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3D PRINTING

OUR FUTURE: NOW

Andrew Taylor & Dr Ertu Unver

School of Art, Design & Architecture, University of Huddersfield

3M: IMI Workshop

In collaboration with EOS, Renishaw & HK 3D Printing

Hosted by 3M Buckley Innovation Centre,
University of Huddersfield. 17th March 2015

OVERVIEW:

This *3D Printing our Future:Now* talk and visual presentation was given to delegates at the IMI 3D Workshop held at 3M Buckley Innovation Centre on 17th March 2015.

The event was hosted by 3Mbuckley Innovation Centre for IMI plc a global engineering company, 3M, and leading 3D additive manufacturing technology providers: EOS, Renishaw and HK 3D printing to disseminate and share their experience on the latest 3D additive design and manufacturing technologies available to the engineering and product industries.

The *3D Printing our Future:Now* talk and visual presentation provided an overview of art, design & architecture research, creative practice, and enterprise & innovation specifically using 3D additive technologies within the School of Art, Design & Architecture and research groups at the University of Huddersfield.

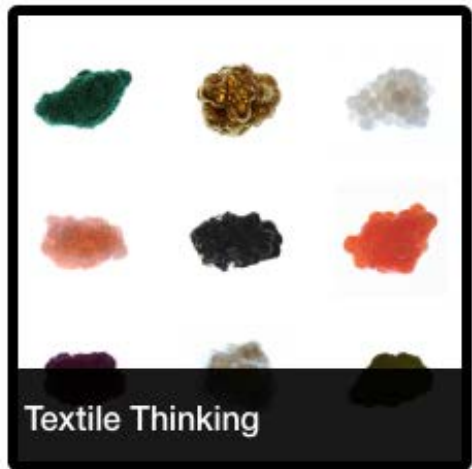
The talk focused on introducing the importance of creative design research practice and how 3D printing has evolved as an increasingly essential and highly versatile tool in the creative process particularly for concept, physical visualisation, prototyping , tooling and manufacture.

Nine research cases were shown to the 3M/IMI delegates to highlight the range of 3D art, concept design, prototyping, and manufacturing projects supported by University of Huddersfield 3D printing technology facilities at Queen Street Studios.

3D PRINTING OUR FUTURE: NOW

RESEARCH CENTRES // ART. DESIGN. ARCHITECTURE

Research Centres at School of Art, Design & Architecture situates academics professional research and postgraduate student projects



From seven research centres, IDL is a new interdisciplinary research centre/laboratory at the University of Huddersfield. The lab conducts theory based and applied research generally into product design, and especially in the built environment, pushing the impact of design thinking and practice to new areas. It cuts across the areas of architectural design, construction management, interior design, new product development, engineering, social sciences and healthcare. Our research focuses on solving real world problems through design innovation, mobilising the underlying theories as well as the enabling processes and technologies needed to deliver value to users and the society at large. Research is developed closely with diverse public and private sector organisations to propose novel solutions to design challenges and project based problems. We offer Undergraduate, Masters and PhD programmes that are future focused and informed by the state of the art in research and practice

3D Printing:

Queen Street Studios and 3D Digital Design
School of Art, Design & Architecture
University of Huddersfield

Four rapid prototyping machines are available for students, academics and researchers to accurately produce three dimensional models in a range of materials. Students are advised by the technical team on which machine is best suited for their work, and also the cost of printing the files once the design is complete.

Technical team operate the printers, and oversee any post processing work that each printer may require. Students are responsible for any fine surface finishing, or painting that is required to finish the printed part with technician support.

3D prototyping machines are located in the Queen Street Studios :

- Projet 5500X - Multi Material Printer
- Zbuilder
- Zcorp 650
- Stratasys FDM

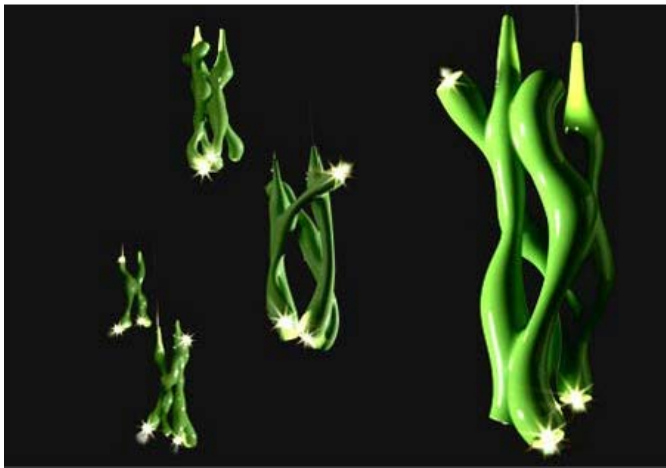




Futurefactories (2003-2009) : The Application of Random Mutation to Three- Dimensional Design. Lionel T. Dean

