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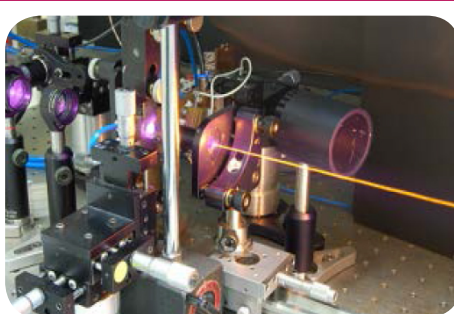
Terahertz lasers: new applications in medicine

Imagine identifying a malignant tumour without the need for invasive biopsies, or immediately detecting and identifying plastic explosives strapped to a passenger's waist. This is the promise of terahertz (THz) radiation, a single technology that can detect and identify concealed materials.

Many people are already familiar with the technology in airports when they are scanned for objects underneath their clothes.

Holding back a broader range of applications is the lack of a compact, robust and cost-effective way of generating THz radiation.

With the support of the OptoFab Node of ANFF, Dr Andrew Lee and his group at Macquarie University are developing a THz laser system that will enable many new applications.



Early prototype of the pulsed yellow Raman laser. Credit: Macquarie University.

"We are developing frequency-tuneable lasers which will operate in the 1-4 THz frequency range, using an all solid-state laser approach," said Dr Lee.

"One of the most promising applications for THz radiation we are working on is identification of cancers and their margins, which has been demonstrated in melanoma."

Dr Lee is now working closely with an industry partner M-Squared lasers on the development of THz lasers for a number of potentially revolutionary applications in medicine.

Dr Lee and the team at the MQ Photonics research centre have commercialised a similar laser system in the past. They developed a pulsed yellow Raman laser used for eye treatment that carries a lower risk of damage to sight than traditional green lasers.

Position Opening

SA Node
Micromachining Technologist
(More)

USA - Australia Joint Commission Meeting on Enabling Technologies

"Australia is one of the leading science and technology research nations in the world and we enjoy a strong partnership," said Dr. Thomas F. Christian, Director for the US Air Force Office of Scientific Research (AFOSR) speaking at the at the Enabling Technologies Technical Exchange, part of the US-Australia Joint Commission Meeting (JCM) on Science and Technology.

The JCM event was jointly organised between ANFF and the Air Force Office of Scientific Research (AFOSR) to explore and build basic research collaborations between the United States and Australia.

The meeting brought together over 70 researchers from both nations at the Basic Research Innovation and Collaboration Centre in Arlington, VA. Some delegates were looking to extend their existing

collaborations set up since the inaugural JCM Australia in 2011 while others were looking to establish new partnerships in the areas of Materials Science, Physics and Human Performance/Biomedical Sciences.

"This is the third meeting of its type, bringing together more researchers than before from the U.S. and Australia to have the opportunity to present on their ground breaking research and to pursue potential research collaboration in areas of fundamental science," said The Honourable Kim Beazley, Ambassador to United States of America.

"This is a testament to the two countries' scientific capabilities that such a large group could come together for the meeting." (More)



Craig Priest from ANFF-SA, (far left), experiences microgravity in NASA's "Weightless Wonder" research aircraft. Priest was on board to test new micro-structured electrodes for use in fuel-cell technologies. The project was initiated as a result of the first JCM events co-organised by ANFF and the AFOSR.

AusMedtech 2015

Stretchable skin-like sensors that can be integrated into clothing;

New lasers for 3D imaging of a melanoma tumour (see p1);

A handheld magnetometer probe to determine whether cancer has disseminated throughout the lymphatic system.

These are a few of the new technologies that were developed with the support of ANFF laboratories, and presented to the Australian Medical Device Industry at the AusMedtech conference in May.

The ANFF session, *Collaboration for Innovation*, was met with enthusiasm by the medical device business community amongst discussion on how the industry can help commercialise these technologies.

Dr Warren McKenzie, Business Development Manager from ANFF said, "As we are seeing more and more technologies like these evolve out of our labs, collaboration with the business community is essential if these devices are going make it into our homes, clinics or hospitals."



Associate Professor Benjamin Thierry speaking at AusMedtech on Microfluidic cancer biodiagnostic and prognostic technologies.

IEEE Nanotechnology Pioneer

During July, the IEEE Nanotechnology Council's 2015 Pioneer Award in Nanotechnology was received by ACT Node Director, Professor Chennupati Jagadish. The award was for his:

"pioneering and sustained contributions to compound semiconductor nanowire and quantum dot optoelectronics."

ANFF would like to congratulate Professor Jagadish for all of the work that has led to this significant accolade. ([More](#))

Design House gets IntelliSuite

ANFF facilities not only fabricate MEMS and electronic devices, it has an expanding capability to design them.

IntelliSuite is the fourth software suite available through the ANFF Design House for MEMS professionals involved in developing complex sensors and detectors.

IntelliSuite adds to the existing software packages available through the Design House, including: Synopsys, Coventor and TannerEDA. ([More](#))

ANFF at the Australian Museum Eureka Awards

ANFF CEO, Rosie Hicks and a number of researchers from the ANFF network were recognised for their work at Australian Museum Eureka Awards, an event dubbed as the Oscars of Australian Science.

Rosie Hicks was a finalist for the Leadership in Science category in recognition of her

work building ANFF into a national collaborative research network. Michelle Simmons won the category for leading CQC2T, a research centre supported by the NSW Node.

Prof Paul Burn and Prof Tanya Monro were also recognised for their research, which was supported by ANFF. ([More](#))

Around the Nodes

Queensland: ANFF client Vaxxas has raised \$25 million in series B venture capital to accelerate the commercialisation of its Nanopatch needle-free vaccine delivery platform. The Nanopatch was developed by the University of Queensland's Prof Mark Kendall at ANFF-Q. Vaxxas continues to be supported by several Nodes of ANFF. ([More](#))

NSW: Dr Alessandro Rossi from UNSW Australia has been awarded the 2015 NMI prize for excellence in measurement research for developing a single electron pump device to serve as a metrological standard for electric current. ([More](#))

Victoria: The Hon Christopher Pyne MP launched the Time of Flight Secondary Ion Mass Spectrometry (ToF-SIMS) laboratory at La Trobe University during July. ([More](#))

Upcoming Events

24 SEPTEMBER - SYDNEY
Fundamentals of Plasma Processing ([More](#))

25-26 NOVEMBER - BRISBANE
ANFF Annual Research Showcase ([More](#))

6-9 DECEMBER - SYDNEY
SPIE Micro+Nano Materials Devices, and Applications ([More](#))

7-11 FEBRUARY - CANBERRA
ICONN 2016 ([More](#))



Supporting ARC Linkage Projects

ARC Industry Linkage projects provide funding opportunities for industry - university collaborations.

ANFF can facilitate the establishment of such collaborative projects by advising companies on Australian nanotechnology research that may be of interest, and directing them to the most appropriate researcher in the ANFF Network.

Applications for 2016 ARC Linkage Projects will be opening soon.

([Contact ANFF](#))



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Providing micro and nano fabrication facilities for Australia's researchers