ACROSS 2013 Annual Report

ACROSS
Australian Centre for Research on Separation Science

UNIVERSITY of TASMANIA

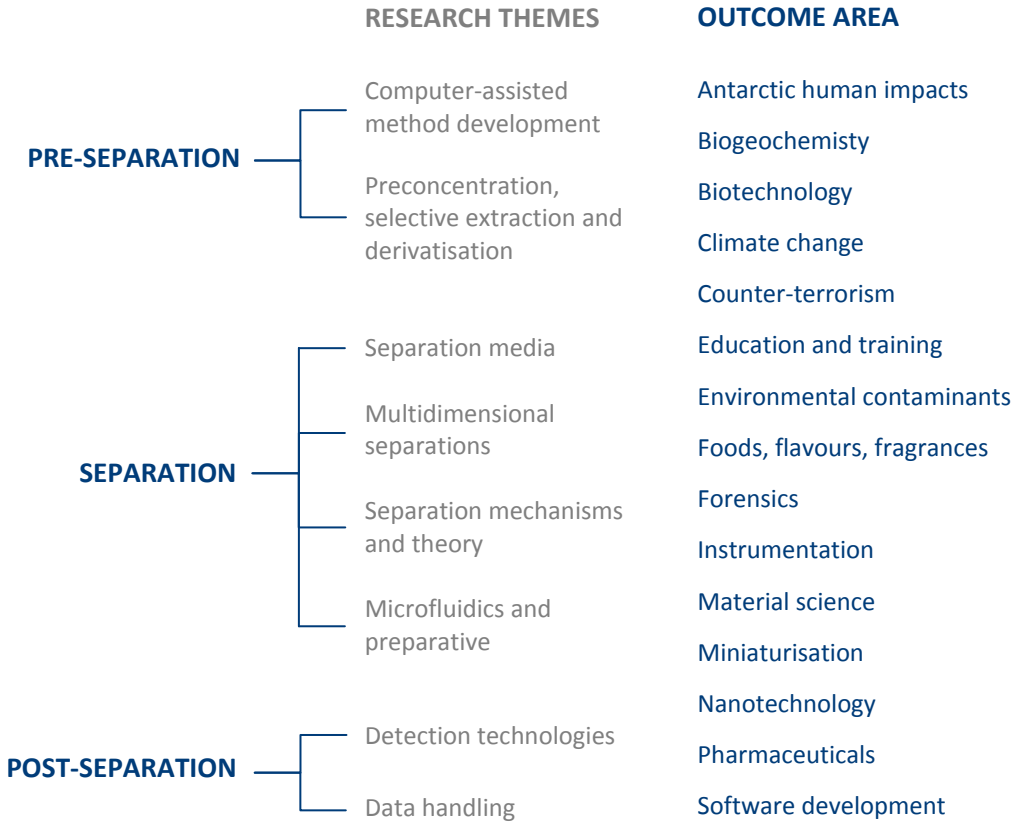
MONASH University

University of Western Sydney
Bringing knowledge to life

INSIDE THE 2013 REPORT

ACROSS RESEARCH STRUCTURE

Research in ACROSS has been established using focused research themes to provide both fundamental and applied research outcomes in separation science. ACROSS draws together multi-institutional, internationally prominent and genuinely collaborative research teams, having complementary skills and synergistic resource-base expertise, and committed to focused programs of national significance. The research structure listed below groups research themes using the three major phases of a separation and also shows the major outcome areas in which these themes are being applied.



INTRODUCTION TO ACROSS

Separation science involves the study of fundamental materials and processes for the separation, isolation and quantitation of individual chemical species, or classes of chemical and biochemical compounds, from within multicomponent mixtures and/or complex matrices. As such it finds application in almost all of the chemical and biological (life) sciences, and in many areas of chemical engineering and indeed industrial manufacturing. Fundamental advances in separation science have provided the impetus for ground breaking new developments in the life sciences (e.g. genomics, proteomics and medicine), pharmaceutical sciences (e.g. drug discovery and characterisation), environmental sciences (e.g. ultra-trace residue analysis), forensic science (e.g. illicit drugs, DNA fingerprinting, and explosives residues), together with a myriad of other scientific disciplines of pronounced societal significance. The continued discovery of new modes of separation science involving analysis, characterisation and purification will be essential to help solve the future challenges in each of the above fields.

Separation science spans the spectrum between nanoscale technology and exploration, and macroscale materials and their application, with common elements of theory and implementation. Further and greater advances in separation science will therefore be an important driver behind a very broad spectrum of Australian science for the foreseeable future, ranging from new developments in nanotechnology, to novel biomaterials, to improved manufacturing processes. Its importance as an enabling science cannot be overstated.

The Australian Centre for Research on Separation Science (ACROSS) was established in 2001 as a strategic agreement between key researchers at the University of Tasmania and RMIT University (with University of Western Sydney joining ACROSS in 2008, and Monash in 2011) to form a consortium of prominent Australian researchers in separation science. This consortium was supported financially by the participating institutions to pursue the following aims:

(i) Maintain an outstanding level of international renown in research on separation science.

(ii) Coalesce and enhance Australian research on separation science into an organised structure, operating with a coordinated research plan, which addresses and exploits the most exciting and innovative themes in modern separation science.

(iii) Provide enabling research and research training of the highest quality, which supports and advances all major areas of Australian science.

Australian research in separation science has long enjoyed an excellent international reputation, earned by the individual activities of talented researchers. ACROSS offers an organisational and resource base, through which these individual researchers can work in a coordinated and synergistic manner, under a series of structured and interlocking research programs. ACROSS operates under an agreed *Research Charter* and organisational structure, established to avoid duplication of effort, allow resources and expertise to be shared, and provide value-added opportunities broadly to industry, academia and the nation. ACROSS also prides itself on providing one of the world's leading centres for education and training in the field of separation science, and indeed the wider discipline of analytical chemistry.

ACROSS at HPLC 2013 Hobart

DIRECTOR'S REPORT

I am pleased to present this report on the activities of ACROSS in 2013.

In 2013, the management team of ACROSS included Professor Paul Haddad, as Director of ACROSS (and as co-Director with Professor Brett Paull from October 1st, 2013), and as Chair of the ACROSS (UTas) Management Committee. Professor Brett Paull took over the role of Deputy Director of ACROSS (UTas) from Associate Professor Gregory Dicinoski in March 2013, to join with Professor Philip Marriott and Professor Andrew Shalliker as the three institutional Deputy Directors. This section of the report provides a general overview of ACROSS in 2013, including achievements, research and statistics. More detailed information can be found within the report, and graphically within the Appendix.

Staffing changes

Various staff changes took place in 2013. Dr Sara Sandron commenced an 18-month postdoctoral fellowship funded via an ARC Discovery Grant, working with Professors Brett Paull, Pavel Nesterenko, Paul Haddad and A/Professor Robert Shellie. Dr Petr Smejkal undertook a 6-month postdoctoral fellowship finalising work on the homemade explosive analyser project, working with Associate Professor Michael Breadmore, and Dr Mohammad Talebi commenced a 3-year position working with Professor Paul Haddad and Associate Professor Robert Shellie on an ARC Linkage Grant on rapid method development in pharmaceutical analysis. During 2013 we also saw the arrival of Professor Zhenggui Wei, from the Nanjing Agricultural University on sabbatical (2 yr), working with Professors Paull and Nesterenko, and Professor Ming Jiang from Tongji Medical Institute (1 yr), and Dr Xiang Ping Liu from the Chinese Centre for Disease Control and Prevention (10-months), both working with Professor Philip Marriott. Finally, 2013 saw the appointment of Associate Professor Cari Sanger van de Griend (Uppsala University) as an Adjunct Senior Lecturer (UTas) and Associate Member of ACROSS. For the full list of 2013 visiting staff and students (originating from no fewer than 17 countries), see page 12 of this report.