Dean worked with 3D prototyping techniques laser sintering as a designer-in-residence on PhD at the University of Huddersfield with Dr. Ertu Unver and Dr. Paul Atkinson.

Working with rapid prototyping techniques like laser sintering as a designer-in-residence, Dean realized that these methods were fully capable of producing high-quality objects fit for the consumer market. Inspired by work being done on applying organic metaphors to architecture, he created the project FutureFactories and began designing his objects as parametric systems. A model has parametric constraints set by the designer, using randomness and evolutionary algorithms to produce a range of unique results from the same template. Coupled with the use of rapid prototyping, the result is a rapid manufacturing process that creates one-off design objects.



Future Factories project pushed the boundaries of the functional object categories all industrial design adheres (a lamp is a lamp, a chair is a chair.) creepers.mgx is a good example.

It's a modular LED-based lighting system, where stems of flower-like shapes clip on to cables running from floor to ceiling.

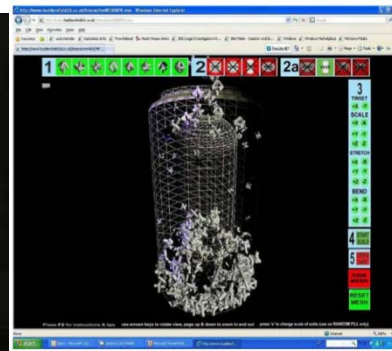
It references the way creeper vines infiltrate their surroundings. And like real plants, all the Creepers are unique in shape. 3D Printing for product design applications.

Biomimicry lighting concepts and Bespoke jewellery printed in titanium, aluminium, and gold.

Figure 215
MMP Polished Stainless Steel Icon



Design „Icon“: Lionel T. Dean, Future Factories; Material: 18-carat yellow gold (Source: CPM)



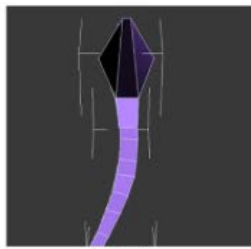
Selection of bangles and necklaces generated using automake software.
Image 4 of 11

AutoMAKE: Generative systems, digital manufacture and craft production. Generative Art Conference, 11th -14th December 2007, Milan, Italy. Ertu Unver, Justin Marshall, and Paul Atkinson.

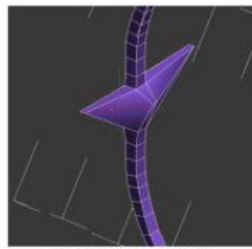
AutoMAKE project combines generative systems with craft knowledge and digital production technologies to create a new way of designing and making objects that blurs the boundaries between maker and consumer, craft and industrial production. AutoMAKE was developed with researchers from University of Huddersfield, Falmouth University, and Sheffield Hallam University as a collaborative research project that aimed to investigate the potentials of using generative systems to digitally design unique one-off works and produce them using a range of rapid prototyping/manufacturing technologies and CNC equipment.



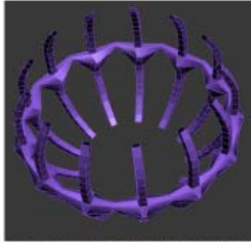
Center piece and bottom rib



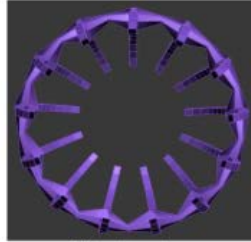
Side view



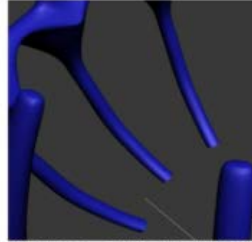
Single created piece



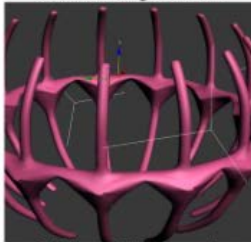
1st Single piece aligned to form circle and target welded



