Researchers at the University of Wollongong used FDM and PolyJet 3D printing technologies to build different parts of this watertight and airtight perfusion chamber in a microscope.

O3D

"We do not want to compromise accuracy for speed. Stratasys' 3D Printers assure us that we can have both." – by Dr. Stephen Beirne - Intelligent Polymer Research Institute University of Wollongong

CASE STUDY

Research Intelligence

THE UNIVERSITY OF WOLLONGONG USES SEVERAL KINDS OF 3D PRINTERS TO INNOVATE ITS RESEARCH

INDUSTRY | Commercial Product **TECHNOLOGY** | PolyJet

The Wollongong-based Intelligent Polymer Research Institute (IPRI) is headquarters for the ARC Centre of Excellence for Electromaterials Science and the Australian National Fabrication Facility (ANFF) materials node. IPRI focuses on improving the functionality of nano-scale materials and facilitating applications in areas including energy and medical bionics.

OBJECTIVE 3D
PRINTERS | PARTS | SCANNERS

Situated within the IPRI is a 3D printing unit made up of Stratasys® 3D Printers: an Objet® Connex™, an Objet Eden™ and a uPrint® 3D Printer – as well as a range of custom-built systems – each building parts for different projects. Funded by ANFF, the 3D printing unit was established by Dr. Stephen Beirne, research fellow of the ANFF and IPRI. "To us, 3D printing opens new horizons for research, allowing a simpler way of fabrication at a lower price," Beirne said.

IMPLANT PROTOTYPE FOR GLAUCOMA SURGERY

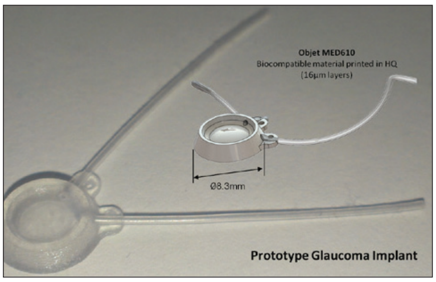
Since the establishment of the 3D printing facility, Beirne and his team have been collaborating with the Centre for Eye Research Australia to prototype implants for glaucoma surgery. Molds for these implants were previously manufactured using machine tools and then used to shape the implant with the actual implant material. This time-consuming and labor-intensive process had to be performed manually, taking two to three months to make. With 3D printing technology, an implant model takes only a few hours to print, dramatically increasing design variations that can be experimentally tested.

In addition to saving time, another benefit of 3D printing is precision. Using bio- compatible PolyJet™ 3D Printing material (also called MED610) that prints in layer thickness of just 16 microns, the 3D printed implant prototype is very accurate. "We do not want to compromise accuracy for speed. Stratasys' 3D Printers assure us that we can have both," Beirne said. "In addition, the MED610 material allows us to sterilize our implant prototypes without damaging the structure. This is very important for us because the real implant material will be in direct contact with the body. Clinical sterilization process is required to eliminate any possible bacteria. MED610 proves to be the optimal choice that can withstand this process."

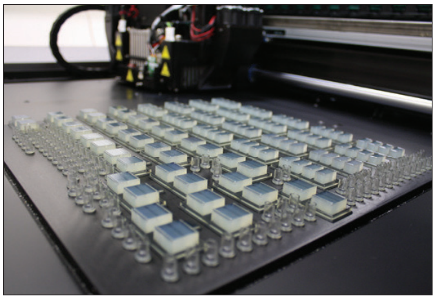
WATER- AND AIRTIGHT END-USE PARTS

Using Stratasys FDM® and PolyJet 3D printing technologies, Beirne and the team also build different parts of a watertight perfusion chamber for use in a microscope. Used to hold cells and biomedical tissues, the 3D printers make end-use parts at a lower cost than conventional manufacturing.

"We print the microscope locating plate, the outer part of the perfusion chamber, with the uPrint using ABS material, which offers strong and stable properties," said Beirne, "while the perfusion tray, the inner part of the perfusion chamber, is printed with PolyJet using

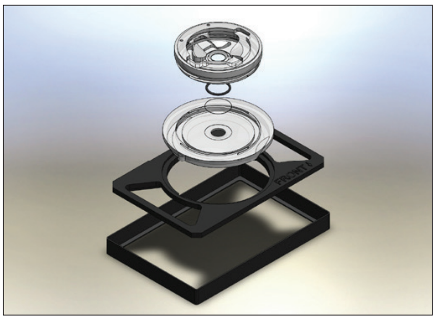


Prototyping implants for glaucoma surgeries is much faster and more costefficient with 3D printing.



The perfusion tray was 3D printed in bio-compatible material since it will come into direct contact with cells and tissues.

the bio-compatible MED610 material, because it will come in direct contact with cells and tissues." The two parts are then snap-fitted together and mounted onto the microscope. This work is being undertaken in collaboration with researchers at St. Vincent's Hospital Melbourne.'



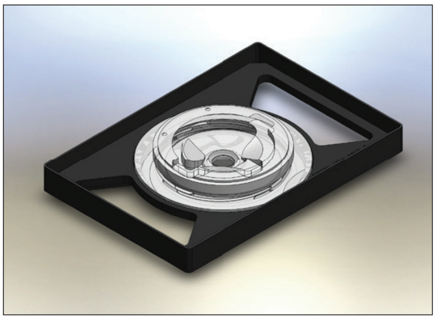
A 3D rendering of perfusion chamber's different parts

GOING BEYOND PARTS AND PROTOTYPES

"We can even create customized tools to facilitate specific projects cost-effectively," said Beirne. Recently, the team used the Eden 3D Printer to produce a scaffold with cubical parts, plating the surface with platinum pieces. The end product is used as an electrode for an electrical cell stimulation study at the institute.

3D printing has become more accessible at University of Wollongong. Beirne plans to expand the 3D printing unit's service to nearby colleges and commercial institutes.

"In sum, 3D printing facilitates our research projects, allowing us to advance technologically in a cost-effective way," said Beirne.



A 3D rendering of the assembled perfusion chamber in a microscope.