Regrettably, 2013 also saw several departures of several key personnel, including Associate Professor Gregory Dicinoski (who remains as an Associate Member), Dr Dimitar Mitev, Dr Joe Hutchinson, and Dr Cameron Johns. We wish them all the best in their future endeavours.

Research outcomes

In 2013 ACROSS continued to expand its program of fundamental and applied research, with a wide range of individual and collective research projects being undertaken. These research topics and their associated outputs are listed in full within this report. As in previous years, the research focus within ACROSS had a strong element of materials development, with an on-going program in the development of monolithic polymer phases, and new projects in inorganic materials and composites for use as future stationary phases. The application of ACROSS technology and methodology in the area of counter-terrorism continued to be an important focus in 2013, as was the development and application of electrophoretic technology and microfluidic platforms, multi-dimensional approaches to complex systems, and retention modelling. In 2013 ACROSS employed its highest number of research staff, and produced its highest ever number of refereed journal publications and conference presentations.

Funding

Funding for ACROSS in 2013 totalled $3,326,327, with $2,396,070 (72%) coming in the form of 17 nationally competitive grants from the Australian Research Council (ARC) [5 Future Fellowships, 8 Discovery Project Grants, 5 Linkage Project Grants] and the National Health and Medical Research Council (NHMRC) [1 Project Grant]. Additional financial support was provided through a large range of organisations and industries, with major contributors being the Universities of Tasmania and Western Sydney, the Department of Industry, Innovation, Science and Research, the Department of Prime Minister and Cabinet, the Defence, Science and Technology Organisation, and the US Department of Homeland Security. Direct industrial funding was received from a diverse range of industry collaborators, including Pfizer, SGE Analytical Science, Thermo Fisher Scientific, LC

Resources, Agilent Technologies, Melbourne Water, Essential Oils of Tasmania, and the Grape and Wine Research and Development Corporation.

November 2013 also saw the announcement of new ARC funding for 2014, with researchers affiliated with ACROSS once again featured heavily in the success list, securing funded worth >$7M in total. Those successful included Professor Michael Breadmore and Associate Professor Andrew Bowie (new ARC Future Fellows), Professors Brett Paull and Andrew Shalliker (recipients of new ARC Discovery grants), and Emily Hilder (ARC LIEF equipment funding). Significantly, two major ARC funded research initiatives were funded to begin within 2014. These were a new ARC Training Centre in Portable Analytical separation Technologies, led by Professor Emily Hilder, and the ARC Centre of Excellence for Electromaterials Science, within which Professor Brett Paull is a CI and Theme leader. Together these two initiatives alone will see ~ $4.5M funding flow to ACROSS, over the following 4-7 years.

Achievements in 2013

ACROSS staff continue to feature prominently on the international separation science scene. Members of staff held five editorships of international journals in 2013, and also appeared on the editorial boards of no fewer than 18 other journals in the area of analytical chemistry or separation science. In 2013, researchers from within ACROSS made numerous plenary, keynote and invited presentations at most of the major international conferences and symposia on separation science (for full list see page 30 onwards). In addition, Professor Paul Haddad and Professor Emily Hilder co-chaired the 40th International Symposium on High Performance Liquid Chromatography and Related Techniques (HPLC 2013-Hobart), held in Hobart over the period November 18th-21st. This is the first time in its 40-year history that the annual HPLC meeting, which is the world's premier separation science conference, has been held in the Southern hemisphere. The event was a great success, and Hobart was home for the week for a significant number of the world's leading separation scientists, many of whom took the opportunity to visit ACROSS labs and explore collaboration with ACROSS researchers.

A number of other notable achievements occurred in 2013. Professor Paul Haddad was awarded the American Chemical Society Chromatography Award for 2013, being the first resident Australian to receive this award, and Dr Jim Luong (externally based ACROSS PhD student) was awarded the Chemical Society of Canada's 2013 Maxxam Award, for his distinguished contribution to the field of analytical chemistry. Associate Professor Robert Shellie was the winner of a Fulbright Senior Fellowship sponsored by the Tasmanian State Government and UTas, to undertake a 3-month visit to Purdue University in West Lafayette, Indiana. Finally, late 2013 saw the announcement of promotions for Michael Breadmore (promotion to Professor) and Andrew Bowie (promotion to Associate Professor).

Pfizer Analytical Research Centre (PARC)

Pfizer, the world's largest research-based pharmaceutical company, established in 2007 a new collaborative research centre entitled the "Pfizer Analytical Research Centre" (PARC), at the University of Tasmania, Hobart, Tasmania. Research in PARC targets innovation and enhanced productivity in the pharmaceutical analytical sciences. The aim has been to produce advancements in the analysis of pharmaceuticals through high-throughput, faster, and smarter analytical systems, thereby allowing these products to be brought to the marketplace earlier and in a more cost effective and 'green' manner.

The PARC multidisciplinary collaboration creates a Centre of Excellence for the development of novel pharmaceutical analytical methods by combining the expertise of ACROSS with that of world-leading pharmaceutical scientists from Pfizer. This multi-million dollar centre brings economic and financial gain to both the University of Tasmania and to the State of Tasmania. Pfizer, through a $3.5m investment, has funded the appointment of research staff and students, purchase of equipment and the provision of running costs for the various projects. The University of Tasmania has contributed $850k for the construction of the state-of-the-art, world-standard, purpose-built laboratory comprising 450 m^2 of instrumental bench and office space, in which PARC is housed. The Tasmanian State Government, through the Department of Economic Development and Tourism, has contributed $267k for scholarships to facilitate the recruitment of international PhD students. This contribution has enabled ACROSS to recruit high calibre students from many different countries throughout the world.

In 2013, the Centre comprised of 5 staff and students, including scientists and technical employees. These personnel include a Director, Deputy Director, 2 post-doctoral fellows, and 1 research higher degree (PhD) student, with additional contributions from current ACROSS staff. Each Pfizer project involves close collaboration between ACROSS researchers and Pfizer scientists located in the UK or at various sites within the USA.
The 2013 projects within PARC were:

- Non-discriminatory, universal and sensitive detection technologies for fluid based separation techniques in the pharmaceutical industry
- Development of analytical approaches for vaccines: High resolution separations
- Mixed-mode chromatography for complex pharmaceutical formulations

On a personal note, 2013 marks my final year as Director of ACROSS, with Professor Brett Paull having taken on this role from 1st October 2013. Since its inception in 2001, ACROSS has grown from a small collection of like-minded scientists to a major, multi-node research centre which enjoys an outstanding international reputation. It has been a honour, privilege and great pleasure for me to act as the founding Director of ACROSS over this period of extraordinary growth and development, I would like to thank all staff and students, both past and present, for their outstanding contributions to ACROSS and I extend my heartfelt congratulations and deep pride to everyone for their many achievements over the past 13 years. ACROSS has benefitted from the services of a large group of motivated and highly talented staff and students and the Centre is extremely well-placed for further growth and continued success. I am highly confident that ACROSS will continue to prosper in the coming years and will further enhance its reputation as a powerhouse of separation science.