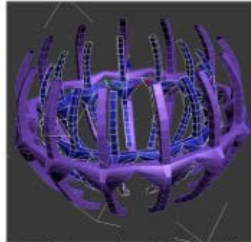
View from top



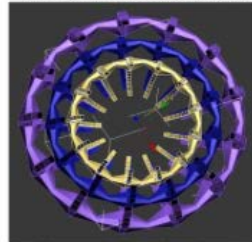
2nd piece - each end extruded and inserted to make curved



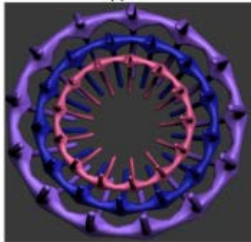
3rd piece - Turbosmooth applied



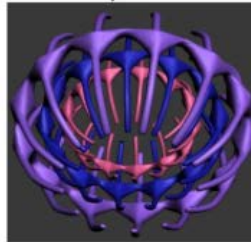
2nd piece placed inside 1st piece



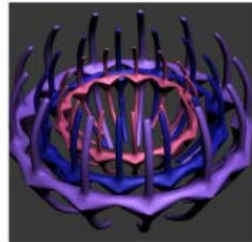
3rd piece added - view from top



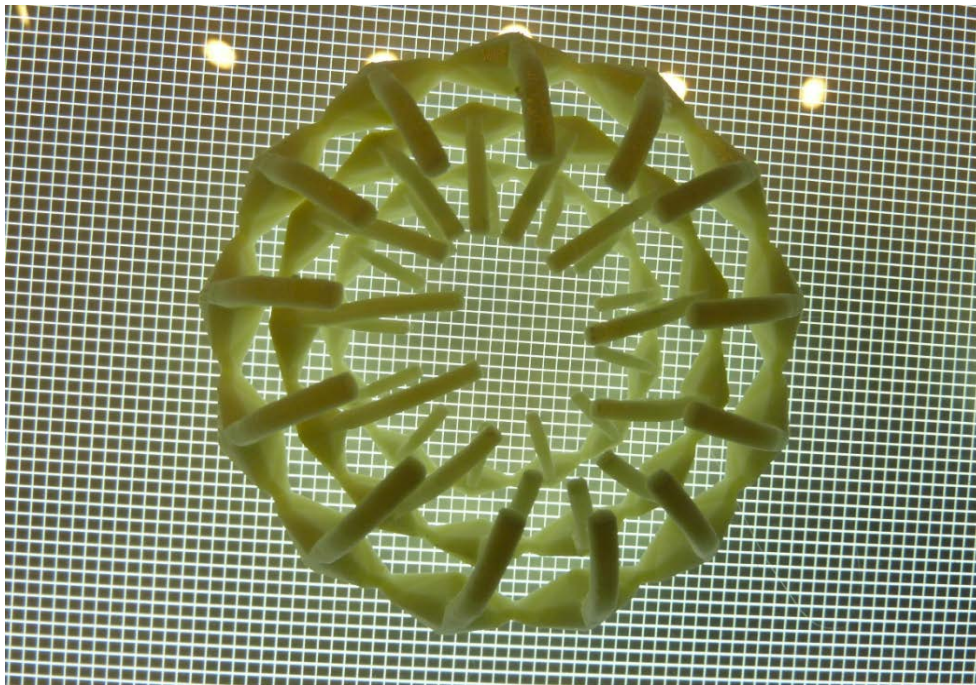
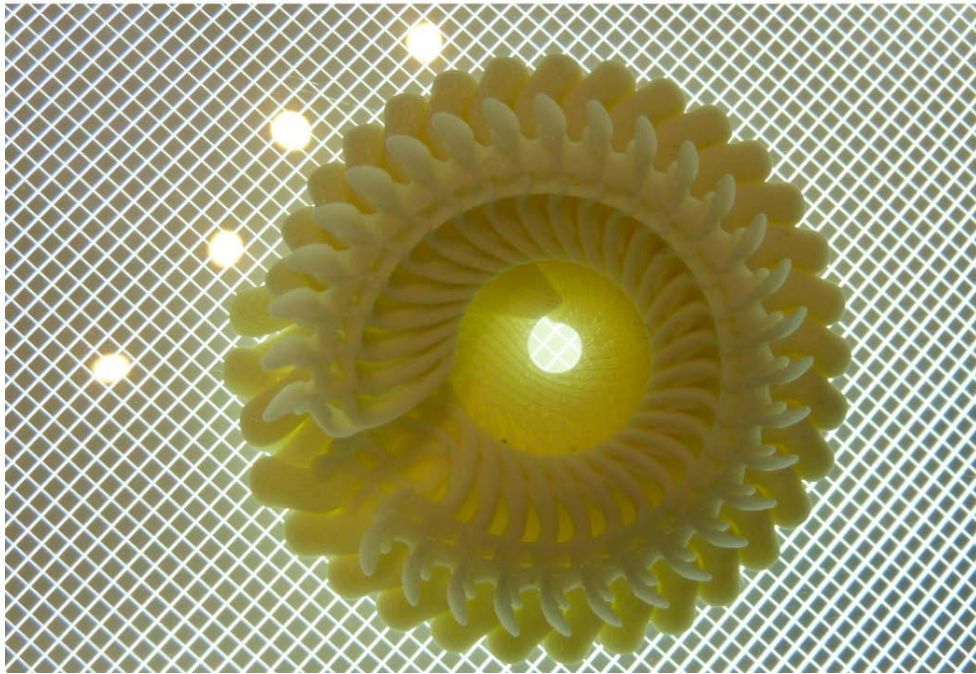
All 3 pieces - not attached - turbosmooth applied



