

# A new imaging modality in nanomaterials and life sciences

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11:00am, 15/08/2024

Melbourne Centre for Nanofabrication

151 Wellington Road, Clayton, 3168

Zoom link: [click here](#)

Meeting ID: 858 5837 9980 and passcode: 873578



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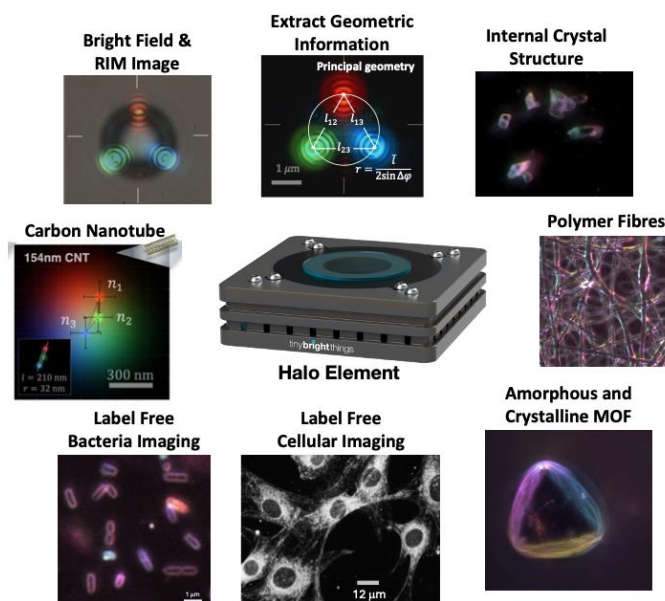
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Engineered or complex particles found in nano-electronics, photonic materials, and nano-sensors, etc. have experienced a rapid growth in research interest and application over the past two decades. Similarly, the interface between nanomaterials and biology has also grown rapidly. These outcomes are in part due to improving techniques to fabricate materials and biomaterials, from both top-down and bottom-up approaches, even at scale. The characterisation needs for such materials leans heavily on existing microscopy or metrology tools that often balance resolution against the time, expense and complexity of measurement workflows. In addition, as objects get small, the methods become more specialised.

Motivated by the need to visualize complex particles and objects in engineered materials and dynamic processes in life sciences, this talk will focus on the operating principles of Resonance Imaging Microscopy (RIM). RIM is a new imaging modality to provide simple and easy characterisation of objects with nearly any shape and composition, ranging in size from hundreds of microns to tens of nanometres. RIM is a multi-source evanescent field scattering technique that enables high-speed, non-destructive, label and stain-free imaging in real time (up to hundreds of FPS) using visible light.

For particle metrology applications, we will present both direct and statistical results validating the fidelity of geometric measurements for a selection of spherical calibration particles with radii spanning four orders of magnitude. We will showcase more complex materials including nanorods and materials with complex internal structures. In life sciences we will show results of multi-modal characterisation studies that demonstrate how RIM is able to elucidate the internal structure of, and relationship between, untagged cells and bacteria. We will showcase how RIM can be used to visualise a range of other biological materials, both static and dynamic in nature. All achieved without the need of fluorescent proteins, dyes or conjugated antibodies or risks from photobleaching when examined using traditional laser-based microscopy systems.



## BIOGRAPHY

Professor Raymond Dagastine, in the Department of Chemical Engineering at the University of Melbourne, leads an interfacial phenomena and soft matter research group at studying how the different aspects of interfacial phenomena, surface forces and nano-mechanics of soft materials can be used to solve problems in applications including particle technology and sustainable product formulations. His work often results in inventing new nanoscale measurement technologies to support these activities. He has a passion for translating novel methods into practice through industry collaborations, often through long lasting partnerships with industry. Prof. Dagastine is also the CEO and co-founder of Tiny Bright Things, a start-up company that uses a unique imaging technology to create products that can characterise unknown samples, understand morphology and determine complex structure on micron to sub-micron scales in wet or dry sample environments with minimal sample preparation.

