This soon led to more sophisticated mechanical and electric production, pioneered by the American factory line production of automobiles such as the Model T Ford.

As this mechanisation of the nineteenth and twentieth centuries began to take command it eventually led to the era of mass production. If we are to return to our dining chair, a mass produced twentieth century chair, would typically be made from plastic by an injection moulding machine in factory in South China, or maybe Northern Italy, that produces over a hundred identical chairs each day.

So what of today, or the near future? New digital manufacturing methods coupled with online marketplaces are making the old factories redundant. Nascent technologies and platforms such as CNC routing, digital looms, 3D-printing, networked manufacturing, open-source micro computing, crowd funding and social networking are removing the barriers of access to manufacturing, enabling more people than ever before to engage with the production of our physical world.

Karl Marx believed that those who control the means of

production control the power. Will changes in traditional manufacturing cause a reversal of the traditional manufacturing powerbases? Small-scale makers and sellers have typically produced the type of objects that factories don't. But what if this changed? What if small companies, or even individuals, began making objects that were previously only viable, either technologically or economically, through mass-manufacture?

So what of our dining chair in the world of today? Now we see the pattern of the previous two systems combining and blurring. Digital technology allows a dining chair to be designed by one individual and for the digital files to be downloaded by a complete stranger on the other side of the planet, who can have the chair digitally fabricated locally.

The aim of *The Future is Here* is not necessarily to take the position that previous systems of production — craft vs mass-production; local production vs centralised; and anything in between — were inherently good or bad. All methods of production are capable of delivering both good and bad products. The aim of the exhibition is to examine whether new technologies are giving us the capacity to develop new ways of making.

Similarly, the exhibition does not make a prediction about the future of manufacturing, but intends to provoke debate about the direction it could take. Most importantly, the exhibition aims to encourage us to consider the impact of another tectonic shift in manufacturing. In order for digital manufacturing to be truly transformative, and to truly democratise the means of production it requires a direct contribution from users and consumers. In many ways this exhibition is a call to arms; an invitation to the public to say that a new industrial revolution will only evolve and take hold if they are active participants in its development.

— Alex Newson
Senior Curator, Design Museum

The Future is Everywhere

Bringing *The Future is Here* from London's Design Museum to Melbourne — for the first time beyond the UK — provides a series of critical leaping-off points for RMIT Design Hub as a place for making, thinking, discussing and exhibiting new ideas.

The exhibition speaks to the impact of new technologies within the context of a 'third wave industrial revolution' or a post-digital age. How do digital technologies such as 3D printing and robotic manufacturing infiltrate our homes, our workplaces, our meeting places, our streets, and how can we take an active role in shaping what this means for all of us?

Design Museum's curator Alex Newson describes the exhibition as a 'call to arms' — an invitation for our active participation within the processes of production so that digital manufacturing might be truly transformative and democratized as a means of production. For Design Hub, the exhibition's premise provided an additional 'call to action' — one sited in the presentation of propositional and provocative ideas.

As a purpose-designed building dedicated to a community of inter-disciplinary design researchers, we saw an opportunity to curate an additional Melbourne-based series of speculative projects where ideas and new technologies meet at the very forefront of innovation. In this way, the exhibition at Design Hub takes a step back from the high street to present research projects that inform the development of digital production and also which query the fetishization of the machine.

As curators, we felt it vital to seize the exhibition environment itself as an opportunity to present local design research. An example is the highly ambitious display system for housing *The Future is Here* designed by Studio Roland Snooks. Snooks's design merges robotic fabrication, CNC milling and laser cutting technologies with traditional boat building techniques. The result is a compelling, proto-architectural suite of tables and display surfaces whose structural and ornamental features are created through a digital translation of the natural swarming systems of birds, fish and insects.

Some of the other projects we have selected, by contrast, such as Matthew Sleeth's 'Study for a Drone Opera' explore the cultural and social implications of new technologies. In this work, Sleeth provides us with a late-night pass into the subculture of DIY drone makers/testers/hackers and the necessarily secretive nature of experimenting with a new technology with a complex and unclear legal status in a public place.

Exploring the opportunities of digital technologies alongside their social and cultural impact is an approach that has clearly resonated with exhibition visitors around the world. Programs and exhibitions such as those held recently in New York at the Museum of Art & Design — *Out of Hand: Materialising the Post-Digital* — attracted record visitor numbers, while Paola Antonelli's compelling online exhibition *Design and Violence* for the Museum of Modern Art, continues to provoke debate around the ethical implications that surround open source technologies and the culture of hacktivism.

Antonelli's exhibition profiles design objects that have an uncomfortable relationship with the notion of societal 'good'. One object profiled is The Liberator — an open source set of instructions for creating a firearm using a 3D printer, posted by Texas-based non-profit group Defense Distributed. The work exposes a darker underbelly posed by the democratization of digital manufacturing and the unpredictable nature of how these technologies might be put to use.

This sense of plurality and critical questioning is what we hope visitors will take from *The Future is Here* at Design Hub. We hope the exhibition provides a multi-layered lens through which to see new technologies at work and a platform to provoke debate about their role in everyday life via our series of talks, workshops and interactive programing.

Design Hub is dedicated to showcasing the 'arc' of design research — that is, the often messy, process side of design practice and all its phases including conception, prototyping, evaluation, outcome and archive. In presenting *The Future is Here* at Design Hub we continue this direction and encourage the mingling of audiences with ideas in action so as to open up expert knowledge as widely as possible. The designed future is surely about generating greener, smarter and better outcomes for us all. With new technologies, techniques and relationships made possible via digital networks each of us will have a hand in making sure that the experience of the future really is here, there and everywhere, for everyone.

— Kate Rhodes & Fleur Watson
Curators, RMIT Design Hub

Bloom

Bloom was commissioned by the Greater London Authority as part of the Wonder series of architectural installations celebrating the 2012 Olympics and Paralympics. *Bloom* is conceptualised as an urban toy, a distributed social game and collective 'gardening' experience that seeks to engage people in order to construct open-ended design formations using *Bloom* building cells.

At each location, the designers construct initial pavilions/ follies to showcase the possibilities of the *Bloom* system. These act as the main 'portals' of the game, inviting interaction and participation. People are then able to manipulate the cells, adding pieces to the initial structure to alter its form or seeding entirely new ground sequences, such as urban furniture or simply unpredictable formations. The participatory design process aims to bring the phenomena of social networks and game culture to the physical environment at an urban scale.

Bloom explores modes of assembly, disassembly and reusability that challenge the notions of traditional construction. Looking at the example of toys like Lego, the lifespan of the project is undetermined as it is able to adapt and reappear in many different places and on many different occasions. The collective act of coming to one place and building together becomes a shared memory for each person participating. The energy for *Bloom*'s design is sourced from people's interactions. None of the pieces can do anything on their own, and only when thousands of them are put together do the game and the *Bloom* garden emerge.

— *Bloom* is created by Alisa Andrasek & Jose Sanchez

Thrive

Thrive is a research 'seeding' project that aims to invite public engagement in an early stage of design experimentation. Inflected by and playing off *Bloom*—an installation designed by Alisa Andrasek and Jose Sanchez and installed in parallel to *The Future is Here*—which enables engaging play with a game-like system, *Thrive* offers access to play within the messy, less-than certain phases of the creative practice research process.

The research project aims to redeploy architectural cladding systems, opening up potential modes of materialising, fabricating and constructing spaces. Repetitive, unit-based architectural cladding systems—such as roof tiles and shingles—are redesigned through adapting off-the-shelf architectural materials such that they incorporate variation and employ materials in new ways.

Research is mobilized through exploring variation in shape across cladding units, variation in materials across the one system, and variation generated by material properties and component design. The shape of the shingles will be designed through digital scripts that enable components to be generated in ways that are both complex and aimed at no-waste cutting plans. Material systems, such as polycarbonate coreflute sheeting and timber veneers, will be brought into dialogue with digital design and robotic fabrication techniques. Exploration into both opaque and transparent materials will aim to suggest new relationships between otherwise distinct parts in building skins, such as wall and window.

Finally, a variety of experimental components—still unresolved, unfinished, and in-development as systems—will be offered up for play and speculation in an exhibition setting as unstructured, open-ended 'seeds'. A greenhouse structure will frame this playful activity into the creation of a site through which these research 'seeds' can grow in unanticipated ways.

— Pia Ednie-Brown, Leanne Zilka & Gwyllim Jahn

This project is supported by:
RMIT Architecture & Design
Danpalon
Corex
Laminex

TIMELINE:
A selected 'quick guide' to the New Industrial Revolution

1801: Jacquard loom invented by JM Jacquard. The Jacquard loom, an early example of programmable machinery, increased the speed that textiles were made and helped unskilled workers create complex patterns.

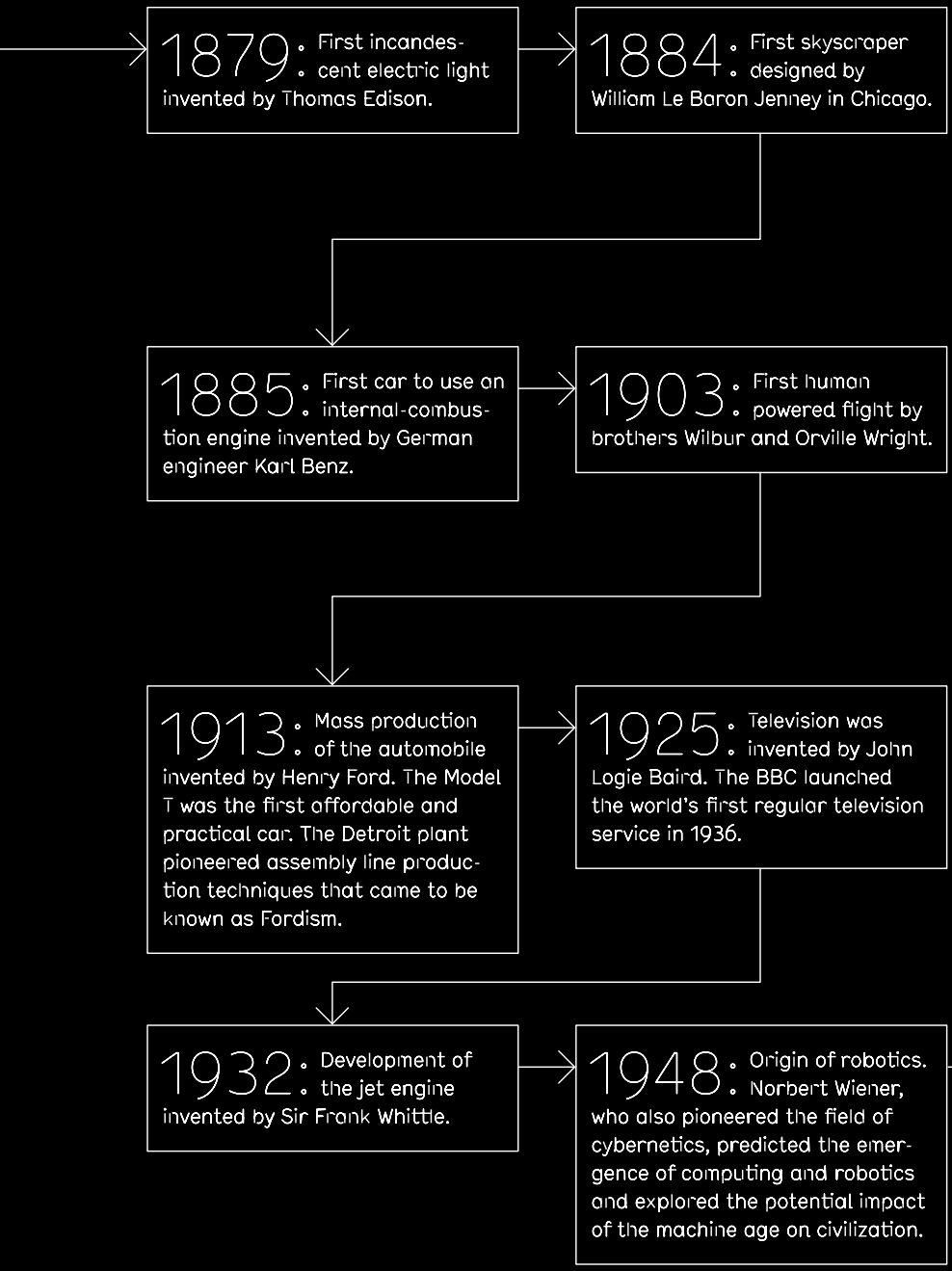
1834: First automatic computing engine invented by Charles Babbage.