View from underneath



View of side from top



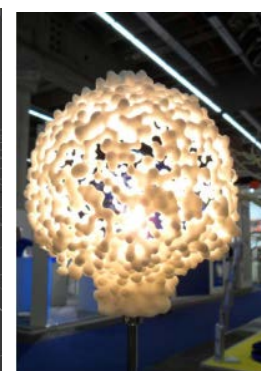
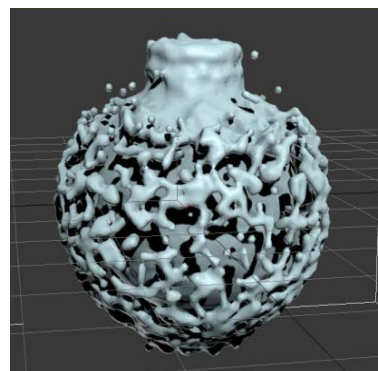
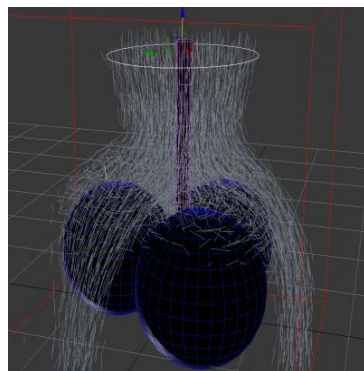
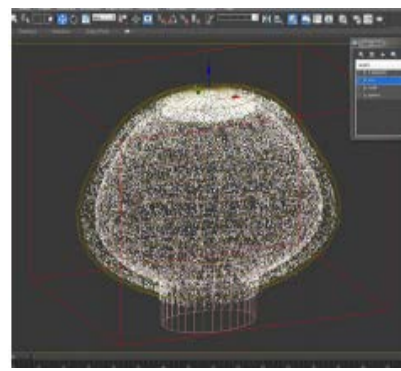
University funded practice led research by Andrew Taylor in collaboration with Surface Design students and academics. The project initiated 3D workshops to introduce 3D concept modelling and 3D printing for the first time to BA Surface Design Final year students. 3D printed prototypes were exhibited at the Surface Design Show and EcoBuilld, London.

Images show developmental 3D modeling phases and final printed prototypes. BA Surface Design students Vicky Kelly, & Shereen Ahmed. 2011.