Professor Paul R. Haddad
FAA, FTSE, FRACI, FRSC, FFACS
Director

2013 ACROSS Performance at a Glance

Node	Research staff	PhD, MSc students	BSc Hons students	Grants ($)	Publications	Conference presentations
UTas	27	32	0	2,672,777	61	107
Monash	3	12	2	391,450	18	28
UWS	4	9	7	262,100	16	36
ACROSS total	**34**	**53**	**9**	**3,326,327**	**95**	**171**

KEY PERSONNEL






Prof Paul Haddad

DSc, PhD, BSc(Hons), DipMilStud, FAA, FTSE, FRACI, FRSC, FFACSARC Federation Fellow

Distinguished Professor of Chemistry, University of Tasmania

Director, ACROSS

Director, PARC

Paul Haddad obtained the degrees of BSc, PhD and DSc in analytical chemistry from the University of New South Wales. He is currently a Professor of Chemistry and ARC Federation Fellow at the University of Tasmania, and the out-going Director of ACROSS. His research interests lie predominantly in theoretical aspects and applications of separations of inorganic ions using the techniques of ion chromatography, capillary electrophoresis, and capillary electrochromatography. He is editor of Journal of Chromatography A, a contributing editor of both Trends in Analytical Chemistry and Encyclopedia of Separation Science, and is a member of the editorial boards of eight other separation science and analytical chemistry journals.

Prof Philip Marriott

PhD, BSc(Hons), FRACI, FFACS

Professor of Chemistry, Monash University and Distinguished Visiting Professor, Chung-Ang University, Korea

Deputy Director, ACROSS (Monash)

Philip Marriott has the degrees of BSc(Hons) and PhD from La Trobe University. He is Professor of Chemistry at Monash University and a Deputy Director of ACROSS. His research is primarily in the area of high resolution separation, in the fields of multi-dimensional and comprehensive two-dimensional gas chromatography, capillary electrophoresis, the use of selective detection including mass spectrometry in gas chromatography, micro-fluidics and cryogenic methods. Philip was recently the recipient of a Discovery Outstanding Researcher Award, from the Australian Research Council (ARC). He is a member of the editorial boards of the following international journals: Journal of Chromatography A, Journal of Separation Science, LCGC Europe, LCGC Asia Pacific, and Analytical Chemistry's News and Features Advisory Panel.

Prof Andrew Shalliker

DSc, PhD, BSc(Hons)

Professor, University of Western Sydney

Deputy Director, ACROSS (UWS)

Andrew Shalliker has the degrees of BSc(Hons), PhD and DSc from Deakin University. He is currently a Professor in analytical chemistry within the School of Science and Health at the University of Western Sydney, and the head of the UWS node of ACROSS. His research interests are in the field of high resolution separations in liquid chromatography, which entails aspects of column and stationary phase design, multidimensional high-performance liquid chromatography, and fluid dynamics.

A/Prof Greg Dicinoski

PhD, BAppSci(Hons), FRACI CChem

Associate Professor, University of Tasmania

Deputy Director, ACROSS (UTas) – Jan-Feb 2013

Deputy Director, PARC – Jan-Feb 2013

Head of School, Chemistry

Greg Dicinoski holds the degrees of BAppSci(Hons) and PhD from the University of Central Queensland. In 2013, Greg held the positions as Associate Professor and Head within the School of Chemistry at the University of Tasmania, and as Deputy Director of ACROSS. His research is in the general areas of analytical chemistry, separation science, environmental chemistry, and hydrometallurgy, along with synthetic and computational chemistry. Specific focus is given to theoretical aspects such as the simulation of retention and mobility in separation science techniques, forensic and national security applications employing separation science techniques, the development of novel, miniaturised, field deployable and portable chromatographic platforms, and specialist applications for the separation of inorganic and organic ions using ion chromatography and capillary electrophoresis for the solution to real-world problems.

Prof Brett Paull

DSc, PhD, BSc(Hons), FRSC, CChem

New Stars Professor, University of Tasmania

Deputy Director, ACROSS (UTas) – Mar-Oct 2013

Co-Director, ACROSS – Oct-Dec 2013

Brett is a University of Plymouth (England) BSc(Hons), PhD and DSc graduate, and a Fellow of the Royal Society of Chemistry. He took up his first lectureship at the University of Tasmania from 1995 to 1997, before moving to Dublin City University (1998-2011), where he currently holds an Adjunct Professorial position. In 2011, Brett rejoined the University of Tasmania as Professor in the School of Chemistry. His research interests within ACROSS specifically focus upon the production and characterisation of new materials and platforms for application within the analytical and bio-analytical sciences, and in particular advanced inorganic and organic phase materials for selective extraction and separation purposes. Brett currently holds a seat on the editorial advisory boards of Analytical Methods and Chromatographia.

Dr Dario Arrua

PhD, BSc

ACROSS Postdoctoral Research Fellow, University of Tasmania

Dario Arrua graduated from the National University of Córdoba in Argentine, obtaining his BSc in 2003 and PhD in 2009. Before joining ACROSS in August 2010, he held a postdoctoral position at the National University of Santiago del Estero (Argentina), working in the development of polymeric materials with antiradical activity. His current research interests are related to the synthesis and chemical surface modification of macroporous polymers, to be used as stationary phases for the separation of biomolecules.






Dr Andrew Bowie

PhD, MSc, BSc(Hons), MRSC

Senior Research Scientist, Antarctic Climate and Ecosystems Cooperative Research Centre, Institute for Marine and Antarctic Studies IMAS and School of Chemistry, University of Tasmania

Andrew Bowie holds the degrees of BSc and MSc from the University of Leeds and the University of Manchester in England. He then conducted his PhD research at the University of Plymouth. In 2006, he commenced a new position as Senior Research Scientist at the University of Tasmania, working jointly in the 'Ocean Control of CO2' subprogram in the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC), and ACROSS. His research interests lie in the general fields of environmental analytical chemistry and chemical oceanography, with specific emphasis on trace metal chemistry in aquatic systems. His research is strongly focused on the development of novel analytical methods to answer key questions in marine biogeochemistry.

A/Prof Michael Breadmore

PhD, BSc(Hons)

ARC QEII Fellow, University of Tasmania

Michael Breadmore was awarded his PhD from the University of Tasmania, after which he held postdoctoral positions at the Microchip Electrophoresis Laboratory at the University of Virginia (USA) and the Institute of Clinical Pharmacology, University of Bern (Switzerland). He has also been Project Leader in Microfluidics for DeltaDOT, an Imperial College London Biotechnology spin-out company. He has extensive research interests in the development of miniaturised analytical separation technology with integrated sample preparation, with applications in drug monitoring, forensics, medical diagnostics and environmental monitoring. He is a member of the editorial board of Electrophoresis, Journal of Chromatography A, and Aviation Security International.

Dr Patrice Castignolles

PhD, MSc

Senior Lecturer, University of Western Sydney

Patrice Castignolles graduated at the National Graduate School of Chemistry of Paris and the University Pierre et Marie Curie. After a postdoctoral stay at the Max Planck Institute for Polymer Research, he was an ARC international research fellow at the Key Centre for Polymer and Colloids (University of Sydney), and a research fellow at the Centre for Nutrition and Food Science (The University of Queensland) and the Institute of Physical Chemistry (Johannes Gutenberg University, Germany). He investigates the separation mechanism of branched polymers, such as polyacrylates and starch, by size-exclusion chromatography (SEC/GPC). His current research at UWS focuses on capillary electrophoresis in the critical conditions to characterise the structure of polysaccharides (chitosan, starch, hemocellulose) and smart polymers (polyacrylates) for drug delivery.

