

T-rays open window to better care

Move over, X-rays. T-rays should be the next big thing.

T-rays are terahertz light, a form of radiation between infra-red and microwaves that was considered something of a scientific no-man's land until a decade ago because it was part of the frequency band that was inaccessible for all manner of technical reasons.

Scientists are now refining techniques that can accurately analyse the composition and density of materials and so identify what they are, not just their basic shape.

The potential is to create new devices to aid in the fight against "enemies" as diverse as terrorism and cancer.

Adelaide is a leader in the field and hosted an international workshop last week. It will move even more to the forefront next year with the opening of a National T-ray Facility at the University of Adelaide.

A \$2.5 million cheque from the Australian Research Council is in the mail and Dr Derek Abbott

and colleagues are planning a shopping expedition. Their aim is to purchase three new T-ray systems, which will work in parallel and specialise in the testing of gases, liquids and cells respectively.

This would create one of the few dedicated, multi-use T-ray facilities in the world. Scientists from a variety of disciplines will

By Nick Carne

have access. "This is a technology that will have wide application in the future," said Dr Abbott, an associate professor and director of the university's Centre for Biomedical Engineering. "Researchers will be using it in the same way that they use other testing equipment today. Anyone with a funky new sample will want it T-rayed."

"People referred to the terahertz gap," he said.

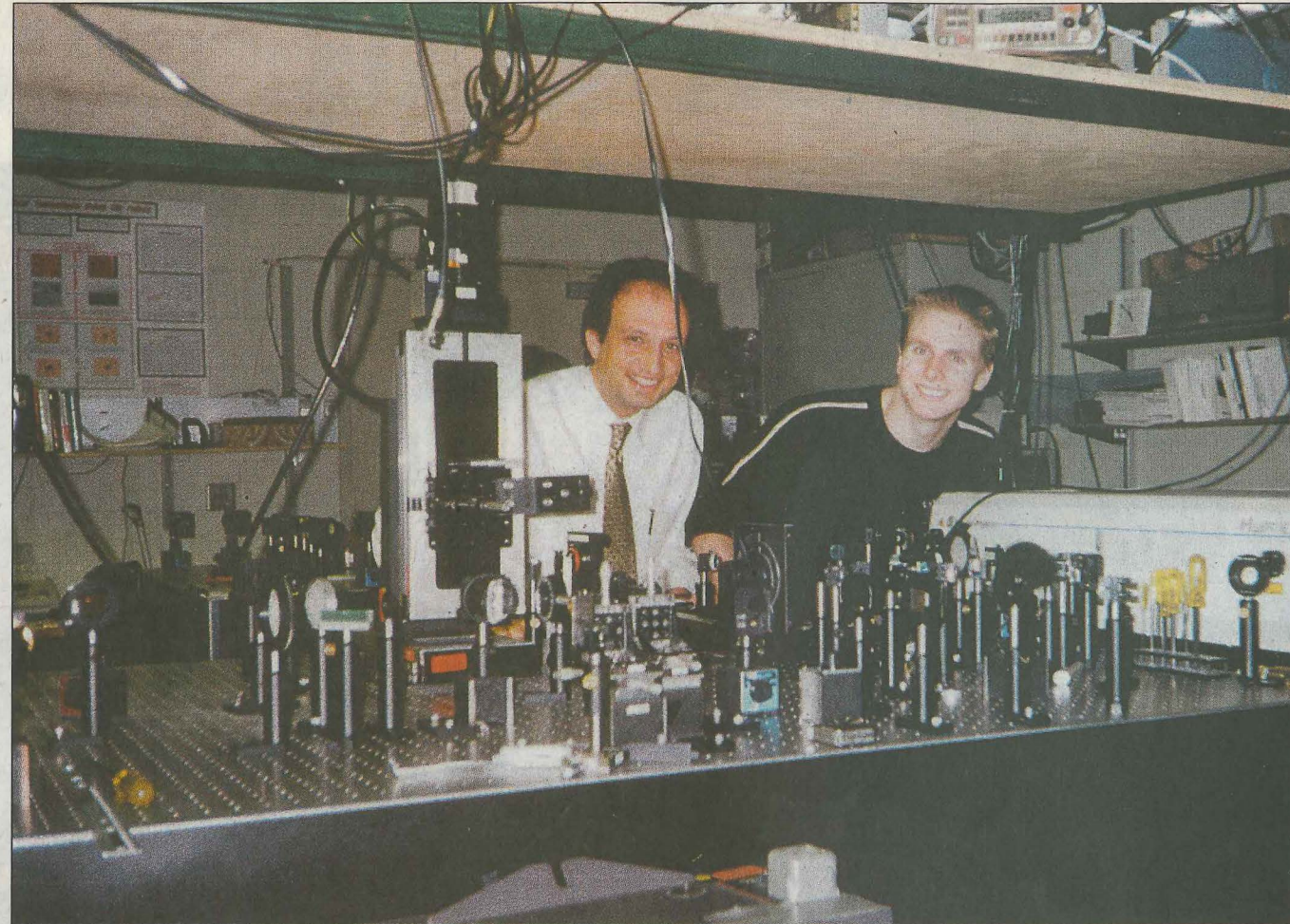
The breakthrough came in 1995 when researchers at Bell Laboratories in the US generated terahertz radiation using ultra-fast lasers. They coined the expression T-rays to highlight that they have similar properties to X-rays. They are similar, but in most cases superior.