Student project blog: <http://extraordinary-3d-materials.blogspot.co.uk>

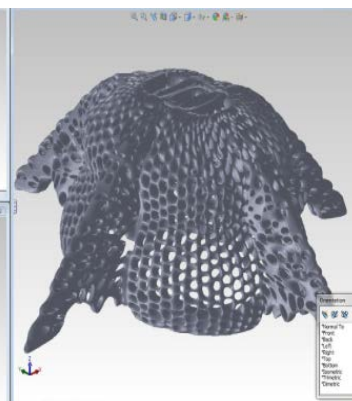
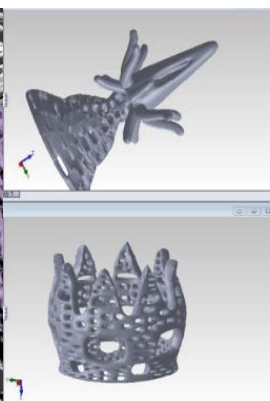
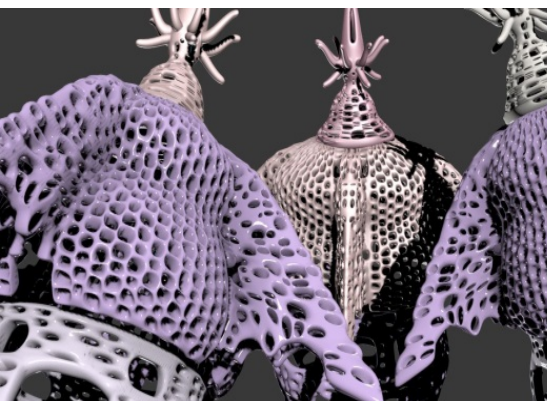


Extraordinary 3D Surface Materials: A practice led research exhibition with Surface Design final year students. 3D modeling concept methods and 3D printed prototypes. Exhibited at the Surface Design Show, Business Design Centre, Islington, London, 2011.



Fluid dynamics experiments for generating lighting concepts.

Exhibited in 2011 at Euromold , Frankfurt, Germany. Dr. Ertu Unver, University of Huddersfield.



3D Biomimicry lighting concept modelling experiments.

Exhibited in 2012 at Ecobuild, London, UK. Andrew Taylor, University of Huddersfield.



Patrick Stewart OBE with the Portrait



3D print of the sculpted bust of Sir Patrick Stewart
by MA 3D Digital Design graduate Daniel Hughes-McGrail – Solaesthetic.
Sourced from Shapeways.

www.shapeways.com/shops/danhughesmccgrail-digitalsculpture



Moments of Death and Revival, 2008, installation detail, Version 1: 3D printed objects in acrylic polymer, dimensions from 19cm-25cm, train, track, lights. Photo: Brass Art, © the artists



By Lewis, Chara, Mojsiewicz, Kristin and Pettican, Anneké (2008), *Skyscraping*.