1838: First public demonstration of Samuel Morse's invention for the telegraph.

1839: Louis-Jacques-Mandé Daguerre in France and William Henry Fox Talbot in Britain announce the first practical photographic processes.

1868: First commercially viable typewriter invented by Christopher Latham Scholes.

1876: The telephone is invented by Alexander Graham Bell.


1879 • First incandescent electric light invented by Thomas Edison.
1884 • First skyscraper designed by William Le Baron Jenney in Chicago.
1885 • First car to use an internal-combustion engine invented by German engineer Karl Benz.
1903 • First human powered flight by brothers Wilbur and Orville Wright.
1913 • Mass production of the automobile invented by Henry Ford. The Model T was the first affordable and practical car. The Detroit plant pioneered assembly line production techniques that came to be known as Fordism.
1925 • Television was invented by John Logie Baird. The BBC launched the world's first regular television service in 1936.
1932 • Development of the jet engine invented by Sir Frank Whittle.
1948 • Origin of robotics. Norbert Wiener, who also pioneered the field of cybernetics, predicted the emergence of computing and robotics and explored the potential impact of the machine age on civilization.

1952 Scientists at the Massachusetts Institute of Technology connect a computer to a milling machine and create the world's first CNC [computer numerically controlled] machine.

1954 Modern mass-produced plastics invented by Giulio Natta.

1959 The microchip is invented by Jack Kilby.

1961 The first use of modern robotics in manufacturing. The Unimate machine operated by General Motors was a large robotic arm that could obey step-by-step commands.

1964 IBM release the first family of computers designed to cover the complete range of applications, from small to large, both commercial and scientific.

1970s A rise in environmentalism triggers an increasing interest in the finite supply of fossil fuels and renewable energy sources. Along with the appearance of electricity generating wind turbines, there are advances in technologies that make solar energy practical.

1973 The first hand-held mobile phone is demonstrated by John F. Mitchell and Dr. Martin Cooper of Motorola.

1984 Apple Macintosh computer released as the first mass-market personal computer featuring an integral graphical user interface and mouse.

1984 Charles W. Hull invents the first 3D printer.

1989 Tim Berners-Lee writes his initial proposal for the World Wide Web.

1992 Architecture's Digital Turn: Bernard Tschumi with Greg Lynn, Hani Rashid and others develop the concept of 'Paperless Studios' at Columbia University that leads to the current wave of generative digital architecture.

1996 Bernard Cache, Patrick Beaucé and Jean-Louis Jammot set up Objectile SARL in Paris and develop an original production method which makes it possible to manufacture objects at every scale with complex curved surfaces and unlimited variations industrially, on digitally controlled machines.

2006 Adoption of industrial robotics into experimental architectural design – a movement lead by Gramazio Kohler to use industrial robotics within the design and construction of complex architectural forms.

2007 Apple release the iPhone.

2012 The Liberator is launched – an open source set of instructions for creating a firearm using a 3D printer posted by Texas-based non-profit group Defense Distributed. The 'product' raises questions about the unpredictable nature of the democratic power of new technologies.

Exhibition & Communication Design

Exhibition Design
Studio Roland Snooks

The composite fibre surface that forms the main installation in Project Room 1 at RMIT Design Hub compresses surface, structure and ornament into an intricate and complex assemblage. The project is an extension and amalgamation of three strands of research — algorithmic design, robotic fabrication and composite fibre materials — that are being undertaken by Studio Roland Snooks.

The intricate pattern of 'agentBodies' that run within the surface of the display tables are designed through a multi-agent algorithm that draws from the self-organising logic of swarm intelligence — such as flocks of birds, schools of fish or social insects. This generative approach negotiates between structural, formal and ornamental design intentions to create an emergent surface condition — that is, one that develops through its own internal logic.

The complex geometry of the project is made possible through the development of robotic fabrication techniques including the extrusion of the fine-scale agentBodies. The surface is produced from composite fibre and gains its strength through the location of the agentBodies that operate as structural beams within the surface. This strategy enables the surface to remain only a few millimetres thick while spanning and cantilevering considerable distances.

Communication Design
Stuart Geddes & Brad Haylock

The visual identity for *The Future is Here* at RMIT Design Hub has been approached in a way that embodies the themes of the exhibition. The visual identity, the exhibition signage, this catalogue and the other graphic elements showcase the latest visual communication design and production technologies, as well as a number of advanced manufacturing techniques usually reserved for other disciplines, such as architecture or industrial design.

The cover of the catalogue that you hold in your hands has been produced using digital offset printing — a quintessentially twenty-first century print technology. This type of printing allows short-run customisation, which is most commonly applied to direct mail campaigns. (Have you ever received a seemingly hand-addressed letter from your bank or electricity company?) For this book cover, though, the variable data isn't an

unsuspecting addressee's name, but the background motif, which is the biomimetic pattern developed by Studio Roland Snooks as the skeleton of the exhibition furniture. Snooks and his team grow the pattern step-by-step using advanced computational processes until an optimum form is achieved. Evoking this process, the patterns on the cover of these books grow and shift from one copy to the next, so no two copies from the print run of 4000 are exactly alike.

The typeface on the covers of these books is modeled on that used in the ongoing visual identity of Design Hub, originally selected by Fabio Ongarato Design. But, exploring the limits of the latest digital font standard, OpenType, hundreds of subtle (and some not so subtle) idiosyncrasies are built in, mimicking the imperfections of handwriting. In the fifteenth century, Johannes Gutenberg invented movable type: individual metal letters were set together to print words on a page. Gutenberg's letters were modeled on the German handwriting of the time (which we today call 'Blackletter'), but all of the inconsistencies of handwriting are erased when cast as metal type.

In a playful demonstration of the possibilities of the OpenType standard, the typeface developed for *The Future is Here* by type designer Dan Milne features random imperfections: lines are too short, so parts of letters don't join, or they double back on themselves, and sometimes the pen doesn't leave the page, so extra lines are scrawled as the software seemingly hurries to finish drawing a letter.

These ideas are further expressed through the use of robots and three-axis routers as writing machines. By plotting the typography in space using architectural modeling software, and routing at different depths, we have achieved something analogous to stone-carved lettering. Similarly, in adapting a machine to hold a Posca ink marker, the result echoes toilet stall graffiti, or is it café blackboard signage? Paradoxically, five and a half centuries after Gutenberg's invention, contemporary font technologies allow us to reintroduce the idiosyncrasies of the human hand into printed and engraved characters.

Glossary

3D Scanning
Digitally recording the surface of an object in three dimensions to create a digital file of the object

3D Printing
Printing successive layers of a material to form a three-dimensional object

Additive Manufacturing
The computerised process of building up thin layers of material to make a 3D object

Arduino
A credit card sized computer designed to make programming accessible to all

Automated Assembly
Producing goods using automated machinery or robots and a systematic approach to assembling goods that operates at least partly independently from human control

CAD (Computer Aided Design)
Using computer software to assist in the design of an object

CAM (Computer Aided Manufacturing)
Using computer controlled machinery and tools to make an object

Casting
The process of pouring a material (such as molten metal or plastics) into a mould to create an object

CNC (Computer Numerical Control) Manufacturing
Using computer software to transform a CAD design into instructions for computer controlled machinery

Crowd sourcing
Obtaining services, ideas or content by seeking contributions from a large group of people, and especially from an online community

Customisation
To modify or produce something to meet individual requirements

Digital weaving
A method of weaving, or creating fabric, where the loom takes instructions direct from a digital file rather than the traditional mechanical instructions

Hacking
Customising or innovatively altering existing products or methods to create something new. Also refers to gaining unauthorised access to data in a system or computer

Laser-Cutting
The process of cutting or etching materials using a computer controlled laser

Mass manufacturing
Production of large quantities of standardised products, especially using assembly lines

Milling
Cutting or shaping metal using a rotating tool to remove material

Open Source
Software for which the source coding is freely available and may be modified and redistributed

Parametric design
The use of computer controlled algorithms to manage and generate form, which can be varied in all directions to create free-flowing, organic forms and ever more complex geometries

Polymer
A natural or synthetic material, often plastic or resin, made of large molecules composed of many repeated molecular sub-units bonded together to produce unique physical properties such as toughness

Prototype
A model or sample produced to test a concept, design or manufacture method

Rasberry Pi
A credit card sized computer designed to make programming accessible to all

Rapid Prototyping
Using computer software and specialist equipment to automate the 3D construction of a prototype, usually by 3D printing, stereolithography or selective laser sintering

Rotational Moulding
The process of pouring a molten material into a mould that is then rotated on all of its axes in order to create a hollow 3D form

Router
A power tool with a bit rotating at high-speed to cut (or rout out) a highly finished groove, trim or shape wood, plastic or other rigid non-metal

Routing
A method of cutting trimming, and shaping wood, plastic, and a variety of other rigid non-metals using a bit rotating at high speed

Selective laser sintering (SLS)
A laser is used to fuse the shape of an object's initial slice from a thin layer of granular or powdered material. After the laser has created first slice, a new layer of powder is spread over the initial one and the process begins again

Stereolithography
A type of additive manufacturing which uses an ultra violet laser to solidify thin layers of liquid polymers in order to build up a 3D form

Subtractive Manufacture
The process of removing material from a solid block of material, usually metal, wood or plastics to form an object, including traditional techniques such as carving, drilling, sawing, wood-turning

Vacuum Forming
A sheet of plastic is heated to forming temperature and stretched over a mould using suction to create a vacuum

Credits

The Future is Here at RMIT Design Hub
28 August – 11 October, 2014

The Future is Here is a touring exhibition created by the Design Museum, London, and co-curated with RMIT Design Hub

