Unlocking the secrets of Aboriginal Australian artwork

Flinders University Research Associate using ANSTO's unique Neutron Activation Analysis techniques to study ochre on Indigenous Australian artefacts has been awarded a prestigious AINSE Fellowship.

> *'We are using 21st Century scientific techniques that employ a nuclear reactor and accelerators, for which ANSTO is a centre of excellence, to shed light on our own Indigenous Australian culture.'*

Nuclear science is being enlisted in the first ever comprehensive study of the elemental make-up of ochre used in archaeological and historical Indigenous Australian objects and artwork.

Aboriginal Australian artworks that are found the length and breadth of our nation are the physical representations of the oldest continuous culture in the world. These objects, such as shields, pigment palettes and bark paintings, are of enormous significance and tell the ancient Dreaming stories of Australia's first people. The majority of Aboriginal Australian objects are treated with ochre, a naturally occurring iron oxide pigment. Various ochre pigments are chosen from specific sites or with specific colours to transform the colour and meaning of an object.

Dr Rachel Popelka-Filcoff, a research associate at Flinders University's School of Chemical and Physical Sciences, along with collaborators at the South Australian Museum and Artlab is using ANSTO's Neutron Activation Analysis (NAA) facilities at OPAL to examine the ochre used in these objects in unprecedented detail.

Leader of the Neutron Activation Group within ANSTO Nuclear Operations, Dr John Bennett, says the information Rachel will gather, using his team's NAA techniques, will be priceless for historians, anthropologists and archaeologists seeking to better understand this ancient art and piece together information about ancient interactions between Indigenous Australian groups. He says by developing this elemental 'signature' of different ochres it means that, if you find ochres at a particular site or in a museum collection — where you don't know where they have come from — then an analysis of the elemental composition of those unknown ochres could indicate where they were sourced from.

Rachel will be gaining a greater understanding of the cultural life of Indigenous Australians pre-European settlement, and it will tell stories about those exchange networks between different Indigenous groups across the country, potentially leading to a significant increase in our understanding of the Indigenous culture and communities.

"Hence we are using 21st Century scientific techniques that employ a nuclear reactor and accelerators, of which ANSTO is a centre of excellence, to shed light on our own Indigenous Australian culture. We also have the advantage that the characteristics of the OPAL reactor are ideal for NAA; other reactors have to make large corrections for interfering reactions from high-energy neutrons but ours has been specifically designed to provide a very well-thermalised neutron flux. So we have the bonus of having a near-perfect reactor for this type of work," John explains.

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Dr Popelka-Filcoff says the use of ANSTO's NAA, used in conjunction with her multivariate statistical analysis, will be the key to answering numerous questions about ancient Indigenous societies.

"Currently, the geochemistry and mineralogy of these pigments are not well understood. We will be constructing a comprehensive elemental, mineralogical and spectroscopic database for the known major and minor ochre source sites across Australia," Rachel explains.

"With this information, we will learn about how ochre was mined and processed, and how it was exchanged across the continent. Interpretation of our data will help us to identify ochre exchange routes and learn about the movements of people. It will also be a valuable resource for museums seeking to better understand some of their collections, and archaeologists to understand archaeological sites.

"The NAA facilities at ANSTO offer unparalleled sensitivity and precision and allow us to measure more than 50 elements at once. In addition, future studies will use ANSTO's PIXE (particle induced X-ray emission) facilities," she adds.

Rachel is currently performing comprehensive studies of ochre from sources in South Australia, the Northern Territory and Western Australia.

In August 2010 Rachel was awarded an AINSE Ltd Research Fellowship (one of two) to facilitate her research at ANSTO.

Gavin Atkins and Greg Conway, August 2010

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