Dr Sung-Tong Chin

PhD, MSc, BSc(Hons)

ACROSS Postdoctoral Research Fellow, Monash University

Sung-Tong Chin obtained his PhD degree in 2013, from the Monash University, and subsequent to this commenced a postdoctoral appointment at Monash University. His background research during his MSc was on methods of analysis of fatty acids using GC×GC-TOFMS to identify the Halal status of meat products. His primary PhD research developed new approaches to olfactometric assessment based on novel GC and MS instrumental analysis methods for volatile aroma compounds. His research culminated in a new instrumental design capable of performing 1D GC, GC×GC and MDGC hyphenated with various detection technologies including olfactometry, FID and MS – all in a single GCMS system. This was tested and validated with wine and coffee aromas. His postdoctoral research includes further applications of the above system to a wider range of products but employing the identification power of triple quadrupole MS, supporting research studies in fatty acids separations, and developments of hybrid GC×GC-MDGC technologies.

Prof Hernan Cortes

PhD, BSc

Adjunct Professor, University of Tasmania

Hernan Cortes obtained the degree of BSc from Florida International University and PhD in analytical chemistry from the University of Stockholm. He worked at the Dow Chemical Company where he achieved the highest technical level within the analytical R&D organisation. His research interests include the development and application of multidimensional chromatography in the gas and liquid phases for complex problem solving, macromolecular characterisation, miniaturisation, the use of temperature for resolution enhancement in liquid chromatography, ion mobility spectroscopy and process chemistry development. He is a member of two editorial boards for journals dedicated to separation science.

A/Prof Gary Dennis

PhD, BSc(Hons)

Associate Professor, University of Western Sydney

Gary Dennis has the degrees of BSc(Hons) and PhD from Sydney University. He is currently an Associate Professor in the area of physical and analytical chemistry within the School of Science and Health at the University of Western Sydney. His research interests are in the field of polymer chemistry, synthesis and characterisation, including the use and development of size-exclusion methods of separation.

KEY PERSONNEL






Dr Cristiano Funari

PhD, MSc

Postdoctoral Research Fellow, Sao Paulo Research Foundation and University of Tasmania

Cristiano Funari has a BSc in chemical engineering from the University of Campinas (Brazil), MSc in drug and medicine research from the University of São Paulo (Brazil), and a PhD in chemistry from the Institute of Chemistry at São Paulo State University (Brazil). He performed part of his PhD research at the University of Salerno (Italy) and University of Geneva (Switzerland). He has worked at AstraZeneca (Brazil), Labiana Life Sciences (Spain) and Centroflora Group (Brazil), where he developed and coordinated projects for innovation in the natural products field, as well as raising research funds for projects in partnership with universities and institutes. Before joining ACROSS in November 2012, he had a postdoctoral position at the Institute of Chemistry at São Paulo State University, focusing on green chromatography. His current research interests are related to sustainable investigation of natural products, especially in green liquid chromatography processes.

Dr Rosanne Guijt

PhD, MSc, MRACI CChem

Senior Lecturer, University of Tasmania

Rosanne Guijt obtained her MSc in biopharmaceutical sciences from Leiden University (The Netherlands), and her PhD from Delft University of Technology (The Netherlands), with a significant part of her PhD studies being conducted at the Institute de Microtechnique (Switzerland). Her research interests lie in the design and fabrication of microfluidic devices for application in chemistry and life sciences, especially in the development of simple and cost-effective microfabrication methods to make this research area more accessible. Applications of the microdevices include the characterisation of explosive residues, drug monitoring and organic synthesis.

Prof Emily Hilder

PhD, BSc(Hons), FRACI CChem

Professor and ARC Future Fellow, University of Tasmania

Emily Hilder is a graduate of the University of Tasmania, where she obtained the degrees of BSc(Hons) and PhD. She has held postdoctoral positions at Johannes Kepler University (Austria) and the E.O. Lawrence Berkeley National Laboratory (USA), and was an ARC Postdoctoral Fellow at ACROSS from 2004-2007. Her research interests lie in the general area of separation science, in particular the development and application of novel polymeric monolithic materials as selective adsorbents and chromatographic stationary phases. She is also interested in miniaturised analytical systems, particularly for applications in clinical diagnostics, counter-terrorism and environmental monitoring. She is an editor of the Journal of Separation Science.

Dr Wei Boon Hon

PhD, BBiotech(Hons)

Postdoctoral Research Fellow, University of Tasmania

Wei Boon Hon graduated from the University of Tasmania, receiving BBiotech(Hons) and PhD degrees. Upon completion of his PhD, he worked as a Pfizer Postdoctoral Research Fellow in developing a new material, MilliSpot, used for dried blood spot sampling technology in drug discovery. His research interests are in the development of novel polymeric monolithic materials as selective adsorbents for high-throughput sample preparation or pre-treatment, particularly for qualitative and quantitative bioanalysis using LC-MS/MS of pharmaceutical interest, and other applications in analytical chemistry.

Dr Joe Hutchinson

PhD, BSc(Hons), MPA

ACROSS Postdoctoral Research Fellow, University of Tasmania

Joe Hutchinson completed his undergraduate and postgraduate studies at the University of Tasmania, and was involved in pre-concentrating small ions using various stationary phases in capillary electrophoresis. After completing his PhD, he relocated to the University of Waterloo (Canada), to assume a position as a Postdoctoral Research Fellow under the supervision of Professor Janusz Pawliszyn. During this time he developed automated solid-phase microextraction systems on the 96-well plate format for GC and LC platforms. His research interests include developing fast, automated and portable separation systems for real-world samples, including fingerprinting explosive devices to combat terrorism.

Dr Cameron Johns

PhD, BSc(Hons)

ACROSS Postdoctoral Research Fellow, University of Tasmania

Cameron Johns obtained the degrees of BSc(Hons) and PhD from the University of Tasmania. He was an Alexander von Humboldt Research Fellow at Philipps University (Germany), from June 2004 to November 2005, working in the area of ion-exchange capillary electrochromatography. His research interests also include indirect photometric detection in capillary electrophoresis and the application of ion chromatography to forensic samples.






Dr Naama Karu

PhD, MSc, BSc

ACROSS Postdoctoral Research Fellow, University of Tasmania

Naama Karu completed her BSc and MSc in biochemistry and food sciences at the Hebrew University in Israel, from 2000 to 2005. Naama obtained her PhD in separation science in 2012, as a Pfizer student scholar at ACROSS. Her research concentrated on the analysis of pharmaceuticals by ion chromatography, coupled to universal detectors. She stayed in ACROSS for a postdoctoral fellowship to conduct research in mass spectrometry for clinical biochemistry application.

Dr Tom Kazarian

PhD, BSc(Hons)

ACROSS Postdoctoral Research Fellow, University of Tasmania

Tom Kazarian graduated from the University of Tasmania, receiving BSc(Hons) and PhD degrees. His doctorate work focused on the analysis of carbohydrates and their preconcentration using capillary electrophoresis and microfluidic platforms. After completing his PhD, he held postdoctoral positions at the Dalian Institute of Chemical Physics in China, and the Pfizer Analytical Research Centre in Hobart. He was also briefly involved with intellectual property law at Griffith Hack in Melbourne. His scientific research interests and expertise lie in the field of liquid chromatography, with a focus on the analysis of pharmaceutical formulations using a variety of detection platforms.

Prof Mirek Macka

PhD, RNDr, FRACI CChem, MRSC

Professor and ARC Future Fellow, University of Tasmania

Mirek Macka holds the degree of RNDr, equivalent to MSc and BSc in analytical chemistry from the Masaryk University (Brno, Czech Republic), and a PhD from the University of Tasmania. He started his career as a research scientist in the pharmaceutical industry in the Czech Republic and Switzerland, and with his move to Australia in 1994, switched to an academic career. He held competitive fellowships Australian Research Council Research Fellow, Marie Curie Excellence Grant and Fellowship, and currently ARC Future Fellowship Level 3. His research interests are in the areas of analytical chemistry, separation science, liquid chromatography, capillary electrophoresis, electrochromatography, miniaturised and microfluidic chip-based analysis, instrumental design, solid-state light sources, and numerical modelling and simulations. He is a member of four editorial boards: Analytica Chimica Acta, Electrophoresis, Journal of Applied Biomedicine, and Czech and Slovak Pharmacy.

