

Institute of Physics – London & South East Branch – Retired Members Section

At Home Meeting

3D PRINTING

Thursday July 9th 2020

This event has been organised by Barry Campbell for REMS

The London & South East Branch of REMS are organising a meeting in July 2020 as part of their highly popular series of ‘At Homes’. The topic on this occasion is 3D Printing. ‘At Home’ events are a combination of social and technical one day meetings. Invitations are extended to all retired and current members of the Institute of Physics and affiliated organisations. Members of the public are welcome. There is no charge to attend but booking is essential (lunch will be provided).

A wide variety of materials can be 3D printed ranging from plastics such as ABS and PLA for low cost printing systems through to metals including stainless steel, titanium and specialist cobalt and nickel alloys, ceramics, concrete and food. There are printers that will mix materials at the nozzle for printing composites and for other complex applications.

Many processes have been adapted for 3d printing including plastic injection moulding, welding including laser and electron beam welding, inkjet printing, bricklaying, cement pumping and electroplating.

Most 3D printers range from table top size, with or without an enclosure to shop floor sized systems. Large systems for building bridges feature robots that move about as the object is being built. The largest known flat bed system is 20ft wide and up to 100ft long.

Parts now fabricated using 3D printing include:

- Prototype components and assemblies
- Components for jet engines including fuel injectors and brackets, and cylinder heads for UAVs
- Tooling and handling equipment
- Casting moulds
- Tissue frameworks for organ replacement
- Bone replacements and teeth
- Chemistry and pharmacy models
- Concrete and stainless-steel bridges
- Pottery

3D printing provides opportunities for creating objects with complex internal structures, this is especially important for aerospace applications where weight is critical but can also be used to reduce material volume and manage mechanical properties.

Achieving good results from 3D printing requires a deep understanding of the materials, the printing process, possible contamination, and the impact of the solidification process on shape and mechanical properties.

Home 3D printing is achievable although there can be steep learning curves. Prices of plastic filament systems have fallen and low-cost CAD systems are available. Flat-pack 3D printers are available for about a hundred pounds and supporting software is available for free download on the Internet. Slicing and printing applications like Cura expose the user to several hundred parameters that affect print speed and quality.

3D Printing doesn't exist in a vacuum. Advances in computer aided engineering (CAE) including standards and software have enabled 3D printing but have also improved design and manufacturing workflows for conventional manufacturing. Justifications for a 3D printed solution needs to be viewed in this context. Very large 3D printers are available that are able to create many components simultaneously.

This one day At Home will bring you up to date with 3D printing capabilities and materials. Morning talks will include overviews of 3D printing processes and materials and the challenges of introducing metal 3D printing into a business. Afternoon talks will include fabrication of a model of Notre Dame, parts for an astronomical telescope and a novel continuous flow chemical reactor. There will also be demonstrations. An industry speaker will talk about 3D printing of metal and plastic parts including process flows from medical imaging to 3D printed parts.

If you have a 3D printer, are considering buying a 3D printer, need parts 3D printed or just have a general interest then you'll find this a really interesting day.

Programme (provisional)

10:30	Registration and coffee	
10:45	Overview of the status of 3D printing including processes and materials	Barry Campbell (REMS)
11:15	UCL – 3D printing processes	Steve Hilton (UCL)
11:45	Introduction of 3D printing into a Business	Geoff McFarland (Renishaw)
12:15	Lunch	
13:45	3D Printing with ABS including Notre Dame	Barry Campbell
14:15	UCL Modular 3D Printed Compressed Air Driven Continuous-Flow Systems for Chemical Synthesis	Steve Hilton
14:45	Renishaw Applications, including Medical	Geoff McFarland
15:15	The PiKon astronomical telescope (PLA)	Mark Wrigley
15:45	Questions and answers	
16:15	End-of day and reception	

Registration: go to the IoP website page for this event, and click on the 'Register' button, by **2nd July 2020**:

<https://www.iopconferences.org/iop/frontend/reg/thome.csp?pageID=955006&eventID=1500>

Where and when to meet: 10:30 (for registration and refreshments) at:

The Institute of Physics
37 Caledonian Road
London
UK
N1 9BU

Getting there: the nearest station is Kings Cross St Pancras.

Lunch: a lunch will be available at the meeting, and there are many other places to eat in the neighbourhood.

Size of party: 150 max.

Cost: free to attend. Registration is necessary, see 'Registration' paragraph above.

Late arrivals: ask advice at the front desk.

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