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MEDIA RELEASE

University of Pretoria setting up facility for the 3D-printing of bone and organ replicas

PRETORIA – The University of Pretoria's (UP) Forensic Anthropology Research Centre (FARC) is setting up a comprehensive facility to help other departments in the University's Faculty of Health Sciences with the 3D-printing of replicas of bones and organs, such as brains, hearts and livers.

This is being done to improve healthcare, research methods and the teaching of students; there are also plans to collaborate with other faculties.

"Three-dimensional printing offers several advantages, such as visualisation and tactile opportunities, allowing us to assist colleagues in the fields of orthopaedic surgery and prosthodontics with their research, particularly their need to use 3D-imaging and 3D-printing in their medical practices," said Professor Ericka L'Abbé, a Professor of Biological Anthropology and Director of the FARC.

"Dr Alison Ridel, a postdoctoral researcher at FARC, is collaborating with Dr Alwyn Fortuin of the Department of Prosthodontics on digital methods to reconstruct a face before and after tumour resection," Prof L'Abbé added. "She will assist the surgeon with processing the patient's 3D cone-beam computed tomography [CT] data before and after surgery to provide 3D prints of their faces, so that Dr Fortuin can visualise the surgical procedure and explain it to the patient.

"In the case of body structures, it is much easier to visualise structures and make informed decisions based on a physical object than a flat image. By adding the third dimension for the purposes of teaching and the treatment of patients, we can harness valuable additional information to enhance outcomes."

Prof L'Abbé's team can also use a CT scan to make a 3D mesh of a patient's soft or hard tissue, which can be 3D-printed and used by the surgeon in their pre-operative planning.

"Students use loose teeth to study," Marius Loots, first technical operator, said. "Although they look similar, all teeth are different. Typical teeth are used to teach dental morphology, but this could differ from what the student has in front of them. By printing a standard set of teeth, it allows the student to master the typical structure, then apply the knowledge on real teeth."

Additionally, 3D-printing can be used in forensic anthropology. "We have a collection of various types of trauma on bone, like gunshot wounds and blunt force trauma," said Loots. "By making prints, we not only save the original skeletal element from destruction by use, but also avoid getting entangled in ethical debates."

He explained that 3D-printing involves various processes, including fused filament fabrication, stereolithography as well as selective laser sintering, which makes use of a laser to fuse powdered material into a solid object.

Prof L'Abbé said that this work is relatively mainstream in Europe and the United States, and that her team's work stems from Erasmus+ grants, which are financed by Education, Audiovisual, and Cultural Executive Agency (EACEA) of the European Commission. The team is collaborating with European and South African universities.

The facility is hoping to open up the job market for students who can do 3D-imaging processing for medical doctors and 3D-print data for them. "We want to bring as much transdisciplinary and collaborative approaches across various faculties and disciplines to realise the benefits of advanced imaging technology within higher education institutions and the workplace," Prof L'Abbé said. "Learning 3D-imaging processing will also increase the workplace readiness of our students."

To showcase the technology, a 3D surface scan was performed on UP Vice-Chancellor and Principal Prof Tawana Kupe, and 3D-printed. "When people start to see a 3D mesh or print of Prof Kupe or Prof Tiaan de Jager, Dean of the Faculty of Health Sciences, they start thinking of applications of this technology in their own disciplines," Prof L'Abbé said. "A 3D-printed person makes the technology real and relatable to everyone, regardless of discipline."

"It is amazing what our faculties can do," Prof Kupe said. "They are future-focused and are using advanced techniques for teaching, learning and research – 3D-printing is a case in point, as we are using cutting-edge technology to improve people's lives. Our transdisciplinary work aims to benefit society in multiple ways."

Ends.

Captions:

1. Postdoctoral researcher Dr Alison Ridel performs a 3D surface scan of Prof Tawana Kupe to create a digital model rendering.

2. A 3D-printed model of Prof Kupe made through collaboration with the Forensic Anthropology Research Centre and 3D scanning and printing teams, part of the Bakeng se Afrika and Dirisana+ projects.

3. Prof Ericka L'Abbé holds a 3D print of a trauma skull from the Bakeng se Afrika trauma workshop.

4. Follow this link to take a tour of the 3D-printing facility: https://fb.watch/9VvZBkEr4B/
Caption: A walk-through of the 3D-printing facility at UP's Faculty of Health Sciences, showcasing the various types of printers that can be used to create 3D models.

About the University of Pretoria

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on the Hatfield Campus, Pretoria. This 114-year-old institution is also the largest producer of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only University in the country with a Faculty of Veterinary Science, which is ranked top in Africa. UP has 120 academic departments and 92 centres and institutes, accommodating more than 55 000 students and offering about 1 100 study programmes.

UP is one of the top five universities in South Africa, according to the 2019-2020 rankings by the Center for World University Rankings. The QS World University Rankings also placed UP among the top 100 universities worldwide in three fields of study (veterinary science, theology and law), and UP is in the top 1% in eight fields of study (agricultural sciences, clinical medicine, engineering, environment/ecology, immunology, microbiology, plant and animal sciences and social sciences), according to the Web of Science Essential Indicators.

In May 2020, the annual UK Financial Times Executive Education Rankings again ranked GIBS as the top South African and African business school. The University also has an extensive community engagement programme with approximately 33,000 students involved in community upliftment. Furthermore, UP is building considerable capacities and strengths for the Fourth Industrial Revolution by preparing students for the world beyond University and offering work-readiness and entrepreneurship training.

As one of South Africa's research-intensive universities, UP launched the Future Africa Campus in March 2019 as a hub for inter- and transdisciplinary research networks within UP and the global research community to maximise 4IR innovation and address the challenges and stresses our continent and world is facing. In addition, UP also launched the Javett Art Centre in September 2019 as a driver of transdisciplinary research development between the Humanities and other faculties. In November 2020 UP launched Engineering 4.0. as a hub not only for Smart Cities and Transport, but also to link the vast resources in technology and data sciences to other faculties via Future Africa. These initiatives are stimulating new thinking at the frontier of 'science for transformation'.

For more information, go to www.up.ac.za