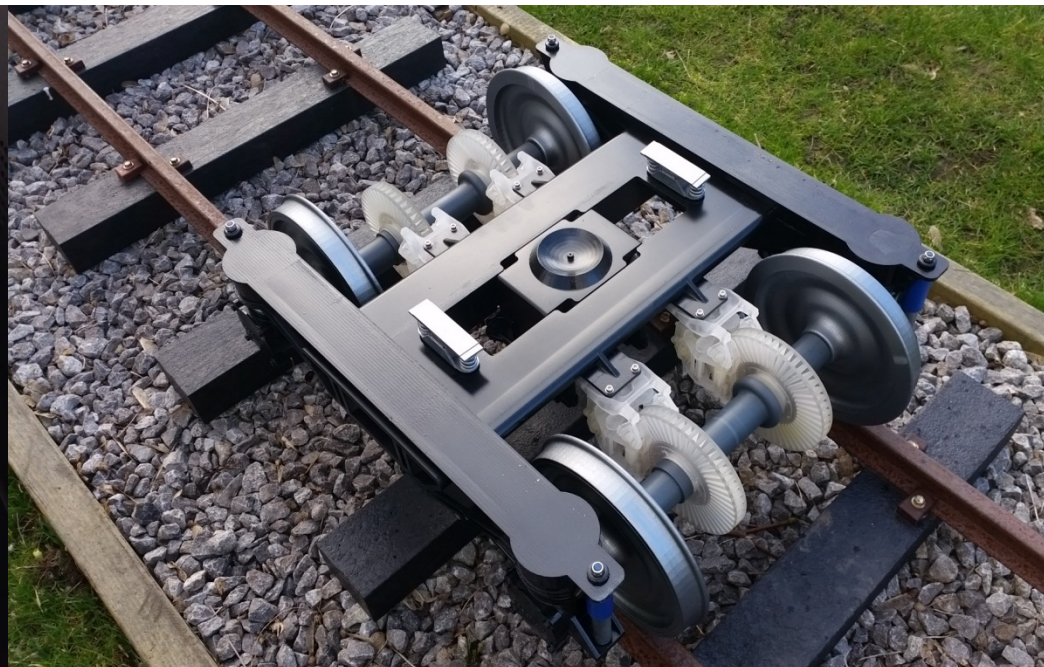
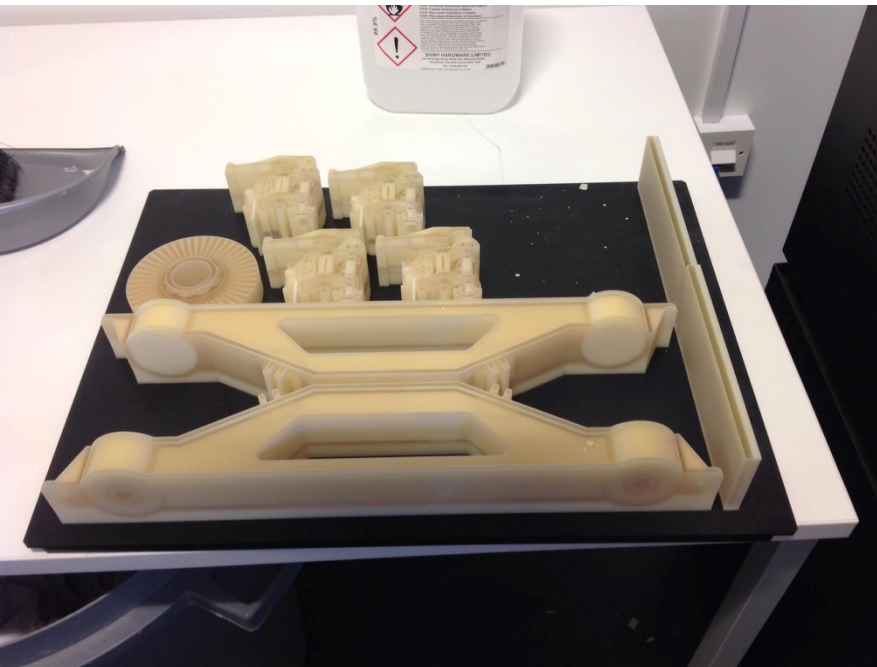
[Show/Exhibition] Brass Art. Anneké Pettican is an artist, Senior Lecturer and co-director of Brass Art (1999 -) with Chara Lewis and Kristin Mojsiewicz. Their collaborative practice explores the uncanny, including aspects of doubling and the limen – the in-between spaces of the physical world and the realms of the imagination.

“We’ve changed the whole way we draw architecture; everything’s changed from hand-drawing to 3-D drawings. And if you draw everything 3-D, then it’s time to change the whole construction process”