Design Museum Curator: Alex Newson
RMIT Design Hub Curators: Kate Rhodes & Fleur Watson
Creative Production: Nella Themelios
Head Exhibition Technician: Erik North
Exhibition Assistants: Kate Riggs, Audrey Thomas-Hayes
Technical Assistants: Tim McLeod, Sam Fagan, Tom Muratore, Marcin Wojcik

Exhibition Design: Studio Roland Snooks
Graphic Design: Stuart Geddes & Brad Haylock
Typeface Development: Dan Milne
Typographic Animations: Sam Margalit
Films: Nervegna Reed Productions
Vinyl Production: Boom Studio
Factory: RMIT Architecture & Design Workshops
Makerbot generously provided by Freedspace/Thinglab

Exhibition Design Team: Roland Snooks (Director), Cam Newnham, Drew Busmire, Amaury Thomas, Pei She Lee
Structural Engineering: Bollinger+Grohmann Engineers/Sascha Bohnenberger, Clemens Preisinger, Robert Vierlinger
Fibreglass Fabrication: Composite Constructions/Steve Campbell

Bloom installation and elective: Alisa Andrasek, Pia Ednie-Brown, Leanne Zilka, Gwyllim Jahn with students from RMIT Architecture & Design

RMIT Fabrication Team: Wen Yap, Milou van Min, Franco Zagato, Farah Rozhan, Sebastian Nicht, Jack Mansfield-Hung, Chris Ferris, Jesse Thomas, Emily Cipriani, Scohldun Beaver, Yee Shuian Sang, Say Huang Tan, Tim Cameron, Simone Tchonova, Kei Jin Pook, Yuxi Cheng, Jonathan Kim, Pat Anglin, Matt Ellis, Vincent Lai, Edmund Olowo, Fahimeh Mosavari, Sanghan Gang, Lijun Loy, Stephen Annett, Tuyen Tran
Carpentry: Rob Sowter, Rohan Bevan, Aron Hemingway
Steel Fabrication: Roni Ellazam

The Design Museum would like to acknowledge the support of the Technology Strategy Board and all lenders to the exhibition: 3T RPD, Adidas, The Agency of Design, Assa Ashuach, Assemble & Join, Catherine Wales, CNCMYMODEL, Digits2Widgets, Dr Adrian Bowyer, Forum For The Future, MADE.com, Manchester FabLab, Michael Warren, OpenDesk, Orangebox, Philippa Brock, Puma, Roland DG, Rolls-Royce, Ron Arad Associates, Sweeep Kuusakoski, Tri-Wall Europe, Unto This Last and Vitamins. Thanks also to Lucienne Roberts and Alice Masters for her films.

Thank you:
Professor Margaret Gardner AO, Deyan Sudjic, Alex Newson, Ria Hawthorn, Charlotte Bulté, Calum Drummond, Lois Fitz-Gerald, Leon van Schaik, Richard Blythe, Paul Minifie, Nick Williams, Mark Burry, Justin Clemens, Susan Cohn, Andy Miller, Lucy McRae, Tom Kovac, Matthew Sleeth, Leah Heiss, Blamey Saunders Hears, Milan Brandt, Peter Choong, Bin Dixon Ward, Floyd Mueller, Scott Mayson, Jenny Underwood, Kate Kennedy, Gyungju Chyon, RMIT School of Fashion & Textiles, RMIT School of Architecture & Design, RMIT School of Media & Communication, RMIT Gallery, SIAL Sound, RMIT Design Archives, Scott Mitchell, Scott Mayson, Malte Wagenfeld, Philip Pille, Toby Reed, Sam Reed, Anna Nervegna, Steve Campbell, Andrew Thompson, Kevin O'Connor, Rafael Diem, Daniel Ong, Alisa Andrasek and Jose Sanchez, Vivian Mistogianni, Pia Ednie-Brown, Leanne Zilka, Gwyllim Jahn, Michele Azzopardi, Emma Telfer, Andrew Wild, Kelly Bosman, Deb Sippitts, Rory Hyde, Lawrence Harvey, Jeffrey Hannam, Andrew Thompson, Kevin O'Connor, Rafael Diem, Daniel Ong, RMIT Design Hub volunteers and all the exhibitors.

RMIT Design Hub

Opening hours:
Tuesday–Friday, 11am–6pm Saturday, 12pm–5pm

Closed Sunday, Monday and Public Holidays

Admission is free

RMIT Design Archives:
By Appointment
The RMIT Design Archives is located on the western side of the forecourt. Contact the Archives to make an appointment to view the collection: rmitdesignarchives@rmit.edu.au

Location:
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www.designhub.rmit.edu.au

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RMIT UNIVERSITY DESIGN MUSEUM

DESIGN MUSEUM
LONDON &
RMIT DESIGN HUB

v 1.0

THE FUTURE IS HERE

WORKS

THE FUTURE IS HERE

WORKS

Experimentation & Speculation

The Future is Here from London's Design Museum provides a springboard for the curatorial team to draw from the RMIT Design Hub research community and present speculative projects where ideas and new technologies meet at the very forefront of innovation.

The opening section of the exhibition is a display of works made in Melbourne that take a step sideways from the many products intended for the 'high street' (encountered later in the show) to, instead, present experimental design research.

This display includes works by craftspeople, artists, architects and designers (as well as a surgeon and a poet) who are currently working on projects that engage with advanced digital processes to form new, collaborative networks and experimental outcomes. They also expose the process side of design practice in all its phases including conception, prototyping, evaluation and outcome. Many of these works are also intended to reflexively provoke discussion around the fetishization of the tools of the new industrial revolution such as 3D printers, drones and robots.

1. Lucy McRae
Swallowable Parfum

As a self described 'Body Architect', Lucy McRae creates startling, highly aesthetic yet unsettling cinematic worlds that describe an avant-garde future.

McRae's work straddles the worlds of design, architecture, science, technology, dance and fashion. She describes her process as taking 'the human body as a canvas, manipulating the body's natural structure to invent anatomical forms and adornments.'

Often using everyday materials to produce her visions, McRae's work sits — at times uneasily — between 'low tech' processes and the frontier of bio-technology speculation. Her work can be viewed within the context of a growing community of practitioners who reject pure parametric and algorithmic computerized design in favour of a poetic digital avant-garde where emotions and identity meet experimentation and new technologies.

In this video work, McRae presents Swallowable Parfum® Live Lab — a digestible luxury product that reacts to one's own body chemistry to exude a bespoke scent through the pores of the skin.

Swallowable Parfum® Live Lab
HD film, 16:9
2013

Director/ Writer: Lucy McRae
Executive Producer: Amy Silver
Assistant Director:
Giuseppe Demaio / The Locals
DoP: Jon Mark Oldmeadow
Costume Design:
Cassandra Wheat / Chorus
Original Music:
Charlotte Hatherley
Production Designer:
Simon Glaister
Graphic Design: Matthew Angel
Product Development:
Sarah Papadopoullos
Location: Pin-up Architecture &
Design Project Space

2. Tom Kovac
100 Year City

100 Year City is a global, online collaborative 'super studio' led by architect Tom Kovac that encourages cross-disciplinary exchange and the sharing of ideas for new sustainable blueprints for our cities.

The project was first produced in collaboration with RMIT University and Slovenian-based EPEKA for the Maribor 2012 European Capital of Culture program in order to explore speculative ideas for the city of Maribor over a 100-year time-scale.

100 Year City uses the tools of the design studio and the currency of a digital social community as agents to instigate, explore ideas and provoke response to the future of a city. With over 65 projects from design leaders and schools from around the world, the collective visions offer a remarkable insight into the future of Europe, brought to life via a purpose-designed app and augmented reality technology.

Presented here, is an immersive and filmic sequence that draws together the diverse range of projects contributed by studios and students internationally. The film includes a series of extracted quotes with residents that are interwoven into the soundscape giving 'voice' to the citizens of Maribor while a haunting cello score interprets the imagery produced by the schools into a musical score.

This sequence was first shown in an installation at the Venice Architecture Biennale and the European Capital of Culture, Maribor (2012).

A second iteration of the 100 Year City project will focus on Kaula Lumpur, Malaysia in 2015.

100 Year City (Maribor)
2012
Single channel HD video

Director: Tom Kovac
Curator: Fleur Watson
Film/Soundscape: Keith Deverell
Project Management:
Katherine Mott
Soundscape (cello):
Judith Hamnn
Soundscape (interviews):
Jonathan Podborsek
Slovenian Project Commissioner:
Peter Tomaz Dobrila,
Deputy Commissioner:
Stefan Simoncic

Project team: Saif Kattan,
Mercedes Mambort, Linton Wood,
Michael Murdock, Selene Wong,
Gianna Zulkafli Matija Kovac

3. Matthew Sleeth
Development video [A Drone Opera]

Artist Matthew Sleeth's work gives an insight into the subcultures and fetishism that emerge around new technologies such as 3D printing, robotic processes and drone technology.

In this developmental video for a larger Drone Opera project that is also underway, Sleeth captures drone pilots flying their machines in an outer-suburban carpark at midnight. The film presents the group of men stationed on camp chairs behind a line up of parked cars, controllers in hand.

The film takes an FPV — first person view — perspective via a camera attached to the drone. As it swoops around the carpark following the other drones, the film captures the concrete surrounds of the carpark and its security lights, made strange from the unusual perspective, all flanked by darkness of the late hour.

The film intimately captures this subculture of DIY drone makers / testers/ hackers and the necessarily secretive nature of toying with a new technology with a complex and unclear legal status in a public place.

Development video
[A Drone Opera]
2014
Single channel HD video
Courtesy of Matthew Sleeth and
Claire Oliver Gallery, New York

Drone object with control system
2013
(displayed on table opposite)

4. Richard Blythe, Paul Minifie and Nick Williams
Penumbra – Facade Concept Prototype

Penumbra explores the design and fabrication of an active building skin system. Extending a design concept proposed by architects Richard Blythe, Paul Minifie and Jan van Schaik in their competition entry for the 'House of Fairytales', the system is composed of a collection of variable cells which operate together as a structural enclosure and a highly articulated surface, meditating both environmental conditions and light.

This tiny manipulation of matter enables major visual and environmental effects, allowing the skin to mediate the available light between the interior and exterior. On the interior the programable cells control sunlight penetration to simulate forest-like experiences. The pixelated surface of the exterior is capable of forming impressionistic images at night achieved by controlling the emittance of interior lighting.

This visual data is unlike that of a computer screen or electronic sign in that the data it contains is intimately linked to its situation (solar or internal lighting) which like the shadows cast by standing stones provides an experience which is unique in both place and time and links the experience to the greater solar system or the internal life of the building.

Penumbra – Facade Concept Prototype
2014
HD film (2 channel) with ABS FDM 3D print, PET and electronically actuated film

Design Lead: Richard Blythe, Paul Minifie
Prototyping and Detailed Design Lead: Nick Williams
Electronics and actuation control: Scott Mitchell
Electronics and actuation control: Daniel Prohasky
Research Assistants: Amaury Thomas, Joshua Salisbury-Carter, Brendan Knife, Wenjin Lai

5. Roland Snooks
Exhibition design — The Future Is Here

The Future is Here provided an opportunity for the RMIT Design Hub team to commission an exhibition design that engages with a 'live' design project and enables the research to move from speculation into built form.