Dr Parvez Mahbub

PhD, MEng, BEng, MIEAust

ACROSS Postdoctoral Research Fellow, University of Tasmania

Parvez Mahbub obtained the degrees of BEng(Hons) from Bangladesh University of Engineering and Technology, MEng from Central Queensland University, and PhD in Environmental Engineering from Queensland University of Technology. His research interest includes fast and cost effective detection of improvised explosives, microfluidic engineering, environmental chemistry, and modelling of hazardous pollutants from natural and anthropogenic sources. He is a professional member of Engineers Australia.

Dr Dimitar Mitev

PhD, MSc

ACROSS Postdoctoral Research Fellow, University of Tasmania

Dimitar Mitev completed his MSc studies at the St. Clement of Ohrid University of Sofia (Bulgaria), and was awarded his PhD at the Space Research Institute, located at the Bulgarian Academy of Sciences. Here he worked on blasting technologies for synthesis and treatment of materials, and in particular detonation nanodiamond. In 2010, he moved to the Institute of Metal Science, Equipment and Technologies at the Bulgarian Academy of Sciences, where he continued his work on the application of blasting- and pyro-technologies for anti-terrorism and defence purposes. In 2011, he moved to the University of Tasmania as a postdoctoral fellow to develop novel methods of purification and continue with the characterisation of nanodiamond at ACROSS.

Dr Blagoj Mitrevski

PhD, BSc(Hons)

ACROSS Postdoctoral Research Fellow, Monash University

Blagoj Mitrevski, a former forensic scientist for the Macedonian police, graduated from RMIT after completing his PhD in 2010. He commenced his postdoctoral research at Monash University, with the move of Professor Marriott's research group to Monash. His research at Monash involves the application of advanced GC and GC×GC methods to drugs analysis, pesticides analysis and bio-fuels analysis. Most of this is supported by selective GC detection and mass spectrometry.

KEY PERSONNEL






Prof Pavel Nesterenko

DSc, PhD, MSc, MRACI CChem

New Stars Professor, University of Tasmania

Pavel Nesterenko obtained his degrees from the Lomonosov Moscow State University in Russia, focusing his MSc in petrochemistry and organic catalysis, and his PhD and DSc in analytical chemistry. He is currently a professor within ACROSS at the University of Tasmania. His research area is associated with the development, investigation and application of new adsorbents and chromatographic columns for different separation techniques, including high-performance liquid chromatography, ion chromatography, chiral phase chromatography and ligand-exchange. He is editor-in-chief of Current Chromatography, and a member of the editorial boards of Analytica Chimica Acta, Encyclopedia of Analytical Chemistry, Open Journal of Analytical Chemistry, Modern Chemistry and Applications, and International Journal of Analytical Chemistry.

Dr Anne Palmer

PhD, BSc, BAntSt(Hons)

ACROSS Postdoctoral Research Fellow, University of Tasmania

Anne Palmer holds the degrees of BSc, BAntSt(Hons) and PhD from the University of Tasmania. In 2008 she was a appointed as a research fellow at ACROSS, within the University of Tasmania, and worked in close collaboration with the Australian Antarctic Division. Her research interests lie predominantly in the field of environmental chemistry and the application of separation science to enhance knowledge of trace metal speciation in natural waters.

A/Prof Joselito Quirino

PhD, MSc, BSc

Associate Professor and ARC Future Fellow, University of Tasmania

Joselito Quirino holds a BSc in industrial pharmacy (1992) from the University of the Philippines and an MSc (1998) and PhD (1999) in material science from the Himeji Institute of Technology (HIT), Japan. He was a postdoctoral fellow at HIT (1999-2000) and Stanford University (2000-2001), and has five years experience in the USA working as an analytical development scientist in the biotechnology and pharmaceutical industry. Joselito's research is supported by the Australian Research Council and his research interests are on the fundamentals and applications of on-line sample preconcentration in capillary zone electrophoresis, electrokinetic chromatography, electrochromatography, and the applications of separation science to drug discovery and development.

Dr Sara Sandron

PhD, MSc, BSc

ACROSS Postdoctoral Research Fellow, University of Tasmania

From 2006 to 2008, Sara Sandron held a fellowship at the Experimental Pharmacologic and Clinical Unit, Oncologic Reference Centre in Italy. Here she investigated analytical method development and validation in relation to pharmacokinetic studies of anticancer and antiretroviral drugs. From 2007 to 2009, Sara completed her Masters in organic biomolecular chemistry, looking at synthesis and functionalisation of carbon-based structures for the targeted delivery of pharmaceuticals. Most recently, Sara completed her PhD at Dublin City University, in multi-dimensional and multimodal separation of dissolved organic matter (DOM). Sara's research interests include multidimensional separations, high-performance counter current chromatography, mass spectrometry, sample preparation which are applied in the separation and understanding of a complex environmental mixture such as DOM.

A/Prof Robert Shellie

PhD, BAppSc(Hons), MRACI CChem

Associate Professor and ARC Australian Research Fellow, University of Tasmania

Robert Shellie obtained postgraduate training in ACROSS at RMIT University. Prior to his arrival in Tasmania in 2005, he held a post-doctoral position at the Max-Planck Institute of Molecular Plant Physiology in Golm, Germany. Robert's research is supported by the Australian Research Council and his research interests include multidimensional separations, high-speed chromatography, mass spectrometry, metabolomics, sample preparation, and modelling of chromatographic retention behaviour.

Dr Petr Smejkal

PhD, MSc

ACROSS Postdoctoral Research Fellow, University of Tasmania

Petr Smejkal obtained his MSc degree in bioanalytical chemistry from the University of Pardubice in the Czech Republic and completed his postgraduate training in microfluidic separations at ACROSS in 2013. Upon completion of his PhD, he was offered the position of postdoctoral fellow on the explosives project at ACROSS for its final six months. He is experienced in the area of separation systems, both electrophoretic and chromatography based, with closer specification to a microfluidic format. His research at ACROSS involved the application of the MCP-CE prototype analyser for detection of explosive residues.




Dr Arianne Soliven

PhD, BSc(Hons)

ACROSS Postdoctoral Research Fellow, University of Western Sydney

Arianne Soliven completed her PhD in 2011 at the University of Western Sydney. She undertook a postdoctoral fellowship from early 2011 to late 2012 at the University of Minnesota under the guidance of Prof. Peter Carr. Arianne then returned to UWS, where she is currently employed as a research associate studying aspects of reaction flow chromatography, which is a new technique designed to improve the performance of post-column derivatisations.

Dr Mohammad Talebi

PhD, MSc, BSc

ACROSS Research Assistant, University of Tasmania

Mohammad graduated from the University of Tasmania where he worked with Prof. Emily Hilder and Prof. Paul Haddad on developing new stationary phases for high-performance liquid chromatography of biomolecules. His research interest is in the area of liquid chromatography and related technologies with the focus on bioseparation, pharmaceutical analysis, and method development and optimization using design of experiments. Upon completion of his PhD in 2013, Mohammad was appointed Research Assistant in ACROSS. Current studies include retention prediction and modelling of liquid chromatography data based on structure-retention relationships and Quality-by-Design principles.