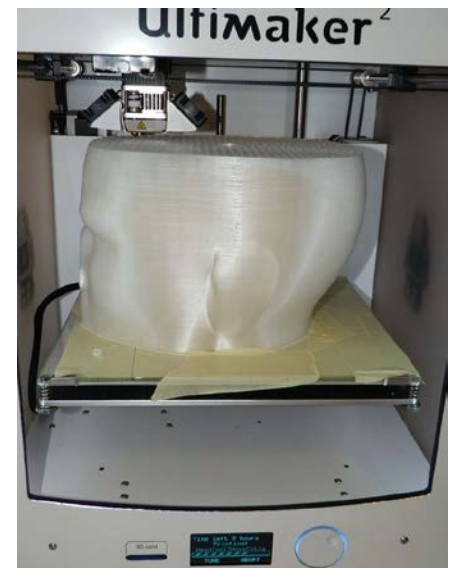
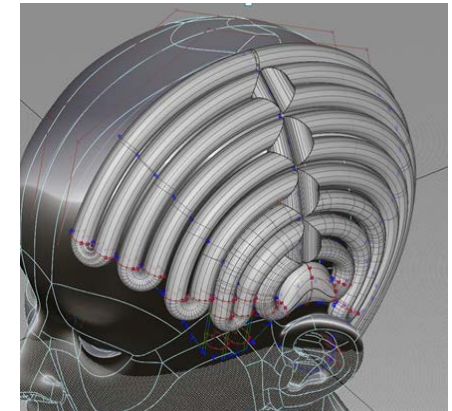
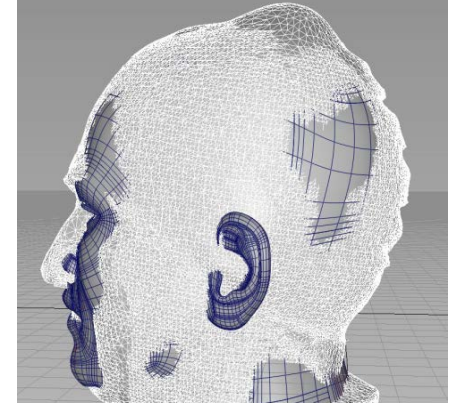
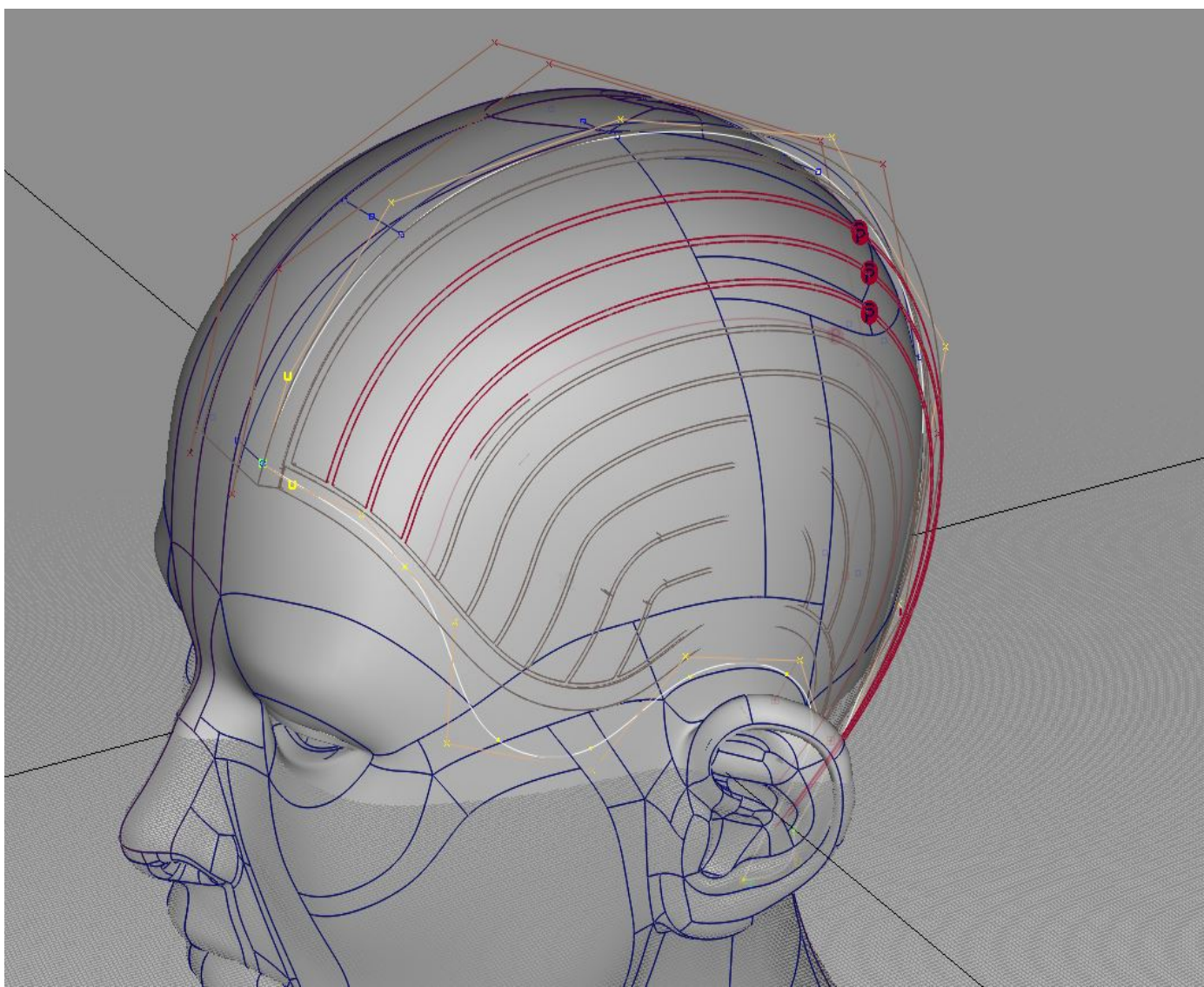
Ebner; UCLA Professor & 3M Architect.



