



Centre for
**Nanoscale
BioPhotonics**
ARC CENTRE OF EXCELLENCE

CENTRE FOR NANOSCALE BIOPHOTONICS

AUSTRALIAN RESEARCH
COUNCIL CENTRE
OF EXCELLENCE

Creating windows into the body

Developing new **light based** technologies

Advancing the health outcomes of tomorrow

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The Centre for Nanoscale BioPhotonics (CNBP) is an Australian Research Council Centre of Excellence, focused on driving the development of new light based sensing tools that can measure at a nanoscale level – providing powerful new ways of understanding cellular processes within the living body.

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A \$40m initiative, this prestigious research centre is a collaborative program, with key nodes at the University of Adelaide, Macquarie University and RMIT University, with other industry and academic partners located around the world.

Funded for seven years from 2014, the Centre of approximately 100 staff and students brings together expertise in physics, material science, chemistry, biochemistry, neuroscience, embryology, cardiology and medicine.

Building tools that will enable the measurement of molecules and processes in and around cells, in real time, in what is a highly complex and dynamic environment – the living body, the Centre's research is at the forefront of interdisciplinary science.

In developing state-of-the-art sensing tools that provide 'windows into the body', knowledge about healthy cells will be improved, innovative questions and answers regarding health and disease can be advanced, novel diagnostic tools will be ultimately created and new and exciting areas of research will be developed.

OUR RESEARCH

CNBP research is focused on the development of tools that utilize photons (units of light) to interact with cells and molecules in the living body. The way in which the light is delivered, emitted, absorbed, reflected, or modified, to and from, this cellular and subcellular environment allows for specific processes to be measured.

Four interconnected research themes with three areas of immediate biological application form the framework of this CNBP activity:

Illuminate – creating new light sources such as nanoscale 'lamps', advanced optical fibres and novel nanoprobes that deliver and collect light, targeting cells and molecules in the body

Recognise – creating smart surfaces for nano sized probes, optical fibres and particles that allow the desired biomolecular and cellular targets to be sensed and detected

Measure – creating integrated nanophotonic architectures to ensure that effective biological measurement can take place

Discover – determining which molecular targets to focus on and enabling probes to best detect the chosen target

The CNBP is also focused on three biologically driven challenges which sit at the forefront of current research:

The Spark of Life – measuring embryonic metabolism, determining how life begins

Origins of Sensation – understanding the role of brain immune signals in the creation of chronic pain

Inside Blood Vessels – measuring nitric oxide in functional blood vessels to determine impact on heart disease

These biological challenges have been selected because they pose measurement questions that cannot be addressed with existing technologies. They provide a context in which the CNBP can explore and extend the limits of the science, as well as a pathway for evolving research outcomes within each theme, in directions that will enable impact and translation to clinical outcomes.

FUTURE IMPACT

The CNBP is developing new and innovative sensing tools - enabling scientists to measure substances in the body at the cellular level, in ways that can truly be considered revolutionary.

Together with current and future commercial partners, CNBP will look to deliver these tools, which will analyze, measure and ultimately provide point of care diagnostic capability.

In the research areas of embryology, neuroscience and cardiology, these CNBP tools will advance scientific knowledge immensely and have enormous clinical translation potential.

In the hands of clinicians, future applications will range from the selection of the healthiest embryo to implant during IVF, to real time blood tests to determine the extent and type of pain an individual feels, to catheters with inbuilt biosensors for use in cardiac surgery which will provide doctors with cellular level health reports of a patient's vascular status.

In creating these 'windows into the body', CNBP is advancing Australian research and innovation globally, will improve our ability to diagnose and treat disease, as well as increase our understanding of what makes up life itself. It will be a research journey that will be truly transformational.

FOR FURTHER INFORMATION

Website: www.cnbp.org.au



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