

MEDIA RELEASE

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A substantial body of work

Muscles made from fishing line, a gel based condom, 3D printed body parts and a bionic bra. 2014 was quite a year for the team at the UOW-headquartered ARC Centre of Excellence for Electromaterials Science.

Bosom buddy

This year, researchers at ACES moved closer to creating the world's first 'bionic bra' in an effort to increase breast comfort, an issue close to women's hearts.

The 'intelligent' underwear, developed in association with Breast Research Australia, is designed to provide greater support, whether the wearer is in motion or at rest, by automatically responding to breast movement.

ACES director Professor Gordon Wallace said new material fabrication techniques had advanced the project significantly.

"Our ability to make things from advanced materials has been greatly enhanced recently with the advent of new approaches to fabrication. The advent of approaches such as 3D printing has enabled us to assemble structures containing new sensing technologies to more accurately monitor movement and new artificial muscle technologies to control it. These advances have inspired us to (re)confront the challenges involved in creating the Bionic Bra," he said.

Hooking the big one

Years of work developing artificial muscles took an interesting twist, quite literally, this year.

After using sophisticated materials such as carbon nanotubes (with exciting results), researchers produced even better results using ordinary, everyday fishing line.

Researcher Professor Geoff Spinks said the process to convert to an artificial muscle is easy; just start twisting.

"We attach one end of the fishing line to an electric drill and hang a weight off the other end to apply some tension," he said.

"We stop the weight from rotating and we use the drill to insert twist into the fibre."

At a critical point, a loop forms in the fibre and further twisting produces more coils.

"Before too long, the whole fibre is a spring-like coil. To set this shape we apply a little bit of heat from a hair dryer and the coil contracts."

Materials experts at ACES have been working on the process of weaving the single coils to produce useable fabrics including power-fabrics that contract in response to swelling or heat, and comfort-adjusting material with weave that can loosen or tighten according to temperature.



Australian Government
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If it's not on...

ACES researchers received funding this year from the Bill & Melinda Gates Foundation, to develop a 'smart condom'.

Designed to assist countries where significant social, economic and environmental problems stem from a lack of birth control and the spread of STDs, the condom will be developed from an advanced material called Hydrogel.

Project leader, ACES Strategic Development Officer Dr Robert Gorkin said he hopes the development could lead to more widespread condom use.

"Making condoms out of materials that provide a more skin-like feeling could help overcome the perceived lack of sensation with latex," he said.

Printing parts for bodies

We may be only a few years away from a time when every major hospital will be equipped with 3D printing capabilities. Why? To re-grow and repair human tissue including bone, cartilage, muscle and nerves, all through a digital fabrication method called 3D BioPrinting.

A new eBook, *3D BioPrinting: Printing Parts for Bodies*, released this year, tells the story of this impending revolution in medicine.

Written by scientists, engineers and ethicists (including ACES researchers) at the forefront of this emerging field, the book offers an entry-level understanding of the principles behind the engineering, the biology and the strategy of this new clinical approach to medicine.

Co-Author Doctor Cathal O'Connell said he and his colleagues were motivated to write the book to give audiences a realistic understanding of the technology.

"The whole field of medicine could be upturned by this technology," he said. "But at the same time, the hype of 3D printing is often overblown. We wanted to present the reality, to provide a general audience with an understanding of what the technology is capable of now, and where it's going in 5 or 20 years."

Mastering BioFabrication

The University of Wollongong, through ACES, joined forces this year with three leading research universities to offer the world's first Master's Degree in BioFabrication to award graduates qualifications in Australia and Europe.

Biofabrication describes a process of regrowing human tissue using 3D printing techniques, and will enable health professionals to offer patients improved, personalised treatments in the future.

All world leaders within the biofabrication field of research, the four universities offering the course are: the University of Wollongong and Queensland University of Technology in Australia, the University Medical Center Utrecht in the Netherlands and the University of Würzburg in Germany.

ACES Director Professor Gordon Wallace said the Master's degree will provide participants with highly sought after, internationally recognised skills in biofabrication.

"Graduates of the program will have an international network, a track-record of collaboration with the world's leading bionics, fabrication and bio-ethics experts and an appreciation of all the processes involved in taking an idea through to commercial reality," he said.



Note for media:

About the ARC Centre of Excellence for Electromaterials Science: Funded by the Australian Government, ACES comprises 11 institutions worldwide, led by the University of Wollongong in Australia. ACES research programs exist to develop functional devices from 'intelligent' electro-materials, including artificial muscles, electronic textiles and plastic solar cells.

Masters of Biofabrication: Expressions of interest are being invited from science and engineering graduates. More info at www.electromaterials.edu.au

3D BioPrinting ebook: Available at 3dbioprint.creatavist.com/3dbioprinting

Media contact:

Professor Gordon Wallace, ACES Director, is available over the Christmas break to talk on topics including 3D printing, 3D bio-printing, bionics and all the research projects mentioned above. Please email gwallace@uow.edu.au or if urgent phone 0448 729 436.

Natalie Foxon Phillips, ACES Communications Officer, is on leave until 5 January 2015. Email nfoxon@uow.edu.au.



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