Prof Zhenggui Wei

PhD, MSc, BSc

ACROSS Visiting Professor, University of Tasmania

Zhenggui Wei completed his BSc and MSc degree from Wuhan University in 1994 and 1997 respectively. Following this, Wei received his PhD degree in analytical chemistry from the University of Science and Technology of China in 2000. Since then, Wei has been a postdoctoral fellow at Peking University and Hong Kong Baptist University. From 2003 to 2008, he was a Professor in the College of Resources and Environmental Science at Nanjing Agricultural University, followed by a Professor at Nanjing Normal University in 2009. His current research involves high-performance chelation ion chromatography.

Dr Philip Zakaria

PhD, BSc(Hons), MPA

ACROSS Postdoctoral Research Fellow, University of Tasmania

Philip Zakaria graduated from the University of Tasmania and completed his subsequent postgraduate training at ACROSS in 2003. Upon completion of his PhD, he spent one and a half years as an ACROSS postdoctoral fellow. Prior to returning as a postdoctoral fellow in 2007 in PARC, Philip worked in a commercial wine laboratory, as well as working outside of the chemistry field. His specialty is in the area of separation systems, both electrophoretic and chromatography based, which have been used in a wide variety of applications including pharmaceutical analysis, environmental testing and forensic detection. His current research involves the development of a prototype explosive residue screening system.

TECHNICAL AND ADMINISTRATIVE STAFF

Mr Jason Hofman
Administrative Assistant
University of Tasmania

Mr Anthony Malone
Computing Technical Officer
University of Tasmania

Dr Kim Shepherd
Administrative Assistant
Monash University

VISITORS TO ACROSS

Visitor	Country	Institution	Period of visit	Location
Dr Jana Aufartova	Czech Republic	Charles University in Prague	7 weeks	UTas
Ms Michely Capobiango	Brazil	Federal University of Minas Gerais	1 year	Monash
Prof Doo Soo Chung	South Korea	Seoul National University	2 weeks	UTas
Ms Katharina Dihm	Belgium	University of Warwick	2 months	UTas
Mr Milos Dvorak	Czech Republic	Brno University of Technology	9 months	UTas
Ms Elizabeth Gilchrist	United Kingdom	Kings College London	4 weeks	UTas
Prof Tadeusz Gorecki	Canada	University of Waterloo	3 months	UTas
Prof Cornelius F. Ivory	USA	Washington State University	4 weeks	UTas
Prof Ming Jiang	China	Tongji Medical Institute, Huazhong University	1 year	Monash
Ms Umme Kalsoom	Australia	Edith Cowan University	6 months	UTas
Ms Celale Kirkin	Turkey	Technical University of Istanbul	1 year	Monash
Dr Lenka Kujovska Krcmova	Czech Republic	Charles University in Prague	1 month	UTas
Mr Chunyapuk Kukusamude	Thailand	Khon Kaen University	9 months	UTas
Ms Lyn May Lee	Singapore	Temasek Polytechnic	3 months	Monash
Mr Jean-Baptiste Lena	France	University of Montpellier, Graduate School of Chemistry	10 months	UWS
Prof Matthew Linford	USA	Brigham Young University	2 weeks	UTas
Dr XiangPing Liu	China	Chinese Centre for Disease Control and Prevention	10 months	Monash
Mr Anze Martincic	Slovenia	Jozef Stefan Institute	3 months	UTas
Ms Raissa Mastello	Brazil	Universidade Estadual Paulista Júlio de Mesquita Filho	1 year	Monash
Mr Muhammad Naveed	Pakistan	The Islamia University of Bahawalpur	6 months	UTas
Ms Asia Nosheen	Pakistan	Department of Plant Sciences, Quaid-i-Azam University, Islamabad	8 months	Monash
Ms Ana Pinheiro	Brazil	University of Sao Paulo	3 months	UTas
Ms Pornpan Prapatpong	Thailand	Mahidol University	1 year	UTas
Ms Heide Rabanes	Philippines	Ateneo de Manila University	1 year	UTas
Ms Phimpha Soisungnoen	Thailand	Khon Kaen University	1 year	UTas
Ms Laura Tedone	Italy	University of Messina	1 year	UTas
Ms Xiao Ying Wong	Singapore	Temasek Polytechnic	6 weeks	Monash

RESEARCH FUNDING

UTAS NODE

Applicant(s)	Funding Scheme	Type of Grant	Title	Funding for 2013
Arrua RD	University of Tasmania	Conference Support Scheme	39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC), The Netherlands	$2,500
Arrua RD, Hilder EF, Desire CT	Institute for Molecular Science	Access to UVSOR Synchrotron Facility	Comprehensive characterisation of monolithic polymers by scanning transmission X-ray microscopy (STXM)	$2,374
Bowie AR	Australian Research Council	Fellowship-Future	Natural iron fertilisation of oceans around Australia: linking terrestrial dust, marine biogeochemistry and climate	$108,982
Bowie AR	University of Tasmania	Conference Support Scheme	Collaborative on Ocean Chemistry and Analysis (COCA), Hawaii	$2,500
Bowie AR	University of Tasmania	Rising Stars Round 3	Rising Stars	$17,000
Breadmore MC	Australian Research Council	Future Fellowship	Highly integrated miniaturised total analysis systems for pharmaceuticals in biological and environmental samples	$109,030
Breadmore MC	Australian Research Council	Discovery Project	Integrated microfluidic device for the direct analysis of drugs and metabolites in biological fluids	$140,000
Dicinoski GW, Breadmore MC	Department of the Prime Minister and Cabinet	Research Support for National Security	Development of a commercial-ready pre-blast explosive analyser for inorganic-based homemade explosives (HME) screening	$192,500
Doble PA, Macka M, Grimm R, Fryer F	Australian Research Council; Agilent Technologies	Linkage Project Round 2	Chip liquid chromatography-inductively coupled plasma-mass spectrometry: A new hyphenated microfluidic instrument for metallomics	$70,000
Funari CS, Hilder EF, Cavalheiro AJ	São Paulo Research Foundation	Postdoctoral Scholarship to CSF and Conferences	A trade off between separation, detection and sustainability in liquid chromatography	$80,000
Guijt RM	University of Tasmania	Research Enhancement Grant	3D printing of biological environments	$18,000
Haddad PR, Shellie RA, Dicinoski GW, Szucs R, Pohls C, Dolan JW	Australian Research Council	Linkage Projects Round 2	Rapid method development in pharmaceutical analysis using quality-by-design principles	$205,000

RESEARCH FUNDING

UTAS NODE cont.

Applicant(s)	Funding Scheme	Type of Grant	Title	Funding for 2013
Haddad PR, Shellie RA	LC Resources, Inc; Pfizer; Thermo Fisher Scientific Australia	Linkage Projects Round 2 Industry Support	Rapid method development in pharmaceutical analysis using quality-by-design principles	$145,000
Hearn MTW, Haddad PR, Boysen R, Reinhard I, Quirino JP	Australian Research Council	Discovery Project	Selectivity enhancement in separation science using responsive materials	$160,000
Hilder EF, Moad G, Bon SAF	Australian Research Council	Discovery Project	Polymer nanoparticles and supracolloidal monolithic structures for applications in separation science	$110,000
Hilder EF	Australian Research Council	Future Fellowship	High performance chromatography based on nanostructured monolithic polymers	$85,800
Hilder EF, Hon WB	Department of Industry Innovation, Science, Research and Tertiary Education; SGE Analytical Science	Contract Research	Researcher in business – polymers for nucleic acid sample preparation	$100,000
Hilder EF, Shellie RA, Candish E	SGE Analytical Science	Scholarship Top-Up	Elite scholarship support – Esme Candish	$7,500
Jose MD, Hilder EF, Shellie RA, Karu N	Royal Hobart Hospital Research Foundation	Research Grant	Towards a better understanding of uraemic molecules	$22,727
Macka M	Australian Research Council	Future Fellowship	Solid-state light sources for bio-imaging and microfluidics	$227,792
Macka M, Breadmore MC, Guijt RM, Henderson A	University of Tasmania	UTas Visiting Fellows and Visiting Scholars Program	Numerical Modelling of Microfluidic Systems Visiting Fellow: Professor Cornelius C. Ivory	$7,500
McCartney PJ, Guven N, Guijt RM, Smith JA	Royal Hobart Hospital Research Foundation	Research Grant	Neuroprotective function of novel short chain-quinones	$9,090
Nesterenko PN, Paull B	Australian Research Council	Discovery Projects	Micro-disperse sintered nano-diamonds: A new class of versatile adsorbent for high performance liquid chromatography	$100,000

UTAS NODE cont.