The design is a continuation of the work of Studio Roland Snooks, which explores the relationship between algorithmic design processes and robotic fabrication.

Conceived of as an exhibit within the exhibition itself, the design of the environment and display systems for the objects is an experiment in the application of emerging fabrication techniques at an architectural scale.

The design features a large-scale composite fibreglass architectural prototype that defines the main exhibition space at Design Hub, exploring a relationship between surface, structure and ornament and creating a dynamic spatial environment for the works on display.

Using robotic fabrication in conjunction with composite fibre techniques, the design provides a fascinating study in the convergence of new manufacturing processes with more conventional boat building processes.

Project Room 1 installation:
Fibreglass, robotically extruded silicon agentBodies, CNC milled foam agentBodies, tubular steel legs

Project Room 2 exhibition design system:
PETG plastic bubbles, vinyl pattern

Design: Studio Roland Snooks
Design Team: Roland Snooks (Director), Cam Newnham, Drew Busmire, Amaury Thomas, Pei She Lee
Structural Engineering: Bollinger+Grohmann Engineers/ Sascha Bohnenberger, Clemens Preisinger, Robert Vierlinger
Fibreglass Fabrication: Composite Constructions/ Steve Campbell
RMIT Fabrication Team: Wen Yap, Milou van Min, Franco Zagato, Farah Rozhan, Sebastian Nicht, Jack Mansfield-Hung, Chris Ferris, Jesse Thomas, Emily Cipriani, Scohldun Beaver, Yee Shuian Sang, Say Huang Tan, Tim Cameron, Simone Tchonova, Kei Jin Pook, Yuxi Cheng, Jonathan Kim, Pat Anglin, Matt Ellis, Vincent Lai, Edmund Olowo, Fahimeh Mosavari, Sanghan Gang, Lijun Loy, Stephen Annett, Tuyen Tran
Carpentry: Rob Sowter, Tim McLeod, Rohan Bevan, Aron Hemingway
Steel Fabrication: Roni Ellazam
Vinyl Decal: Boom Studios
RMIT Architecture and Design Workshops: Andrew Thompson, Kevin O'Connor, Rafael Diem, Daniel Ong

6. Leah Heiss with Blamey Saunders Hears Incus

In collaboration with Blamey Saunders Hears, designer Leah Heiss has created a programmer, or 'hearing pod', which enables the user of a hearing aid to tailor their hearing experience in situ. *Incus* was produced through an iterative approach that involved form modelling using polymer clays before moving on to 3D modelling and additive manufacturing in a range of materials including plaster, resin and plastic. The final version of *Incus* has been manufactured in a CYCOLOY C 2950 plastic using an injection moulding process.

While the hearing aids are automatic, it is important to be able to have some personalised settings for extreme listening conditions, such as working in a coffee shop, or performing live music. The wearer discreetly sets up their hearing aid in real world environments, and then picks the appropriate hearing program — for instance, from one designed for a concert or for skiing — to ensure the user has full hearing in all acoustic conditions.

The programmer sits between the hearing aid and a mobile device (phone or computer) and acts like a personal audiologist. The programmer also has a carefully considered form that is both a pleasure to look at, and to hold, in order to help de-stigmatise the issue of hearing loss and to encourage a bond between the user and their medical device.

Incus prototype — jewel model
Designed 2012, printed 2014
Plastic 3D print

Incus prototype — jewel model
Designed 2012, printed 2014
Ceramic 3D print

Incus prototype — jewel model
Designed 2012, printed 2014
Plaster 3D print

Incus prototype — Pod model
Designed 2012, printed 2014
Plastic 3D print

Incus prototype — Pod model
Designed 2012, printed 2014
Ceramic 3D print

Incus prototype — Pod model
Designed 2012, printed 2014
Plaster 3D print

Incus prototype — Bean model
Designed 2012, printed 2014
Plastic 3D print

Incus prototype — Bean model
Designed 2012, printed 2014
Ceramic 3D print

Incus prototype — Bean model
Designed 2012, printed 2014
Plaster 3D print

Incus final manufactured product
Designed 2012, manufactured 2014
Cycoloy C 2950 plastic

Leah Heiss, Peter Blamey, Daniel Taft, Jeremy Blamey, Yaniv Kaufman, Sarah Bellhouse, Planet Innovation, SRX Global, Wolfson Dynamic Hearing, Tom Frauenfelder (3D modeling)

7. Milan Brandt and Peter Choong
Just-in-time patient-specific medical implants

Engineer Milan Brandt and Surgeon Peter Choong are working together toward the creation of tailor-made, bone replacement parts using additive manufacturing.

Using patients' own CAT or MRI scans as the data for 3D printing, Choong and Brandt are able to generate perfect replicas of the cancerous bone removed during surgery. These replacement parts are formed in Titanium as a lattice-like structure that mimics the density and weight of bone and encourages bone to grow into the 3D print.

This research may one day allow the manufacture of bone replacement parts in real time, so that in the future 3D printers could be part of a surgeon's kit in the operating theatre.

Just-in-time patient specific
medical implants
2014
Model hip with removable part,
titanium alloy implant, polymer
implant, aluminium implant

RMIT team members:
Mr. Darpan Shidid, PhD student,
and Dr. Martin Leary, Senior
Lecturer, RMIT University

8. Mark Burry
The Third Policeman

Until recent times human conceptual abilities have been largely trapped within the confines of our consciousness through the difficulty of their external representation in any tangible form — we could only rely on wordsmiths, poets and artists to help us envisage the totally unfamiliar.

The Third Policeman Project which takes its name from the now cult novel by Flann O'Brien (aka Brian O'Nolan) challenges this condition by taking full advantage of digital technologies whereby not only can we bring into being interpretations of complexity through image and animation, we can also sublimate them into physical existence as objects.

On display here are a series of parametrically generated 3D printed forms that represent the project's intent: to enable the creation of a unique object for each human being, past and present.

The Third Policeman
1998–2014, ongoing
Objet Fused Deposition Modeling,
ABS Thermoplastic

Mark Burry, Wojtek James
Goscinski, Andy Miller,
James Loder, Michael Wilson,
Chen Canhui, Brad Marmion

9. Susan Cohn and Justin Clemens
Valentine cc_1402_2014

Valentine cc_1402_2014 is a critical commentary on the contemporary ritual of Valentine's Day — a ritual that is simultaneously global, generic and corporate and yet utterly local, singular and personal.

On Valentine's Day people present poetry and rings to their loves as tokens of affection. But how have these two ancient artistic practices — jewellery and poetry — become so associated with this day? As a response to these provocations, jeweller Susan Cohn and poet Justin Clemens have playfully created a project comprising of a how-to guide for constructing a love poem and a sizing template for ordering matching rings that are produced out of 3D printed nylon.

The white 'sugar cube' quality of the 3D printed nylon ring is an analogy to the 'purity' of a new relationship. In addition, nylon has been chosen as it gradually becomes 'soiled' with dirt and sweat (the realities of life) by the wearer. The project comments on the fetishization of new technologies and the potential devaluing of objects whose preciousness and intimacy is, in part, generated through their hand-made production. The project suggests that the highly personal acts of writing poetry and giving jewellery might be subverted when their production is automated.

Valentine cc_1402_2014
Hand-made instruction manual,
3D printed nylon rings
2014
48/99
Nylon, aluminium, paper, ribbon,
HD film (2 channel)
Susan Cohn and Justin Clemens

Graphic design: Thomas Deverall

This project was first presented
at Anna Schwartz Gallery,
Melbourne on 14 February 2014.
Susan Cohn is represented by
Anna Schwartz Gallery.

10. Bin Dixon-Ward
Framework

Contemporary jeweller Bin Dixon-Ward's interlinked, geometric, architectural necklaces take their form from an investigation into the renowned 1837 Hoddle city grid for Melbourne. The work is a commentary on the dissolving, porous nature of the grid as the city shifts, matures and grows.

Framework is produced utilizing CAD (Computer Aided Design) software program 'Rhino' and selective laser sintering, a process of bonding microscopic grains of nylon by laser. The objects are built up layer-by-layer and then colour is applied by hand. Dixon-Ward pushes the capacity of the 3D printer beyond solid forms to produce intricate, interlocked sections that react and move on the body.

For Dixon-Ward, embracing digital technologies provided the capacity to shift her conceptual ideas into material form. The process of using the computer and 3D printing enables the translation of ideas from a hand drawing to the finished object outside of the usual process of using traditional gold and silver-smithing techniques.

Framework
2013
Laser sintered nylon, ink

11. Floyd Mueller
Joggobot

Interaction game designer Florian 'Floyd' Mueller sees a future where exertion activities will become a new experience involving interactions with robotic systems. Joggobot is an autonomous flying quadcopter — or drone — that exemplifies his thinking about the combination of robotics and physical exercise. Joggobot helps us to understand the interactions between a person and a robot. In particular, it allows the examination of interactions between embodied parties that are both exerting: the jogger is getting exhausted, while the quadcopter, thanks to its physical body, also requires significant energy to fly. This can be seen as a contrast to existing jogging apps on mobile phones, helping us to examine the potential of embodied systems in terms of facilitating novel interactions between people and interactive systems.

Mueller uses Joggobot to ask questions such as how (and if) robots should support us when exercising, should the robot be more like a coach, or more like a dog or something different altogether? How does this affect the interaction, and in particular, the exercise experience for the jogger? Will joggers run faster or longer because of the robot? And, maybe more importantly, will the jog be more engaging?

Joggobot
2014–
Various hardware and software components

Florian 'Floyd' Mueller and Matthew Muirhead, Exertion Games Lab, School of Media and Communication, RMIT University

12. Scott Mayson
Breastfeeding Support Project + Happy Feet

Breastfeeding Support Project

Breastfeeding does not come easily to all mothers and babies. This digitally-designed, 3D-printed 'hack' for Google Glass created by industrial designer Scott Mayson transforms this new wearable technology into a device that allows specially trained counsellors to guide mothers through breastfeeding, addressing any specific concerns and questions through a private and secure live video stream to the Australian Breastfeeding Association. The service is on demand when and where it is needed, no matter where the mother is located. This project encourages mothers to stick with breastfeeding, ensuring all the benefits for their babies such as boosting their immunity, nutrient intake and brain development, in addition to the benefits of breastfeeding for themselves and their own health.

Breastfeeding Support Project
2013–14
3D printed SLA Plastic,
Rare Earth Magnet,
Liquitex Colour Brilliant paint

RMIT University & Small World Social: Dr Scott Mayson, School of Architecture and Design, RMIT University; Liam Fennessy, School of Architecture and Design, RMIT University; Kathy Phelan, CEO Small World Social

Happy Feet

Happy Feet is a foot scanning project with RMIT and Melbourne University funded by the Bill and Melinda Gates Foundation. The project uses an existing finger scanning technology and hacks it with additive manufacturing to create a simple additional platform transforming an off-the-shelf device into a foot scanner for babies that is simple and effective. The project helps to capture information about nomadic families who might not carry paper records of vital health information, like immunisation and bio data, and might also assist in child-theft cases. The project exemplifies how additive manufacturing is able to make objects that are fit for purpose in a timely way.