Students from the University of California in Los Angeles, University of Huddersfield, Munich Technical University and the Center for Entrepreneurship and University of Applied Sciences, collaborated on the full-scale mobile prototype of urban living accommodation in 2014.



3D printed bogie parts (chassis bearers, brake calipers, brake disc) printed on Projet 5500X Multi Material Printer, at Queen Street Studios, School of Art, Design & Architecture. The train bogie prototype was commissioned by the Institute of Railway, (Dr. Phil Shackleton, Senior Research Fellow, IRR) at University of Huddersfield and funded under the EU FP7 Project Spectrum.



Enterprise activities between the University of Huddersfield and Paxman Coolers Ltd.
3D design modelling, prototype development and tooling manufacturing for Paxman cap cooling

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3D SLIDE SOURCES:

1. Research Centres at School of Art, Design & Architecture, University of Huddersfield. 2015.
2. 3D printing: Queen Street Studios, School of Art, Design & Architecture labs and research. University of Huddersfield. 2015
3. PhD Lionel Dean, (2009) Futurefactories: the application of random mutation to three- dimensional design.
<http://eprints.hud.ac.uk/8799/1/ltdeanfinalthesis.pdf>
4. Dean, L, Icon Jewellery. <http://www.futurefactories.com/>
5. Justin Marshall, Ertu Unver, and Paul Atkinson. *AutoMAKE: Generative systems, digital manufacture and craft production*.
<http://eprints.hud.ac.uk/3386/>
6. Phases of 3D modeling and 3D printed Concepts, Surface Design Final year students, 2011. <http://extraordinary-3d-materials.blogspot.co.uk>
7. Taylor, A, 2011 Extraordinary 3D Surface Materials: A practice led exhibition of 3D learning artefacts and prototypes.
<http://eprints.hud.ac.uk/17246/>
8. Unver & Taylor 2011 – 2012. Fluid dynamics experiments for generating lighting concepts. 3D Biomimicry for lighting concept design.
<http://eprints.hud.ac.uk/12760/>
9. Daniel Hughes-McGrail. 3D Patrick Stewart bust, Sourced from Shapeways. www.shapeways.com/shops/danhughesmccgrail-digitalsculpture
10. Brass Art. Lewis, Chara, Mojsiewicz, Kristin and Pettican, Anneké (2008) *Skyscraping*. [Show/Exhibition] <http://eprints.hud.ac.uk/3554/>
11. 3D printed apartment by Peter Ebner; <http://www.3ders.org/articles/20140407-students-build-3d-printed-mobile-mini-house.html>
12. 3D printed chassis bearers, brake calipers and bogie for Institute of Railway Research (IRR) printed in SADA 3D printing lab at University of Huddersfield. Images courtesy of Dr. Phillip Shackleton Senior Research Fellow Institute of Railway Research.
13. Unver, Ertu, Howard, Chris and Swann, David (2013) *Design & Development of Scalp Cooling Cap*. In: Smart Scalp Cooling Symposium, 3M Buckley Innovation Centre , Huddersfield, UK. <http://eprints.hud.ac.uk/17743/> <http://www.paxman-coolers.co.uk/news>
14. [Automake/FutureFactories](#) (2008) E Unver, J Marshall, LT Dean, P Atkinson, Hub: National Centre for Craft & Design
15. Unver, E (2013) [Design and Development of a new Scalp Cooling Cap - Stage 1 : Confidential Design and Development Report](#) Confidential Report Submitted to Paxman Coolers Ltd.