



MANCHESTER
1824

The University of Manchester

ANALYTICAL CHEMISTRY AND MEASUREMENT SCIENCE

**LEARN FROM
WORLD-LEADING EXPERTS
IN ANALYTICAL SCIENCE**

DISCOVER THE RESEARCH SHAPING MODERN ANALYTICAL SCIENCE AND THE EXPERTS WHO BRING IT INTO YOUR LEARNING.

INTRODUCTION

Learn from researchers shaping the future of analytical science — from disease diagnostics to environmental monitoring.

Analytical chemistry underpins many of today's most advanced scientific and industrial applications, spanning health, materials science, nuclear science and beyond. This showcase highlights how research and teaching on [MSc Analytical Chemistry and Measurement Science](#) translate advanced measurement, spectroscopy, imaging and data analytics into real-world impact

- + Advanced analytical technologies are enabling more sensitive, selective and spatially resolved chemical measurements.
- + Non-invasive diagnostics are opening new routes to earlier disease detection and personalised healthcare.
- + AI-enabled spectroscopy and imaging are transforming how tissues, cells and complex mixtures are interpreted.
- + Research-led teaching connects students with internationally recognised expertise across analytical chemistry and measurement science.

RESEARCH IN PRACTICE

BIOLOGICAL MASS SPECTROMETRY, MULTIOMICS AND INSTRUMENT DEVELOPMENT

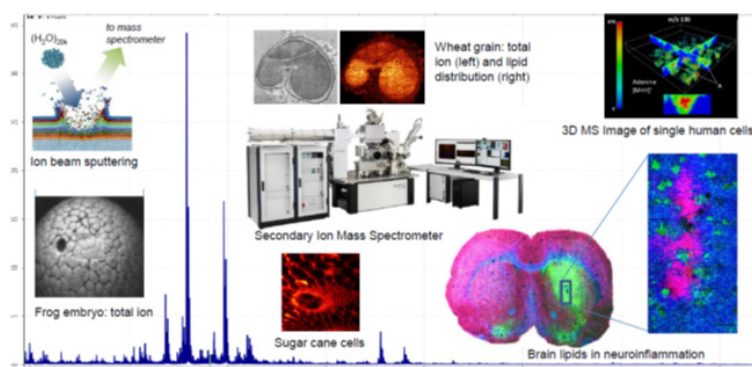
Professor Perdita Barran develops and applies mass spectrometry to understand biological systems, protein structure and disease-related molecular signatures. Her work spans instrument and technique development, dynamic and disordered systems, and non-invasive metabolomics for Parkinson's disease diagnostics. Her teaching brings this research directly into the student experience, encouraging learners to understand analytical behaviour at the molecular level — to “think like an ion”.

SEBUM METABOLOMICS AND NON-INVASIVE DIAGNOSTICS

Dr Drupad Trivedi demonstrates how sebum collected from a simple skin swab can reveal molecular fingerprints of disease. Using liquid chromatography–mass spectrometry, chemometrics and machine learning, his group has identified biomarkers linked to Parkinson's disease, COVID-19, REM sleep disorders and lung diseases, offering a route towards earlier diagnosis and personalised healthcare.

SURFACE ANALYSIS AND MASS SPECTROMETRY IMAGING

Professor Nick Lockyer develops mass spectrometry technologies that use ion beams and lasers for two- and three-dimensional chemical imaging. His research has driven advances in Secondary Ion Mass Spectrometry, including molecular imaging of single cells and biological tissues. These approaches support innovation in disease diagnostics, energy storage, food security and advanced materials research.



INFRARED SPECTRAL PATHOLOGY AND PRECISION MEDICINE

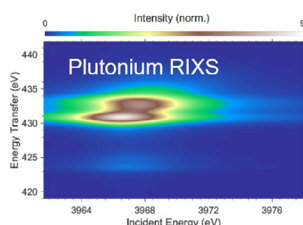
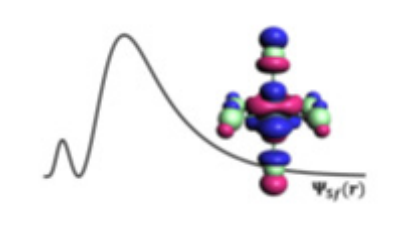
Professor Peter Gardner advances infrared spectroscopic imaging and AI-driven pathology for cancer diagnosis and prognosis. His group has pioneered Quantum Cascade Laser imaging and Optical Photothermal Infrared microscopy, enabling rapid, label-free molecular characterisation of tissues and single cells. This research supports the development of next-generation digital pathology and precision medicine.

NMR METHODS FOR COMPLEX MIXTURES

Professor Mathias Nilsson develops practical NMR methods that turn crowded, overlapping spectra into quantitative chemical information. His research focuses on pulse sequences, acquisition strategies and data-processing tools that can be used by non-specialists on existing instruments. Applications include reaction monitoring, impurity analysis, formulated products, foods and metabolites, supported by freely available software such as GNAT and the DOSY Toolbox.

ADVANCED X-RAY SPECTROSCOPY AND ACTINIDE BONDING

Dr Michael L. Baker investigates inorganic structure–function relationships using synchrotron X-ray spectroscopy and quantum-chemical theory. His research advances understanding of actinide electronic structure and chemical bonding, including the use of resonant inelastic X-ray scattering to probe bond covalency. This work supports applications in nuclear forensics, waste processing and the selective extraction of actinides.



ABOUT THE CONTRIBUTORS



PROFESSOR PERDITA BARRAN

Perdita holds a Chair of Mass Spectrometry and is Director of the Michael Barber Centre for Collaborative Mass Spectrometry. Her research and mentorship have supported a strong community of mass spectrometry researchers and practitioners. materials, magnetism and f-block chemistry.



DR DRUPAD TRIVEDI

Drupad is a lecturer in Analytical Measurement Sciences at The University of Manchester. His research combines analytical chemistry, metabolomics, data science and biomedical applications to develop non-invasive diagnostic technologies. materials, magnetism and f-block chemistry.



PROFESSOR NICK LOCKYER

Nick is Professor of Physical Chemistry at The University of Manchester, a Fellow of the Royal Society of Chemistry, and an internationally recognised expert in Secondary Ion Mass Spectrometry.

ABOUT THE CONTRIBUTORS



PROFESSOR PETER GARDNER

Peter is Professor of Analytical and Biomedical Spectroscopy. He leads internationally recognised research in infrared spectroscopy, spectral pathology and AI-enabled diagnostics, and serves as President of the International Society for Clinical Spectroscopy.



PROFESSOR MATHIAS NILSSON

Mathias is Professor of Physical Chemistry at The University of Manchester. He develops NMR methods and open software tools for analysing complex mixtures and teaches magnetic resonance.



DR MICHAEL L. BAKER

Michael is a senior Lecturer in Physical Chemistry at The University of Manchester and The University of Manchester at Harwell. His work brings together X-ray spectroscopy, electronic structure interpretation and collaborations across bio-inorganic chemistry, materials, magnetism and f-block chemistry.



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