Applicant(s)	Funding Scheme	Type of Grant	Title	Funding for 2013
Paull B, AA Kazarian	Essential Oils of Tasmania	Contract Research	Extraction of shell protein	$13,500
Paull B, Nesterenko PN, Lawson TT	Essential Oils of Tasmania	Contract Research	Development of extraction technology for absorption and purification of perfume oils	$10,000
Paull B, Nesterenko PN, Macka M	School of Chemistry, University of Tasmania	Professional Development, Strategic Support	EU Marie Curie FP7-PEOPLE-2009-IRSES MASK Project	$6,000
Paull B, Nesterenko PN, Shellie RA, Haddad PR, Davies NW, Wilson RR, Kelleher BP	Australian Research Council	Discovery Projects	Resolving dissolved organic matter: New multi-dimensional separation approaches	$220,000
Quirino JP	Australian Research Council	Future Fellowship	Green sample preparation technologies for analytical chemistry	$175,843
Shellie RA	Australian Research Council	Discovery Projects	A field-portable comprehensive multidimensional gas chromatograph	$105,000
Shellie RA, Breadmore MC, Farrell RR	Grape and Wine Research and Development Corporation	Travel and Conference Grant	Improving quality of wine maturation products through real-time analysis of oak wood volatiles	$2,966
Thomson RJ, Hoy W, McMorran BJ, Jose MD, Hilder EF, Charlesworth JC	National Health and Medical Research Council	Project Grant	To search for genetic causes of renal disease in the Tiwi Island Aboriginal population	$216,173
			Total	**$2,672,777**

RESEARCH FUNDING

MONASH NODE

Applicant(s)	Funding Scheme	Type of Grant	Title	Funding for 2013
Grace MR, Marriott PJ, Coleman RA, Pettigrove V, Rosi-Marshall EJ	Australian Research Council	Linkage Projects	Impacts of pharmaceuticals and personal care products on Australian aquatic ecosystem	$51,450
Grace MR, Marriott PJ	Melbourne Water	Linkage Project Industry Support	Impacts of pharmaceuticals and personal care products on Australian aquatic ecosystem	$25,000
Marriott PJ, Evans DJ	Australian Research Council	Linkage Projects	Oxidation product generation during heating and storage of bio-fuels and alternative fuels assessed by multidimensional gas chromatography	$30,000
Marriott PJ	DSTO	Linkage Project Industry Support	Oxidation product generation during heating and storage of bio-fuels and alternative fuels assessed by multidimensional gas chromatography	$20,000
Marriott PJ	DSTO	PhD Program Support	Improved quantitative and qualitative analysis of oxidative heteroaromatic species in middle distillate fuels using multidimensional gas chromatographic techniques	$15,000
Marriott PJ, Chaffee A, Mitrevski B	Australian Research Council	Discovery Projects	Ultra-high resolution hybrid comprehensive-multidimensional gas and supercritical fluid chromatography for explicit characterisation of petrochemicals	$250,000
			Total	**$391,450**

UWS NODE

Applicant(s)	Funding Scheme	Type of Grant	Title	Funding for 2013
Barnett NW, Conlan XA, Francis PS, Stevenson PG, Shalliker RA, Scott C, Purcell S	Australian Research Council	Linkage Projects	Identification and isolation of new pharmaceutical opiate analogues: Today's problem tomorrows solutions	$31,000
Castignolles P, Gaborieau M, Aldrich-Wright J, Jones M, Shrestha A, Philips M, Markham J, Temple M, Chan K, Jones C	University of Western Sydney	Major Equipment Grant	Capillary electrophoresis	$70,000
Castignolles P	University of Western Sydney	Travel	HPLC 2013 Hobart Conference	$1,300
Castignolles P, Gaborieau M	University of Western Sydney	Minor Equipment Grant	Sample preparation for CE and NMR	$5,800
Castignolles P, Gaborieau M	University of Western Sydney	Research	Chitosan conjugates as substrates for stem cell culture	$9,000
Castignolles P, Gaborieau M	University of Western Sydney	Research	Macromolecular characterisation	$30,000
Maniego A, Castignolles P, Gaborieau M, Nicolas J	Endeavour Fellowship	Research (Travel)	Characterisation of anticancer drug delivery agents	$10,000
Shalliker RA	Department of Industry, Innovation, Science, Research and Tertiary Education	Cadetship	Joint Research Engagement Engineering Cadetship – David Shock	$5,000
Shalliker RA	Thermo Electron Manufacturing	Research	Active flow management chromatography columns	$90,000
Thevarajah J, Gaborieau M, Castignolles P, Graf R, Cottet H	Endeavour Fellowship	Research (Travel)	Characterisation of chitosan	$10,000
			Total	**$262,100**

MONASH STORY

Understanding, characterisation, rational selection and design of novel phases for gas chromatography.

written by Yada Nolvachai and Chadin Kulsing

Background: Conventional stationary phases employed in gas chromatography (GC), e.g. poly(siloxane) and poly(ethylene glycol), provide separation mechanisms mainly based on vapour pressure and polarity difference of separated compounds. This often limits the separation power and separation dimensionality to two dimensions due to lack of selectivity and orthogonality. In a 2D GC experiment, this can result in reduced peak capacity. This inherent limitation may be overcome, if one could finely tune the relative position of target analytes in a GC result. Since retention time of an analyte in GC depends on the ratio of the analyte molecules in the carrier gas to that in the stationary phases (e.g. captured by the distribution coefficient value), beside the effects of temperature program variation, a change in chemical interaction between analytes and stationary phases will naturally alter analyte retention; and thus the separation result which could be achieved by changing the chemical structure of the stationary phase. A finely tuneable functionality of stationary phases is thus ideal for finely tuning GC separation results, and ideally if that functionality leads to a different type of retention mechanism then it is possible to introduce new dimensionalities as a way to improve resolution and orthogonality in a 2D GC experiment. Some novel materials such as metal organic frameworks (MOF) and ionic liquids (IL) seem to be excellent candidates for tuneable stationary phases due to their desirable properties such as customisable functionality and molecular structures, and high thermal stability.

The role of new GC stationary phases: The synthesis of many new GC phases have been reported over the years, applied for different specific applications such as isomer separation (e.g. liquid crystal phases) or for improved orthogonality in multidimensional (MD) separations. If this trend continues, it will expand the number of GC phases in the 'world library'. Provided that these novel phases are available in the lab, understanding their use and achieving maximum performance for these phases is as important as making the new phase, especially in multidimensional separations, where the selection of column sets critically affects orthogonality and peak capacity.

However, random column selection and inappropriate 'optimisation' processes may be ineffective, and performance of novel column phases may not improve performance over conventional polar/non-polar column sets for separation of complex analyte mixtures. Furthermore, the concept of "column synthesis first, application later" may play a major role for novel phase synthesis. It would be 'cool' if one could design and synthesise a new phase according to an informed decision according to a given set of rules focussing on desired retention performance of given analytes.