T-rays work because most molecules vibrate in the terahertz frequency, allowing them to identify a given molecule.

Program devices to ask the right questions and you can get the right answers, or at least a hint to look more closely.

You could search for a specific item, for example, or create a device that would look for any form of powder in envelopes or parcels.

Dr Abbott's team has identified anthrax in laboratory tests. Japanese and US researchers have found drugs and explosives respectively. "Labs have proved the concept, now we need to engineer smaller,



Professor Derek Abbott, left, and Dr Sam Mickan working in a typical laboratory T-ray set-up.

cheaper, more robust equipment that can produce fast results," Dr Abbott said.

The other advantage of T-rays is that they are low-energy, thus safer than X-rays and more versatile because they are able to see contrast in human tissues.

X-rays go straight through a body until they hit bone, making them ideal for seeing skeletons but of little value at the more shallow levels of the body where many cancers lie. T-rays can't see skeletons, but may prove an alternative to some forms of X-rays, such as those used by dentists.

The University of Adelaide facility initially will focus on two areas: understanding why T-rays can detect cancer ("we're racing the rest of the world on this one," said Professor Abbott) and how to differentiate between single and double strands

of DNA. "We know we can detect cancer but we don't know exactly how we are doing it. We don't know which molecules we are picking up," Dr Abbott said. "If we understand that we can fine-tune our techniques."

The DNA work is equally exciting. Scientists are developing the bio-chip, which allows doctors to check in a single test whether a patient has one or more of 10,000 genetic diseases or even a predisposition to them.

The process works because DNA normally exists in double strands but can be stripped back to a single strand.

If a single strand of a person's DNA is washed across a slide holding single strands of the diseases, it will bind (creating a new double strand of DNA) with the

strands of any relevant diseases. Current methods of detecting any pairings are slow and unreliable. T-rays, Dr Abbott believes, can do it in a more precise and less invasive way.

His team also is working on imaging techniques to reveal whether skin lumps are benign or malignant.

The potential of T-rays is enormous, according to delegates at last week's conference. They are better than infra-red systems at penetrating dust, smoke or bad weather, for example, and can even be used to analyse things smaller than their own wavelength, meaning researchers may soon be able to study human cells at below the cellular level.

College staff get protest green light

Joan Atkinson

Update

The Industrial Relations Court has ruled that 24 disgruntled Christian Brothers College teachers can take their challenge over extracurricular activities to the Industrial Commission.

Independent Education Union secretary Glen Seidel says the ruling is a victory because it allows teachers to challenge extracurricular activities they believe to be excessive or unreasonable.

But the battle between CBC principal Brother Pat Cronin and up to 19 teachers facing the sack is not over yet. The commission is expected to meet early this week to hear arguments over whether hundreds of hours of activities such as sport and debating are voluntary or compulsory for teachers. A decision may not be handed down until January.

"This court decision is a first step and means any other Catholic school in SA can now raise the same issue in the Industrial Commission," Seidel said.

"The biggest victory is that while there can be a requirement for teachers to do extracurricular activities, it can also be challenged if the staff think it's excessive or otherwise unreasonable."

The court rejected the claim by Brother Cronin that the current enterprise agreement's "no extra claims" clause prohibited negotiations on extracurricular activities until July 2006.

The dispute, which began in September, will have repercussions for Catholic and independent schools across Australia and is being hard-fought by the Independent Education Union SA and Catholic Education SA.

"The teachers' position has been validated and the work-value argument from the school was not accepted," Seidel said.

"As far as sacking people goes, while the members are acting within dispute resolution process, they should be fine unless they went against court directions."

Brother Cronin was in Perth last week and did not wish to comment and Catholic Education SA director Allan Dooley was unavailable.