Happy Feet
2014
Edition V4a
3D printed FDM, ABS Plastic,
Rare Earth Magnets,
NEC finger print scanner

Happy Feet
RMIT University & The University of Melbourne
Dr Scott Mayson, School of Architecture and Design, RMIT University; Dr Stephen Davis, School of Mathematical and Geospatial Sciences, RMIT University; Professor Kathy Horadam, School of Mathematical and Geospatial Sciences, RMIT University; Associate Professor Jodie McVernon, School of Population and Global Health, The University of Melbourne

13. Jenny Underwood and Kate Kennedy Digital Fashion Futures project

Fashion and textile design researchers Jenny Underwood and Kate Kennedy are exploring how will we design, make and consume fashion in the future. Jenny and Kate are approaching this question from different perspectives: Jenny from the 'material' perspective and Kate from the 'body' perspective.

Kate is working with 3D body scanning data to examine the future of garment design by first understanding more about the body itself. Using actual body data, captured from hundreds of body scans, 1/16 scale model bodies are being 3D printed. Seeing the range of body sizes and shapes helps us to re-think cultural, age and gender stereotypes and to question the ongoing use of the 'average'.

Jenny is working with 3D and parametric modeling tools to explore integrated and scalable approaches to the design and manufacturing of material and clothing. These tools enable them to work creatively and efficiently with greater complexity and diversity without the associated costs. Through the material surface decorative pattern and structural form converge.

Jenny and Kate use the tools of the design studio of the future — such as 3D printing, parametric modeling and seamless knitting — to bring their different perspectives together. Their work shows the potential for mass customisation and how they can best work with digital fabrication technologies associated with a changing fashion and textiles industry.

Body Collective, 1/16th scale people generated from 3D body scanned cloud point data
3D printed in silver filament
Kate Kennedy
2014

Hexagonal Colour Play fabric series explores parametric modeling processes and the colour spectrum for scalable pattern generation
Digitally printed on sheer polyester substrates
Jenny Underwood
2014

Otherness fabric series derived from nature, creating organic textures and lattice forms
Layered dark tones with white, combining digital printing, lasercut and screen printing processes
Lisa Carroll
2014

Transmutation digitally manipulated text overlayed with images of flora
Digital subtractive print process layered polyester substrate
Patrick Snelling
2014

Keep it today – a run of swatches exploring digital and natural dye techniques
Blue geometric patterning digitally printed on certified recycled PET, and natural dyed sienna brown lasercut and etched
Verity Prideaux
2014

Cellulose based on microscopic views of cellulose fibres and its chemical formula
Lasercut white lace layered over screen printed white devore velvet
Luise Adams
2014

Lightworks – many hands
Digital embroidery, florescent pink thread on water soluble fusing
Claire Beale
2014

Dr Jenny Underwood and Kate Kennedy, School of Fashion and Textiles, RMIT University

With thanks to: Lisa Carroll, Patrick Snelling, Verity Prideaux, Luise Adams, Claire Beale, Georgina Cranswick and Janelle Russell, School of Fashion and Textiles, RMIT University

14. Gyungju Chyon (Little Wonder) Wrapping/Tailoring Project

Gyungju Chyon's Wrapping / Tailoring project explores the relationships between hand-making and 3D scanning and 3D printing through experiments with paper, textiles and porcelain.

The Wrapping / Tailoring project is a series of porcelain tableware pieces that fuse the handcraft of paper folding with digital technologies. The construction of wrinkled paper is a complex challenge to reproduce with cast ceramic.

Digital fabrication technologies offer new opportunities to imbue surface qualities into porcelain. The resolution of both the 3D scanner and printer impart their own signature, while allowing the wrinkled paper to be translated into the materials of the model, mould and final piece.

Wrapping / Tailoring
Wrapping, 2010
Tailoring, 2012
Textile, paper, plaster
little wonder (Gyungju Chyon & John Sadar)

The Future is Here: Themes & Works

Digital Making

Digital manufacturing has developed to encompass a range of platforms and techniques. While they differ in scale, speed, material and process, they all share the ability to take digital instructions and turn them into something real. It is this principle, whether it involves cutting, grinding, fusing, bending, weaving, bonding or extruding that is at the centre of the idea of a new industrial revolution.

3D Printing

Often referred to by the more general term 'additive manufacturing', 3D printing is a process of creating a three-dimensional object from a digital file by layering successive slices. This can be achieved using various different methods, such as extruding small amounts of molten plastic or using a laser to fuse together tiny particles of powdered material. It is also possible to 3D print in a variety of materials, including plastics, ceramics, metals and wax.

The chief benefit of 3D printing is that objects can be created without having to invest in the expensive machining and tooling traditionally required when producing intricate objects. This facilitates 3D printed objects being made in small batches, where each object can be unique and customised for an individual at virtually no extra cost.

15. Bouncing vases
designed by Ron Arad 2000

Produced as part of Arad's *Not Made by Hand, Not Made in China* series, this early experiment in additive manufacturing is thought to be among the first commercial uses for 3D printing.

P eyewear
designed by Ron Arad 2013

These frames are a perfect example of how additive technologies can produce a product that could not be achieved any other way. Rather than using metal pins and pivots to create a hinge, the gill-like sides allow the arms to move inwards freely but restrict them from opening outwards beyond the perfect width and perfect pressure for the head.

16. Project DNA
Feathered shoulder
Corset and DNA components
designed by Catherine Wales
produced by Digits2Widgets

Inspired by identity and the visual structure of human chromosomes, Project DNA is created almost entirely with individual and interchangeable ball and socket components that allow it to be built in a number of directions.

Produced using white nylon with a 3D printer, the eight piece collection encompasses a scaffolded corset, a blossoming feathered shoulder piece and a waist bracelet complemented by four transformative headpieces that hide key areas of the face.

17. Ron Arad discusses his experiences
with additive manufacturing
Film by Alice Masters
Music by Dan Hayhurst

18. 3D printing expert Jonathan Rowley from
Digits2Widgets discuses additive manufacturing
Film by Alice Masters
Music by Dan Hayhurst
Photography by Christine Kreiselmaier

CNC [computer numerical control] machining

CNC is the oldest true form of digital fabrication. It is also one of the most straightforward and most versatile. In its simplest form it involves a cutting tool moving in just three directions, usually referred to as the x, y, and z axes. The control of these different directions of movement is governed by a set of instructions generated by a computer directly from digital design drawings. There are three main benefits to CNC technology. Firstly, the ability to automate processes makes production more efficient. Secondly, the consistency and accuracy is far superior to any manual process. Finally, the process is extremely flexible, allowing different objects to be produced as often as the operator requires, simply by loading a different set of instructions.

19. Roland iModela desktop milling machine

The iModela is a cheap entry level CNC machine that can create precise 3D shapes and patterns out of foam, wax, wood and plastic.

20. CNC manufactured objects

Models, samples and prototypes produced using small format and desktop CNC milling machines

Mare Tranquillitatis marble tray
designed by Studio Shiro
manufactured using CNC milling

Topography sample
created and produced by
CNCMYMODEL from a single
sheet of birch plywood using a
three-axis CNC milling machine

Double sided pattern
designed by House of Production
produced by CNCMYMODEL
from sapele hardwood using a
three-axis CNC milling machine

Foam samples
designed by House of Production
produced by CNCMYMODEL using
different three-axis CNC milling
techniques

Brass ornament
designed by House of Production
produced by CNCMYMODEL using
a three-axis CNC milling machine

Digitising and manipulating 3D forms

In order for an object to be digitally fabricated, the instructions or code, which tell the machine what to do, must first be created. The tools, or software platforms, commonly used to do this are referred to as computer-aided design [CAD] and computer aided manufacturing [CAM]. While the original CAD programs were limited and hard to operate, there are now multiple ways to create digital designs.

Professionals rely on powerful and sophisticated software enabling them to design complex products complete with integrated electrical or mechanical engineering solutions and manufacturing instructions. Similar software is used in architecture, where building information modelling [BIM] systems are used to generate and manage not just 3D forms but also the functional characteristics of a building such as light analysis, geographical location, costs, engineering services, and quantities and properties of building components. At the other end of the scale are programs that offer entry level solutions for beginners. These simplify the user experience, giving anyone the opportunity to create completely new 3D designs or to scan an existing 3D object.

Electronics prototyping and programming

Products requiring integrated electronics have typically been complicated to develop and prototype. The arrival of open source electronics and programming platforms such as Arduino and Raspberry Pi have revolutionised this process. Arduino kits include a variety of sensors that detect changes in the environment. Data from the sensors can be used to control lights, motors and other mechanisms. These products are cheap and freely available, both as individual components or preassembled modules. As well as helping designers quickly develop electronic products, they have also enabled the community of DIY makers to create new objects and hack existing ones.

Similarly, low cost computing platforms such as Raspberry Pi allow designers to experiment without the need to invest in expensive equipment. Originally developed to teach children the basics of programming, Raspberry Pi includes a basic circuit board with a CPU, graphics processor and ports to connect to a keyboard and monitor. These platforms have been used by designers, schools and DIY hackers to build projects involving robot electronics, remote controlled devices and household gadgets.

Open design

New technologies are often heralded as liberating and democratic. Utopian even. Open source services will usher in a new era of prosperity and unrestricted access to all. Success, however, usually leads to these technologies becoming increasingly authoritarian. Issues such as proprietorial software and feedstock, built-in obsolescence and restrictive copyrighting are introduced, reinforcing traditional consumer–manufacturer relationships. However, digital communities and social networks behave differently to traditional, less dynamic, networks, making it hard to maintain cultures of elitist power. The music, film and publishing industries have already found how difficult it is to transpose their old ways of working to modern networks based on principles of sharing.

Progressive designers and manufacturers are using platforms like Creative Commons to challenge the established ways of protecting their creative ideas or intellectual property. Creative Commons licenses are free to use and allow creators to communicate which rights they reserve, and which rights they waive for the benefit of recipients or other creators, essentially changing copyright terms from 'all rights reserved' to 'some rights reserved'. This form of open source design allows designers to build on the work done by others, as well offering consumers an opportunity to engage with making on a variety of different levels.

21. AI light
designed by Assa Ashuach 2007

Created using open source electronics and computing platforms as well as 3D printing, this one-off lighting design uses sensors to detect the movement of nearby users. A form of artificial intelligence interprets patterns in users' behaviour, adapting the shape and function of the light accordingly.

22. Raspberry Pi
Type A Single Board Computer 256MB

23. Arduino
Mega Atmel Atmega2560 MCU Board

24. Vitamins design studio explains how Raspberry Pi and Arduino are a vital part of its design process
Film by Alice Masters
Music by Dan Hayhurst

Unmaking & Closed Loop Production

The rate at which we currently consume the planet's natural resources is unsustainable. In order to survive a future with increasingly expensive and limited resources, the speed and intensity with which we consume objects is an issue that requires our attention today. New technologies and ways of thinking have the potential to dramatically increase efficiencies in consumption.

