

Theory and Modelling in the CNBP



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Abstract

Underpinning the experimental and translational activities of the Centre is a theory and modelling program. The theory and modelling program explores all aspects of the interaction of light with matter at the nanoscale. Our work spans nanophotonics, nonlinear plasmonics and magneto-plasmonics, photo-acoustics, quantum optics, information theory, and *ab initio* techniques; and I will cover some highlights and research directions in this talk.

Research into plasmonic nanoantennae is being driven by Ivan Maksymov. When integrated with optical fibres, they give the opportunity for a novel photo-acoustic sensor. Daniel Drumm heads up molecular modelling, and performs *ab initio* studies of molecular systems to aid in the prediction of their optical response. Super-resolution imaging is one of the most important new frontiers for bioimaging, but biological systems suffer from photo-induced damage. Our team is working to understand optimal imaging protocols by applying information-theoretic techniques to realistic biological settings. Related to this, we are also exploring quantum correlation imaging to understand various tradeoffs in quantum-limited sensor integration.

Biography

Prof Andrew (Andy) Greentree is co-theme leader for the Measure Program in the CNBP, professor of quantum physics, and Vice Chancellor's Senior Research Fellow at RMIT University. His interests range from quantum optics, quantum information, diamond and the application of these fields to practical problems, especially those of biological relevance. Andy has published over 130 refereed journal publications and five patents. He is a member of the Australian Institute of Physics and Fellow of the Institute of Physics (UK), and is on the editorial board of *Scientific Reports* and *Frontiers in Quantum Computing*. In addition to his scientific interests, he is passionate about outreach and has given numerous lectures to the general public and school students.