

Synchrotron brings \$220m support for research

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RESearchERS have welcomed this week's opening of the \$220 million Australian synchrotron as having huge implications for the ability to conduct important environmental health research.

One example of research likely to benefit is ongoing work that has been looking at the extent and nature of arsenic contamination in young children.

The researchers have so far been using an overseas synchrotron — a type of particle accelerator that can be used for advanced scientific work — to determine the pattern of arsenic deposits in the toenail clippings of children.

While this has meant taking the samples on a flight to Chicago in the US, this week's opening of the Australian synchrotron in Clayton, by Victorian Premier John Brumby and federal Education Minister Julie Bishop, means further work may be conducted here in Australia.

Dora Pearce, the University of Ballarat PhD student whose work on toenails has been done using the US synchrotron, said the opening of the Australian facility had "huge implications" for health-related research. "It just opens up the possibilities for environmental health research amazingly," she said.

Pearce's research has involved her looking at the clippings to determine whether arsenic found there was deposited evenly or in concentrated periods of time, and also how it was metabolised and excreted.

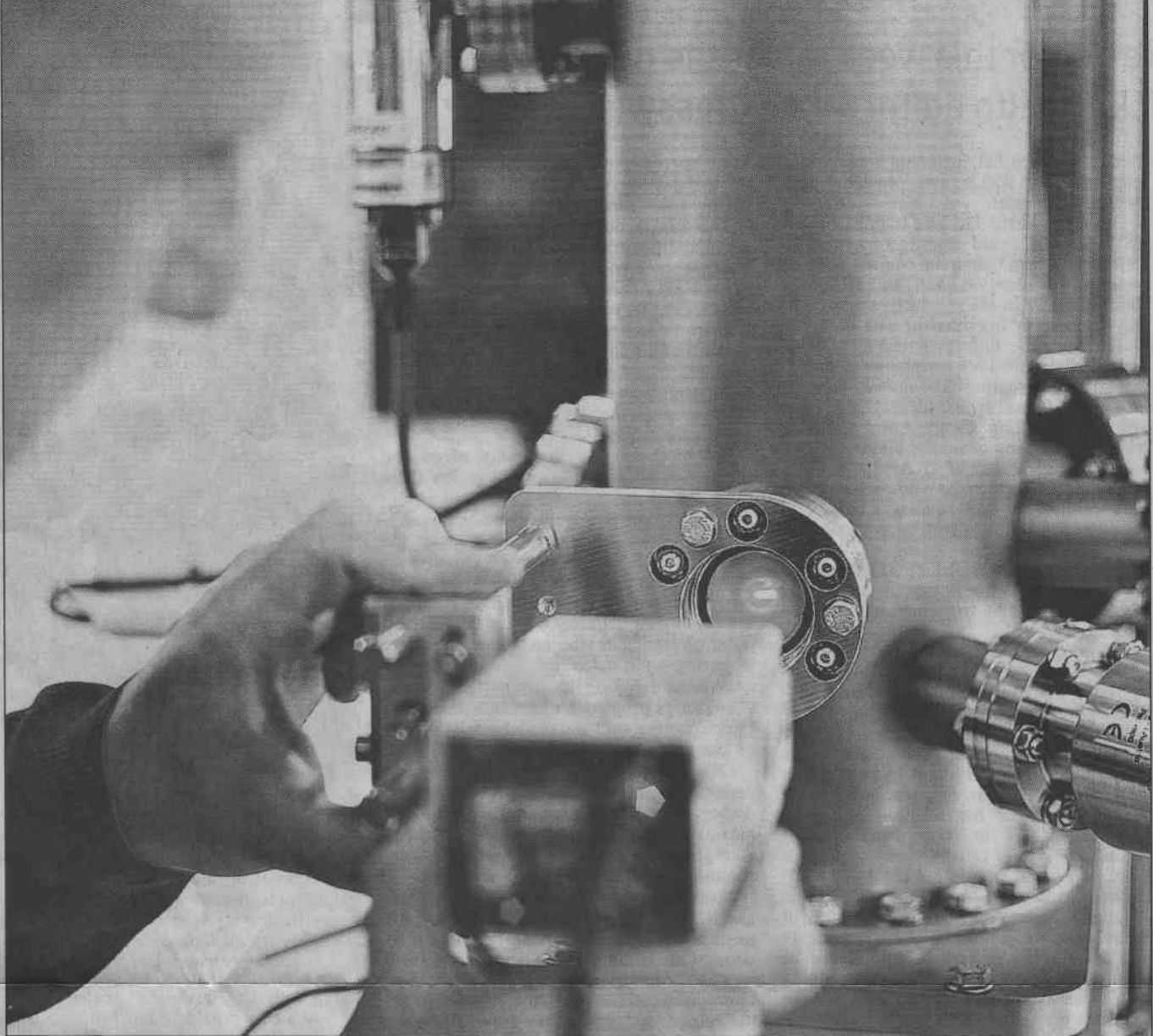
Professor Andrea Gerson, an expert in mineral processing at the University of South Australia, who uses synchrotrons extensively and has acted as an adviser to the project, said alternative methods of studying arsenic levels required the nail or hair to be dissolved in a solvent before the analysis.