At a time when the life of a mobile phone is more likely to be measured in months than in years, let alone decades, the design industry can play a vital role. By using principles such as "closed loop" product designers can help to make the most of the planet's finite resources. There are many different types of closed loop systems. Long-loop systems, for example, attempt to minimise the effects of technological, physical or visual obsolescence, maximising the lifecycle of a product. Products that use natural loops are made from materials that can be easily broken down into biological nutrients. These products can be left to decompose in natural environments, eventually returning to the local ecosystem in the same form that they were taken out.

Another form of closed loop design is multiple loop systems. Perhaps the most realistic, given our current rates of consumption, multiple loops help us return products to an additional or alternative other use. This requires considered design and construction that allows products to be recycled easily, as well as procedures put in place by manufacturers to help recover products after use to be refilled or repurposed.

25. Connected bulb
designed by The Agency of Design

This bulb brings together internet connected hardware and a leasing ownership model to create a sustained relationship with the user that ensures optimal material recovery and product efficiency. Recycling rates for light bulbs are typically very low, resulting in finite materials being lost to landfill. The Connected bulb attempts to capture 100 percent of the material used. Internet connectivity allows the manufacturer to maintain a live inventory of materials being used in its products. Using this connected relationship between manufacturer and owners, products can be updated, recycled and repaired when required.

Real-time usage and temperature data is sent to the manufacturer to accurately monitor the bulb's health. If required, a replacement is automatically sent ahead of failure with the packaging used to return the old parts for reprocessing. LED bulbs can last up to 25 years. In order to take advantage of new technologies such as increasingly efficient LEDs, the Connected bulb's modular design makes it easy to change and install different elements.

26. Optimist toaster
designed by The Agency of Design

Inspired by the concept of long-loop production, the Optimist toaster has been designed and built with longevity in mind. Its all-aluminium construction makes it virtually unbreakable, however when it does eventually reach a point where it is no longer usable it can simply be melted down to start life as something new. As the heating elements do not last as long as the rest of the object a simple repair process had been developed to allow replacement clip-in elements to be inserted by just removing four simple bolts. To engage the consumer with the story of a toaster built to last a lifetime, the toaster's birth date has been cast into the back of the handle and a counter indicates the number of slices of toast the machine has produced in its life.

Emotionally durable design

In order for a product to be used over long periods, perhaps even a lifetime, a number of important issues need to be resolved. As well as designing with physical durability in mind, the emotional durability of a product should also be considered. While it might be technologically possible to build an electronic device for life, how would it be designed so people want to keep it for that long? Why is it that we treasure some objects while others we have no attachment to at all? This is the challenge of emotionally durable design — a term coined by Jonathan Chapman, Professor of Sustainable Design at Brighton University, in the United Kingdom. According to Professor Chapman this requires consideration of five elements:

Narrative
: How users share a unique personal history with the product.

Consciousness
: How the product is perceived as autonomous and in possession of its own free will.

Attachment
: Can a user be made to feel a strong emotional connection to a product?

Fiction
: The product inspires interactions and connections beyond just the physical relationship.

Surface
: How the product ages and develops character through time and use.

27. Do task chair manufactured by Orangebox

No matter how good a product is, there comes a time when its first useful life comes to an end. Orangebox design all their products with this natural lifecycle in mind, using closed loop cycles that recover all the materials used and recycle them into new products. Simple design features allow this chair to be stripped into its component parts very quickly and with minimal tools.

This shows that the same careful thought that is applied to assembly can be used at the end of a product's life to maximize the value of the recovered materials.

To further eliminate waste, customers can return their used and unwanted products to Orangebox, which has established its own recycling centre. If a product is still in reasonably good condition then the most energy efficient next step is reuse rather than recycling.

To aid recycling, products are designed to be broken down into components that consist of just one material. While it is possible to identify one material from another, it can be laborious and expensive. To solve this, Orangebox use material identifiers to mark each component, improving the identification and recycling process when the object is deconstructed.

28. InCycle biodegradable shoes designed and manufactured by Puma

After research showed that 57 percent of Puma's environmental impact is related to the production of raw materials such as leather, cotton and rubber, the company looked at increasing the number of sustainable materials they use. The resulting InCycle collection is entirely biodegradable or recyclable and 100 percent Cradle-to-Cradle certified. Cradle-to-Cradle is a design approach modelled on restoring objects to their original materials, to be returned to the ecosystem after their natural lifecycle or reused.

For products to be biodegradable they must be only made of materials comprised of organic fibres without any toxic chemicals. The upper part of the biodegradable shoe is made of a mix of organic cotton and linen while the sole is composed of a biodegradable plastic. When they have served their natural life these ingredients can be composted and broken down to their building blocks.

29. Wandular prototype
developed by Sony, Forum for the Future,
Engage by Design and Brunel University

With the rapid pace of change in technology is it possible to have a device that stays up to date? The Wandular project is an investigation into how we might overcome obsolescence in consumer electronics, presenting a different vision to the one that is currently espoused by the consumer electronics industry.

The aim was to explore multipurpose and modular technology that evolves with the user over a lifetime, aging stylishly and staying up to date thanks to cloud downloads and hardware plugins. Rethinking how technology is 'made' and lengthening its lifespan can have new emotional, sustainable, and financial benefits to people and businesses alike.

The prototype is based around a concept of a digital 'core'. The core serves as a personal cloud connection that can be attached to other objects. The objects take many forms, such as a child's toy or a necklace, allowing users to switch between forms to better suit different stages of their life, encouraging relationships to be developed with the device from an early age.

30. The Wandular Concept
Film by Futerra in partnership with
Forum for the Future and Sony Europe

31. Justin Greenaway from Sweeep Kuusakoski, one of the UK's leading waste electrical and electronic equipment [WEEE] recycling plants, gives a tour of the facility
Film by Alice Masters
Music by Dan Hayhurst

Mass Production

Digital fabrication is sometimes viewed in terms of desktop manufacturing and the DIY movement. However there are countless examples of new technologies and manufacturing innovations used in high value and large-scale manufacturing. As digital fabrication models become more sophisticated they offer genuine alternatives to the established techniques of industrial production. This is not to say that there will soon be no place for the traditional factory. There will always be situations where economies of scale make mass production the sensible solution. However the era of mass production as the only alternative to craft and artisan manufacturing may be coming to an end. The New Industrial Revolution will enable a diversity of manufacturing.

32. The Endless Process

Chubby chair
designed by Dirk Vander Kooij

Flow Open rocking chair
designed by Dirk Vander Kooij

The idea behind Endless originated from Dirk Vander Kooij's student work at the Design Academy in Eindhoven. The title refers to how each object is produced from a single continuous strand of plastic, intriguingly revealing the process that created them. By combining different techniques he was able to design an automated but very flexible process, essentially using a robot to produce a collection of furniture from scrap plastic pellets from recycled refrigerator interiors. This unusual production technique is in a sense itself recycled, with Vander Kooij rescuing his original robot from a Chinese production line after a 140,000 hour non-stop career. This process of taking a digital tool originally developed for mass production and repurposing it raises some interesting questions. It is the first commercial example of modern plastic furniture being manufactured using a process that doesn't require injection moulding. This has allowed the development of the design to easily grow and evolve, enabling constant iterations and improvements.

33. Endless Process
Film by Esgo Klein
Courtesy of Dirk Vander Kooij

High value manufacturing

High value manufacturing is the application of cutting edge, technical knowledge and expertise to the creation of products, processes and services. This constantly requires new knowledge and usually involves bringing together more than one novel technology in ways that have never been done before.

34. Trent 900 engine blade designed and manufactured by Rolls-Royce

At the heart of Rolls-Royce's aerospace innovations sits the Trent engine. The Trent 900, which entered service in 2007, is the fourth engine in the Trent family and was specifically designed for the Airbus A380.

Among the 20,000 components in the Trent 900, the engine blades are some of the most complex. The titanium turbine blades need to endure temperatures at least 400 degrees above the material's usual melting point and withstand forces equivalent to a double decker bus hanging from their tip. In order to withstand this extreme heat, a titanium alloy is grown as a single crystal in a vacuum furnace. This creates a complex series of air passages that provide the necessary cooling when the blades are in operation.

The fan blades are made from three sheets of titanium fused together using a procedure called diffusion bonding. The next process is called superplastic forming, in which the two outer panels are expanded to create the aerodynamic form, while the middle sheet is stretched into a zigzag shape leaving the blade hollow inside. This gives extraordinary rigidity to the structure.

Innovations such as this have dramatically improved the efficiency of the engine, helping the A380 achieve a significant reduction in fuel consumption and emissions of nitrogen oxides.

35. A film on the manufacturing process of the Roll-Royce Trent 1000 engine Film courtesy of Rolls-Royce

The Factory

The Factory is equipped with a range of machines including a 3D scanner and printers, robots and a CNC milling machine. It is staffed by RMIT technicians and by RMIT Industrial Design students who are undertaking work here as part of their degree. While 3D printers typically print in a variety of materials including plastics, ceramics, metals and wax — the students will also be experimenting with some highly unusual materials — including 3D printing food. The aim of the studio is for the students to 'hack' the 3D printer (built by the studio leaders) and test the various printer heads they have created so as to examine just what these digital tools are capable of, and how they might impact on their future designs.

Other RMIT University students are here to learn the basics of 3D printing and the experiments of both studios will be on display to encourage conversation. The students and technicians are all here for the duration of the exhibition; creating, testing and investigating. You are welcome to join them and to explore, discuss and participate in one of our many programs throughout the exhibition.

Fabrication tools small enough to put on a desktop and affordable enough to use at home are becoming simpler to use and much more widely available. A single individual working in a spare room can now achieve what once needed a whole chain of designers, developers, technicians, machinists and distributors.

36. RepRap desktop 3D printer invented by Dr Adrian Bowyer

The RepRap uses a fused deposition modelling [FDM] process to heat thin filaments of plastic, which are then extruded through an applicator to create three-dimensional objects one layer at a time.

The RepRap was the first of the low cost 3D printers and is available as a kit of parts for users to assemble themselves. It was conceived as an open source project supported by a network of users and developers sharing information about how to construct, use, modify and improve their machines. Since many of the machine's components are made from plastic they are designed to be easily printed by another RepRap. It is this form of self-replicating rapid prototyping that gives the machine its name.

3D printer
MakerBot Replicator™ 2

One of the more accessible and popular machines, the MakerBot uses spools of plastic wire or filament that are melted and extruded to form complex 3D shapes.

3D scanner
Sense

A scanner capable of producing detailed 3D scans of small objects. The scanner captures both 3D and image data.

3D printer
Fortus 250mc

The Fortus produces very high resolution 3D objects using the process of fused deposition modeling (FDM).

Desktop milling machine
Roland MDX–540

Easy to use and compatible with many popular 3D CAD software programs, this machine can be used to create simple 3D shapes.

