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Research at Macquarie Medical Imaging Revolutionises The Study of Ancient Artefacts

Experts in modern medicine and archaeology at Macquarie University have unlocked a revolutionary way of studying ancient artefacts.

Using new technology in CT scanners, Professor John Magnussen of Macquarie Medical Imaging and Dr Jaye McKenzie-Clark of the Department of Ancient History have pioneered a completely non-destructive technique for analysing the composition of ancient artefacts.

Currently most analytical techniques require the partial or total destruction of the ancient samples, resulting in the continuous destruction of a precious and finite resource of information about culture and civilisation from the ancient world.

In sharp contrast, the new technique produces comparable results which are achieved totally non-destructively. The method can be applied to most ancient materials, consequently it has the potential to revolutionise archaeological research while at the same time preserving the world's cultural heritage.

Magnussen and McKenzie-Clark have also scanned Cuneiform tablets, which preserve some of the oldest writing in history – embedded in artefacts up to 3,500 years old. Macquarie University's Museum of Ancient Cultures possesses 24 cuneiform tablets, and many of these are wrapped in an envelope of clay. Until now, the only way to inspect the inner tablets was to destroy the outer shell. Magnussen and McKenzie-Clark have been able to non-destructively unwrap the tablets.

Professor Magnussen explained 'We are examining and analysing the contents of what is, in effect a 3,500 year old clay tablet encased in a clay envelope without having to break the seal' The ability to send a private message has been valued since humans first wrote. The tablets enabled privacy because they were sealed.

He added 'Macquarie University is fortunate to have 24 wonderful examples of Cuneiform tablets dating from the third century BC. The sealed tablets preserve fragments of the oldest known form of writing. To be able to view the contents without having to crack the clay shell is a wonderful capability'

Such CT scanners have also been used by Magnussen and McKenzie-Clark to accurately reproduce ancient artefacts using 3D printing. This allows researchers and students alike to handle, examine and analyse the replica without harm to the original irreplaceable artefact.



The new techniques were presented last week at a special forum organized by Macquarie University and have generated huge interest among historians and archaeologists.

Dr McKenzie-Clark said 'these developments have the potential to revolutionise the way in which archaeologists study the material culture of ancient societies. The results will enhance current understanding of trade, distribution and consumption in the ancient world'. She added 'I believe it is not going too far to say that this new development will transform the field of non-destructive ancient artefact analysis'.

Macquarie Medical Imaging (**MMI**) is a joint venture between Cyclopharm, Alfred Health Solutions and Macquarie University Hospital. Mr James McBrayer, CEO of Cyclopharm and Chairman of MMI stated that our decision to locate our cyclotron on site at Macquarie University Hospital and form the MMI joint venture was with the belief that it would open doors to new opportunities. Little did we know that MMI would open doors to the past.

Mr McBrayer went on to say 'While we are more accustomed to our imaging equipment and services being used to advance human health, this is a fascinating application and example of the collaborative work we are engaged in at the University and together we will explore opportunities to leverage the IP we are developing. We are delighted with the truly revolutionary research John and Jaye have initiated and the part MMI is playing in unlocking some of the secrets of the ancient world'.

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Professor John Magnussen

Professor Magnussen qualified in Medicine and then went on to complete a PhD in Nuclear Medicine and Biomedical Engineering at UNSW. John qualified in Radiology from RPAH in 2002, where he worked both in diagnostic and interventional radiology, and was the Director of Research. He is a Partner in Specialist Magnetic Resonance Imaging and has completed advanced training in CT Coronary Angiography. John has presented at numerous international meetings in basic science and clinical research and is the Professor of Radiology at Macquarie University.

Dr Jaye McKenzie-Clark

Dr McKenzie-Clark is an award-winning, consulting archaeologist and ceramic specialist. She has worked on several projects in Greece and Italy and has authored many journal articles, book chapters and most recently her own book. At Macquarie University Jaye lectures and tutors in both Archaeology and Society and Museum Studies and is an Education Officer at the Museum of Ancient Cultures. Jaye is also a Director of Macquarie University's Australian Carsulae Archaeological Project, which is investigating the ancient Roman city of Carsulae in Umbria. With training in architectural design and construction Jaye is conversant with the identification, documentation and analysis of archaeological standing remains. Her long-standing experience as a commercial potter has also led to a comprehensive understanding of the manufacture and analysis of archaeological ceramics. She is recognised as an international authority on ancient Roman pottery.



Background

Cyclopharm Limited

Cyclopharm is a radiopharmaceutical company servicing the global medical community. The Company's mission is to provide nuclear medicine and other clinicians with the ability to improve patient care outcomes.

Cyclopharm achieves this objective through the provision of radiopharmaceutical products, Technegas (for lung imaging) and Molecular Imaging / PET radiopharmaceuticals (used in cancer, brain and cardiac imaging). Our customers are nuclear medicine departments located within hospitals and clinics.

Technegas

The Technegas technology is a structured ultra-fine dispersion of radioactive labeled carbon, produced by using dried Technetium-99m in a carbon crucible, micro furnaced for a few seconds at around 2,700°C. The resultant gas like substance is inhaled by the patient (lung ventilation) via a breathing apparatus, which then allows multiple views and tomography imaging under a gamma or single photon emission computed tomography (SPECT) camera for the superior diagnosis of pulmonary emboli (blood clots in the lungs).

Positron Emission Tomography (PET)

PET radiopharmaceuticals target specific tissues / organs, concentrate there, and the attached radioisotope emits radiation, which is then detected by a PET or PET / CT gamma (collectively PET camera). These imaging modalities help physicians improve their ability to detect and determine the location, extent and stage of cancer, neurological disorders and cardiac disease at a metabolic level. By improving diagnosis, PET scans aid physicians in selecting better courses of treatment, as well as assessing whether treatment is effective or should be changed at a much earlier stage.

Macquarie University Hospital and the Macquarie University School of Advanced Medicine

Macquarie University Hospital is a major medical precinct within the Macquarie University Research Park to complement the Allied Health teaching services offered by Macquarie University.

The Macquarie University Hospital together with the Macquarie University School of Advanced Medicine is a state of the art facility that delivers health education and research on site.

Macquarie Medical Imaging

Cyclopharm formed a joint venture with Alfred Health Solutions and Macquarie University Hospital to provide all imaging services on-site at the hospital. The new venture named Macquarie Medical Imaging ("MMI") represents a rare strategic opportunity to provide a fully aligned and integrated diagnostic, therapeutic and research platform. MMI offers a range of diagnostic radiology, interventional radiology, nuclear medicine and molecular imaging services for inpatient and outpatients.

The combination of state of the art imaging equipment, a GE cyclotron located on the grounds of MUH, leading surgeons, clinicians and academics will ensure that MMI will become the leading centre of imaging excellence.