"You lose the chemical information — you know how much arsenic is there, but you lose the chemical state it was in, what else it was bonded to," Gerson said.

"That's quite important for these materials. In some forms they are quite toxic, and in other forms they are not as toxic. It provides valuable information about the patterns of ingestion.

"What we are hoping to do in the next set of experiments, again overseas, is to check that the arsenic has come through the blood supply, and hasn't been absorbed through the surface of the nail."

The issue of arsenic contamination is relevant because of the pollution problems associated with mining. Arsenic is a relatively common element often found under-



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ground, and at the surface in places where the ground has been disturbed — such as near mining operations.

“There’s a lot of arsenic materials in the environment,” Gerson says.

“In Bangladesh they had a lot of problems with arsenic in the water. If there’s mining all the dirt under the surface is dug up.”

Gold-containing ores quite often contained ores of other metals, and not uncommonly also had arsenic mixed up with the materials.

Because of the association with gold mining, Pearce’s research was based on a study of rural communities in the Victorian goldfields. Even where mines are no longer in use, waste dumps from decommissioned mines remain scattered across the area and have been used for landfill sites and other uses.

Children, selected through two primary

schools in arsenic-contaminated areas, were chosen as the source of the toenail clippings used in the research because Pearce said children “are the ones who tend to get down and dirty with the environment”.

“We’re not saying there is a danger, rather we are developing ways of monitoring so we can assess risk in the future,” she said.

A technique known as X-ray fluorescence was used to map the distribution of arsenic across sections of the toenail samples, and the oxidation state of the arsenic was also detected using X-ray absorption near-edge spectroscopy.

Pearce, and her co-authors on the study including Gerson and Pearce’s supervisor doctor Kim Dowling, found detectable bands of arsenic in the nail, and in two distinct forms involving higher and lower levels of oxidation.

They concluded that the analysis showed evidence the children had absorbed the arsenic systemically from the soil.

Pearce said what that pointed to was the need for a further epidemiological study to “look at the possibility of short-term and long-term health effects associated with this particular level of exposure”.

“I am going to look into what my future options are once I finish my PhD — I would hope to do a post-doctorate (on this issue),” Pearce said.

She said she was looking forward to using the Australian synchrotron and no longer having to take biological samples on a plane to Chicago, which was “a hassle”.

“Not only do you have additional ethical clearance to run the experiment in the US, but there are also serious bio-security issues,” she says. “I’m looking forward to driving my toenail clippings down the road to Clayton.”

Gerson said to date there had been little work on the long-term effects of arsenic absorption.