Robotics

The first use of modern robotics in manufacturing was the Unimate machine operated by General Motors in 1961. Essentially just a large robotic arm, it could obey step by step commands and proved to be surprisingly versatile.

Originally used to automate the manufacture of television sets is was also able to pour liquid metal into die casts, weld automotive components and manipulate heavy payloads. The two primary benefits of these machines — accuracy and repeatability — were clear and robots soon became commonplace in manufacturing. Originally derived from the Czech word 'robotnik', meaning worker, robots in industry are often portrayed in a negative light, viewed as an innovation that takes jobs away from factory workers. An automated workforce that will work for 24 hours, without food breaks or the threat of industrial action. While there is a degree of truth to this, the benefits of automated assembly are greater than just increased productivity. Countries with advanced high value manufacturing industries, such as the UK and US, have seen investment in new high tech manufacturing, including robotics, result in increases in manufacturing jobs. Rather than use robots to help automate standard mass production processes, innovative manufacturers are using machines to eliminate the need for traditional manufacturing tools such as casts, moulds and dies, fundamentally shifting the manner in which products are made.

KR AGILUS series
designed and manufactured by Kuka Robotics

The KR AGILUS family of robots are available with five or six axes of movement. Their small size makes them ideal for high speed and precision work. The machines can reach and perform tasks at any place within their given work envelope measuring around one metre in radius.

KUKA Robotics has been manufacturing industrial robots for 40 years. After starting out in the automotive industry their machines are now used for numerous applications in all industrial sectors, and can carry payloads weighing up to 1,300 kilograms. KUKA's latest range of machines, the LBR iiwa series, uses sophisticated inbuilt sensor technology to detect nearby movements, making the possibility of human cooperation with robots a reality. KUKA use accessible and adaptable software to control the machines providing users with open access to the programming. This allows end users to quickly manipulate the commands,

making the machines perform different tasks, achieve higher production rates and significantly reduce energy consumption.

Grow portable CNC router system
designed by Michael Warren

Grow is a unique modular CNC system that can be unpacked and set up in less than three minutes, allowing designs to be routed in various materials almost anywhere. This flexible approach is intended for users who might not have the space to install a machine permanently, or those who need to move the machine regularly between various locations.

Grow portable CNC router system in action
Film by Alice Masters, with music by Dan Hayhurst

Uses of 3D printing

While 3D printing is a relatively new technology it is already used for a host of commercial and domestic applications. These can vary from prototyping and model-making to high quality commercial applications such as the production of small metal components for the aerospace industries.

The medical sector was an early adopter of additive manufacturing with the process being used to create hip replacements, cranial implants, dental crowns and even customised hearing aids built to an exact fit of the user's ear. After successful experiments in 3D printing with live cells, there is growing excitement that additive manufacturing will soon be capable of producing transplantable organs and tissue samples suitable for experimental drug testing.

There have also been developments in the architectural uses of additive manufacturing using either large format machines located on the building site or by producing small components to be assembled into larger structures. This potential application of these technologies has the power to change the way that buildings are both conceived and produced.

37. 3D printed objects

Titanium chainmail sample
Cranial plate

Ball within ball within ...

Model of lungs
created and produced by
3T RPD Ltd

Heat exchanger
designed using Within Enhance
software produced by
3T RPD Ltd

Trophy
designed by Lionel Dean
produced by 3T RPD Ltd

Clone lights
designed and produced by
Digits2Widgets

Bird house
designed by Saint H and
produced by Digits2Widgets

A set of skulls
3D printed in resin and taken
from a digital CT scan produced
by Digits2Widgets

Mass Customisation

Conventional production techniques make it too expensive to allow for mass customisation. The large investment in initial tooling needed to make objects, such as automotive components or injection moulded plastic chairs, requires the products to be sold in tens or hundreds of thousands in order for them to be profitable. For example, while the cost of making a single steering wheel could be enormous, after the same factory has made and sold a million the cost of each unit could be as little as a few dollars. Any changes to the design of the steering wheel would result in a new investment in tooling and the cycle would begin again.

But what if digital manufacturing could challenge the established economies of scale and offer an alternative approach? Without the constraints imposed by large quantities, designers are free to make products that better respond to individual needs. Product development can be faster and more flexible. Mass customisation becomes a possibility, allowing users to directly engage with the production of their objects, creating personalised consumer goods.

38. Makies
developed by MakieLab

Makies are unique poseable action dolls with faces and features designed by their owners. Using the Makies website or mobile app, customers have the power to choose not only what the face of their doll looks like — the eyes, nose, jaw, smile, hair — but also what clothes it wears. With no age or gender stereotyping, Makies allow anyone to create a unique toy in a style of their choosing.

Makies continue to be customisable after they have been made, with additional clothes, feet or hands available to purchase. Owners are also encouraged to hack and modify their dolls. This could involve low tech methods such as hand painting the dolls and making new clothes or even using open source electronics platforms to fit LEDs, voicechips or Bluetooth. To help facilitate this, the doll's head has been designed to fit an Arduino board, while there is room in the neck for wires and in the back cavity for batteries.

Making Makies:
The doll is a clear demonstration of the way in which digital production is moving from a blue skies prediction into a present day reality. They are the perfect example of a digital product being made real. First a doll is designed and named by a customer, then the digital model is sent away to be 3D printed and mailed to the customer.

The head offers the largest degree of choice. The size and shape of the nose, the colour of the eyes, and the distance between them are all the result of individual choices. The bodies are more standardised, with a limited range of options. With rising demand, this would allow for building a stock of body types, with only the heads being manufactured on demand.

The 'made-on-demand' principle has the potential to disrupt the traditional toy market, offering a genuine alternative to identical mass-produced toys.

39. Femur stool
designed by Assa Ashuach supported by Altair
stool, models and samples printed by 3T RPD

The Femur stool is inspired by the natural structure of bones yet wholly digitally designed and manufactured. Its form is generated using an algorithm based on the weight and proportions of a particular user. Using a process called finite element analysis, the stresses and strains of a particular weight are applied to a 3D model of the stool.

This data is then used to optimise the stool according to ergonomics and the individual user's profile, removing any material that is not crucial to its structural integrity. Any change in weight will change the shape of the stool. As the stools are customised for a particular user each one is 3D printed rather than investing in the equipment necessary for mass production.

40. UCODO
A selection of home objects designed to be co-designed by Assa Ashuach powered by Digital Forming Ltd.

UCODO [user co-design object] is a platform for product designers and design orientated businesses to develop new products for mass customisation.

The platform consists of two separate elements. An area where designers can use specialist tools to create new products, and a facility to set the parameters governing the degree of customisation they are comfortable allowing to third party users. This can include the addition of customised text, or changing colours and even the shape of the object. Once complete, this ODO [original design object] is uploaded to the website and linked to a network of manufacturers where pricing and margins are set. The final stage allows third party users to customise any of the uploaded designs, thus creating a unique CODO [co-design object] and digital model that can be automatically sent for 3D printing.

41. A discussion about the impact of
CAD / CAM and their impact on the design process and digital manufacturing
Film by Alice Masters
Music by Dan Hayhurst

42. mi adidas Superstar II Nitrocharge

Once consumers are aware of the availability and benefits of digital customisation market forces can begin to demand it. It is not only small batch manufacturers that are embracing the potential of mass customisation, a number of large commercial brands are also incorporating a degree of customisation within their processes.

The mi adidas range allows consumers to use a simple online application to customise their shoes before they make a purchase, empowering them to create something unique and personal. Variations within the range allow individuals to choose the style of shoe they would like, the colour of individual elements, the materials and even the finishes. As well as a customised appearance the mi adidas range also enables people to create a sports shoe to their exact personal specifications with regards to fit and performance.

43. Unto This Last

Unto This Last is a furniture design and manufacturing company that utilises digital tools and manufacturing to reduce its dependence on industrial processes. Taking the name of a book written by John Ruskin, the Victorian critic of the Industrial Revolution who advocated a return to local craftsman workshops, Unto This Last has based its workshop in the heart of the city and only makes furniture to order. These principles are reflected in the style of its products, all of which are CNC routed from plywood sheets and avoid industrial fittings. This simplifies the supply chain and shortens the production time, with no item taking longer than a day to make.

While the ethos and principles behind the company are rooted in the traditions of regional craftspeople and artisans, it relies on sophisticated digital technologies to realise its products. Bespoke software has been developed that automatically adjusts the cutting patterns depending on the precise thickness of each plywood sheet, further reducing the need for industrial processes. The software also optimizes each sheet by inserting smaller products into available spaces, helping to spread materials costs and reduce waste.

Unto This Last is also hoping to franchise its business model, providing others with the software, designs and production system that it has created to set up new workshops in other towns and cities.

Digital knitting and weaving

The weaving and textile industries were one of the earliest to mechanise their manufacturing processes. The Jacquard loom, invented in 1801, was the first machine capable of manufacturing according to a set of instructions.

These early looms were controlled by a series of linked cards with holes punched out in various places that could be read by the machine. In this sense the Jacquard loom was the first digitally programmable machine — albeit mechanically digital as opposed to electronically digital. Looms have been controlled by these basic principles for over 200 years. While modern looms take digital instructions direct from computer files and electronic designs, the essential process remains the same.

44. Digitally woven textile samples designed and produced by Philippa Brock

Brock's research investigates potential innovation within the digital power loom and woven Jacquard processes. The outcomes of her research have a dual focus to create innovative fabrics and investigate new approaches to the industrial production method.

Brock is a member of the Textile Futures Research Centre and her design and research practice has included the Self-fold/Self-assembly/X-form series. Described as a 2D–3D process, this series uses on-loom finishing techniques and innovative yarn and woven structures to produce 3D textile forms when cut from the loom. She has also developed woven e-textiles from conductive materials that act as electronic sensors, switches, actuators and circuits.

Philippa Brock's large, hanging textile is woven with UV thread. Please shine the light from the torch provided onto the fabric to see it glow.

45. adiZero Primeknit manufactured by adidas

Using an innovative digital knitting process the entire upper element of the Primeknit is made in a single piece. A carefully constructed pattern is knitted using fused yarn to create a form that wraps around the foot. The performance of the material and the knitting pattern provides varying degrees of stiffness and flexibility, offering support where it is needed without additional reinforcements or lining.

Crowd-Sourcing, Hacking & Community Design

The majority of new technologies and manufacturing innovations are supported by a form of network or community, the influence of which can be seen throughout the entire production of an object during the conception and design stages, the fabrication stages and also in distribution and retailing. Platforms such as open source design, social manufacturing, networked manufacturing, crowd-funding, distributed supply chains, online payment systems and digital marketplaces are all innovations acting as agents of change, giving rise to new markets and products and disrupting existing ones. Open source design allows designers to build on the work done by others, as well offering consumers an opportunity to engage with the process of making themselves.

46. IKEA hackers

Social networks and digital communities can also inspire creativity in surprising ways. DIY designers and hackers are forming online communities to share experiences, ideas and knowledge.

The IKEA Hackers website is dedicated to modifications to and the repurposing of IKEA products, inviting users to post examples of their ideas for others to try and experiment with.

Frosta Z
hack posted by Andreas Bhend,
Switzerland

Draisienne
hack posted by Samuel Bernier
and Andreas Bhend, Switzerland

These two hacks have all been created using one of IKEA's cheapest and most ubiquitous products, the Frosta stool.

47. OpenDesk
developed by 00:/, FabHub and David Steiner

OpenDesk is a web platform offering furniture designs that can be downloaded, locally fabricated and easily assembled. It is founded on the belief that a combination of digital design, the social web and the growing proliferation of digital fabrication tools will fundamentally change the way we consume over the coming decade.

Visitors to the OpenDesk website are invited to engage with the production of their objects on different levels. Digital designs can be downloaded for free under a Creative Commons license for users to make themselves, or users can browse a network of makers in locations all over the world to be connected directly to someone who will produce the product. All items bought through the site are available in one of three versions — Sawn (raw cut parts for finishing and making yourself), Flatpack (finished kits ready for simple assembly at home) or Built (fully finished and assembled products delivered by the maker). This form of digital making presents new opportunities for reduced shipping, and allows more openly social and distributed supply chains.

OpenDesk furniture

Stools

made from birch veneered plywood
produced by The CNC Workshop
Southampton, UK

made from birch veneered plywood
produced by IJ CNC Services
Harpenden, UK

made from red Valchromat
produced by Factory Settings
London, UK

Edie table

made from birch veneered plywood
produced by IJ CNC Services
Harpenden, UK

Edie stools

made from birch veneered
plywood and solid oak

produced by IJ CNC Services
Harpenden, UK

made from blue Valchromat
produced by Pedro Terra Lab
Sao Paolo, Brazil

made from poplar core birch
veneered plywood

produced by Nicholas Godfrey
at Charleston FabLab South
Carolina, USA

made from red Valchromat
produced by Factory Settings
London, UK

Edie table and stool loose parts

made from birch veneered plywood
produced by The CNC Workshop
Southampton, UK

48. Crowdsourcing a sofa

Online furniture manufacturers MADE frequently use crowd-sourcing and peer production processes to help develop new products. To demonstrate this process they created a brief for a new, compact two-seater sofa and invited anyone to submit designs. The public then voted for a winner via the vote section on the MADE website.

The initial submissions

60 different designs were initially submitted for the competition. Here is a selection of 3D printed rapid prototype models of the unsuccessful entries.

Alexander Purcell Rodrigues
Harry Owen
Damien Jamet
Stephen Tierney
Veronica Massoud
Jeremy Grove
Liam de la Bedoyere
Charles Trevelyan
Casa Estudio — Andres Ros Soto and Giles Round

The winning design

After more than 10,000 votes, a design by Je-Uk Kim was selected as the crowd's favourite. Taking inspiration from classical Georgian furniture as well as the lovebird, a small and colourful parrot, his design responded well to the brief's requirements for a functional and compact sofa adapted to modern living. Je-Uk Kim introduces his design, explains his inspiration and the processes behind his solution to the brief.

Love birds
from The Incomplete Dictionary of Show Birds
by Luke Stephenson

From concept to production in four months

By using distributed manufacturing, a practice that relies on a coordinated global network of manufacturers, and through direct collaboration with suppliers, MADE are able to cut the cost of their products. For this project MADE worked in close collaboration with the design textiles manufacturer Kvadrat.

The Lovebird
designed by Je-Uk Kim produced by MADE

49. A film about the creation of the Lovebird Sofa
Film courtesy of MADE.com

50. Listen to Je-Uk Kim describing his design
Audio courtesy of Je-Uk Kim and the Design Museum

51. Assemble & Join
Examples of the products designed and made by Assemble & Join and local community members

Described as a community micro-manufacturing workshop, Assemble & Join offers schoolchildren, shopkeepers, market traders and other community groups the chance to collectively research, design and build changes to the public realm. This reimagining of the role a high street can play within a community uses local people to develop and improve an area over time, creating an environment to better suit their needs as well as those of the community as a whole. This includes everything from wayfinding schemes and flatpack market stalls and seating systems. Using digital manufacturing techniques, the Assemble & Join team work collaboratively with community groups to design and build their ideas in a matter of minutes. All machinery is on view, meaning participants can watch their designs come to life in real time workshops.

The workshop, primarily funded by the local council, was set up for a three month period in a former café in Waterloo, London.

Revealing the Process

This is an image of the making of the exhibition design at RMIT Design Hub. It evocatively captures the process of making the main structure using advanced digital design and robotic manufacturing combined with traditional boat building techniques. The image brings the aim of *The Future is Here* into focus: reminding us of how new technologies are giving us the capacity to develop new ways of making that will both intersect with, and evolve beyond, traditional modes of production. The exhibition does not make a prediction about the future of manufacturing, but intends to provoke debate about directions it could take. Most importantly, the exhibition hopes to encourage us to consider the impact of another major shift in manufacturing. In order for digital manufacturing to be truly transformative, and to truly democratise the means of production it requires a direct contribution from users and consumers. In many ways *The Future is Here* is a call to arms; an invitation to all of us that says a new industrial revolution will only evolve and take hold if we are active participants in its development.

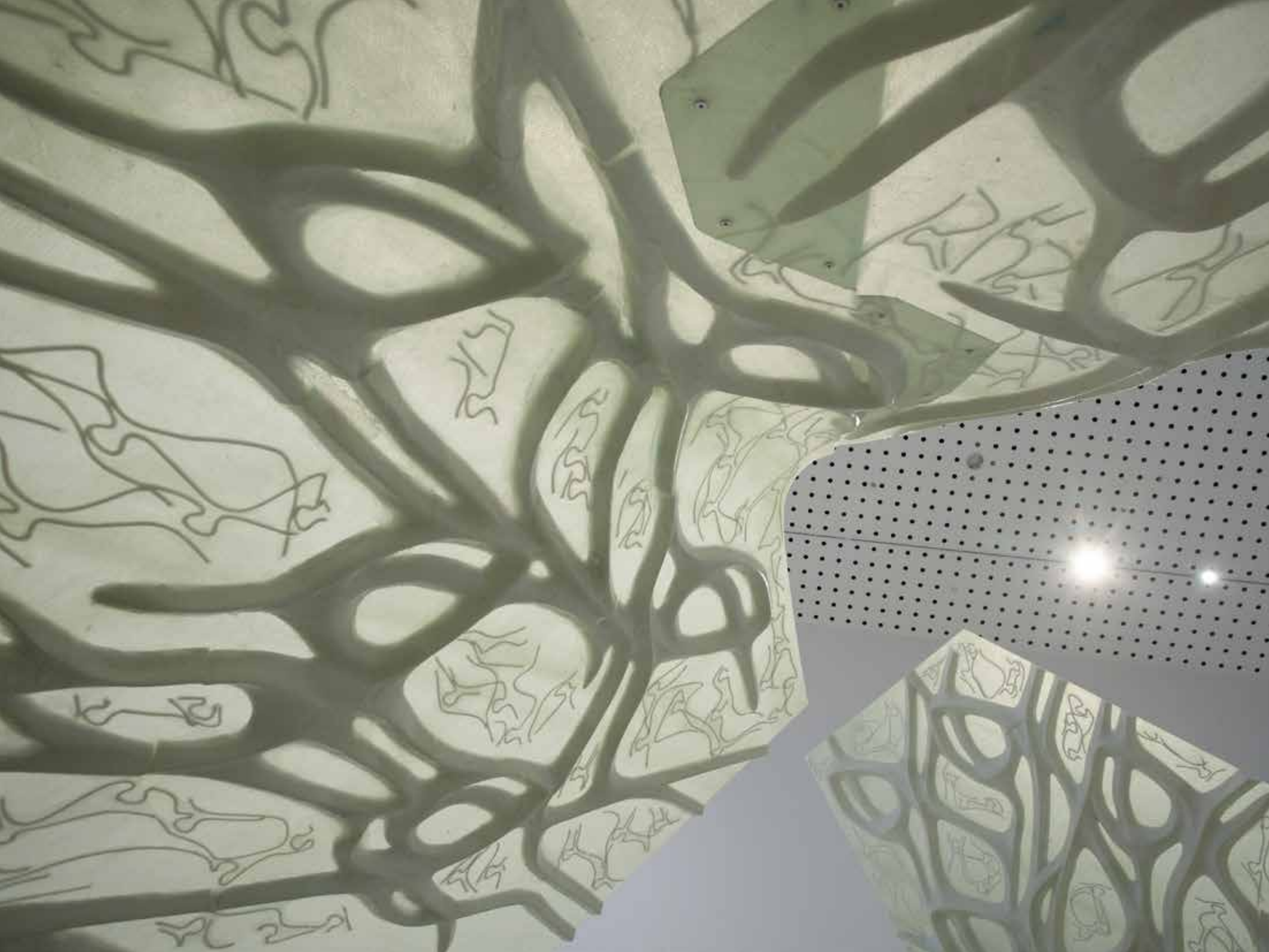
Image courtesy of
Studio Roland Snooks.

Images

The following section differs in the two versions of this catalogue. In Version 1.0, this image section visually tracks the creation of *The Future is Here* at Design Hub, from the design and manufacture of the exhibition environment by Studio Roland Snooks, to the arrival of the exhibition crates from the Design Museum, London, to the early installation phase. In Version 2.0 of the catalogue, released midway through the exhibition, this section contains images of the late installation phase and our opening celebrations and programs.

THE
FUTUR
IS
HERE

EXPERIMENTATION
&
SPECULATION



THE
FACTORY
theFuture
wasHere

BLOOM
Alisa Andrasek and Jose Sanchez's Bloom was commissioned by the Greater London Authority to celebrate the 2012 Olympics and Paralympics. Bloom is conceptualised as an urban toy, a distributed social game and collective 'gardening' experience that seeks to engage people in order to construct open-ended design formations using Bloom building cells.
When Bloom is exhibited the designers construct an initial pavilion/folly to showcase the possibilities of the system. These act as the male 'portals' of the game, inviting interaction and participation. People are then able to manipulate the cells, adding pieces to the initial structure to alter its form or seeding entirely new ground sequences, such as urban furniture or simply unpredictable formations. This participatory design process aims to bring the phenomena of social networks and game culture to the physical environment at an urban scale. At Design Hub, Alisa Andrasek worked with students from RMIT's School of Architecture and Design to create the opening formation of Bloom.
The Bloom cells are manufactured through a plastic injection mould process in 100% recyclable PET plastic – a material certified for food products, with the highest standards. Each cell is light, with approximately 90g. The plastic is strong, easy to handle and child-safe. Bloom exp des of assembly, disassembly and reusab challenge the notions of traditional c tion. None of the pieces can do anything on, and only when thousands of them are p ther do the game and the Bloom garden

theFuture
isHere

theFuture
wasHere

Image credits

All the images contained in this section of v.2 are by Tobias Titz (tobiastitz.de). All the works on display are part of the exhibition *The Future is Here*, a touring exhibition created by the Design Museum, London, and co-curated with RMIT Design Hub. Please see the list of works and the acknowledgements page in this guide for all credits.