MOFs and ILs offer tuneable retentions: Our efforts in this area thus focus on understanding, characterising and developing reliable approaches to select and synthesise novel materials, especially IL and MOF for effective application in GC. Our research is based on both experimental and modelling studies (using GAUSSIAN) of different sets of commercially available IL columns, as well as newly prepared columns, in either one dimensional or MDGC. We also establish isotherm experiments of standard reference analytes (e.g. alkanes; saturated fatty acid methyl esters (FAME)) with these novel columns as a database for prediction of GC results based on linear solvation energy relationship approaches. We are able to provide overall characterisation of novel stationary phases and this allows translation of molecular language into chromatographic results, as well as understanding how modification of stationary phase structures can tune target analyte positions in the separation space.

Completed studies: As part of this overall program, we have completed the following typical research studies:

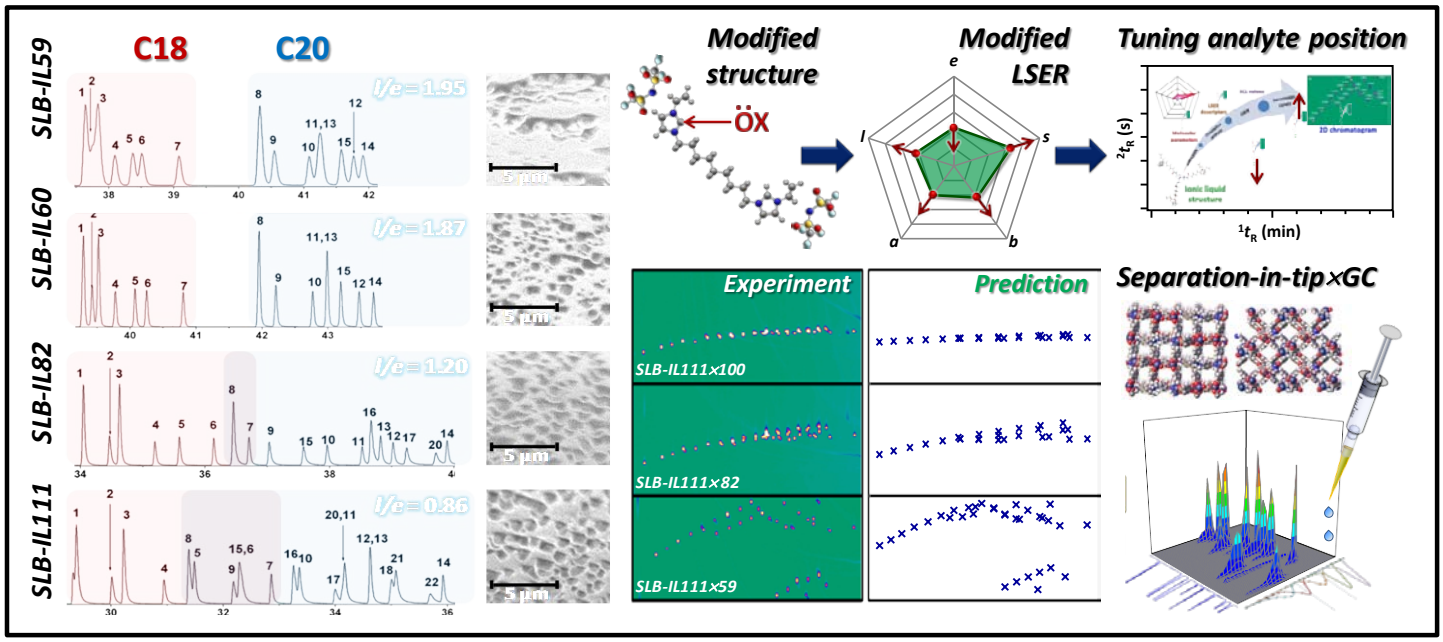
1. Demonstrated tuneable peak distribution of FAME in either 1D [1] or 2D plots [2] which was achieved by using different IL column sets. In addition to polar/non-polar interactions and boiling point differences, the tuneable separation mechanisms were mainly based on different lone pair electron interactions (quantified with e descriptor) and cavity formation (quantified with l descriptor) interactions provided by each IL phase, as indicated by different l/e values based on LSER concept.

These interactions independently govern the positions of saturated, unsaturated and isomeric FAME.

2. Demonstrated the possibility of modelling approaches for prediction of GC results of fatty acid analytes on capillary columns coated with ionic liquid phases, by knowledge of their molecular structures [3]. Whilst providing deeper insight into separation mechanisms, trial-and-error experimentation related to method development in MDGC could also be reduced. This approach illustrates tunability of target analyte peaks by changing molecular structures of stationary phases, providing rational design of novel IL phases for different separation purposes.
3. Synthesised and demonstrated that MOF stationary phases e.g. poly-[Cd(1,4,7,10-tetrakis(4-carboxybenzyl)-1,4,7,10-tetraazacyclododecane)] could provide additional and mixed-mode separation mechanisms in liquid chromatography, such as co-ordination and multi-size selective interactions, compared to conventional stationary phases [4]. The size selective retention of analytes can be further tuned by just changing the pore dimension of polymorphic MOF. This demonstrates the possibility of MOF for tuneable separation of complex mixtures. With the thermal stability of this MOF being above 250 °C, MOF coated GC capillaries can be synthesised and employed as stationary phases, and is intended to improve orthogonality in MDGC.

Further reading:

- A.X. Zeng, S.-T. Chin, Y. Nolvachai, C. Kulsing, L.M. Sidisky, P.J. Marriott. Characterisation of capillary ionic liquid columns for gas chromatography–mass spectrometry analysis of fatty acid methyl esters. *Anal. Chim. Acta*, 803 (2013) 166–173.
- A. Nosheen, B. Mitrevski, A. Bano, P.J. Marriott. Fast comprehensive two-dimensional gas chromatography method for fatty acid methyl ester separation and quantification using dual ionic liquid columns. *J. Chromatogr. A*, 1312 (2013) 118–123.
- C. Kulsing, Y. Nolvachai, A.X. Zeng, S.-T. Chin, B. Mitrevski, P.J. Marriott. From molecular structures of ionic liquids to predicted retention of fatty acid methyl esters in comprehensive two-dimensional gas chromatography. *ChemPlusChem*, Accepted for Publication 2014.
  DOI: 10.1002/cplu.201300410.
- C.S. Hawes, Y. Nolvachai, C. Kulsing, G.P. Knowles, A.L. Chaffee, P.J. Marriott, S.R. Batten, D.R. Turner. Metal–organic frameworks as stationary phases for mixed-mode separation applications. *Chem. Commun.*, 50 (2014) 3735-3737.



UTAS STORY

Resolving dissolved organic matter: new multi-dimensional separation approaches.

written by Sara Sandron

Background: Dissolved organic matter (DOM) in seawater and freshwater represents a carbon reservoir comparable to atmospheric CO2 (respectively 624 and 720 Gigatonnes). CO2 is a product of DOM mineralisation, therefore an intimate link exists between these two pools. DOM includes various classes of compounds such as amino acids, organic acids, lipids, phosphonates, carboxyl-rich alicyclic molecules (CRAM), molecules derived from linear terpenoids (MDLT) and carbohydrate like precursors, with molecular weights ranging from 300 to 7000 Da and concentrations from picomolar to micromolar.

Due to the presence such diversity in chemical-physical properties, the first critical issue is the isolation of DOM itself (Figure 1). The techniques commonly employed in DOM extraction such as ultrafiltration (UF) or solid phase extraction (SPE) do not guarantee a total recovery for all the existing molecular species within DOM. Thus a more efficient method must be found, possibly exploiting the different selectivities available for SPE resins. Different and more specific SPE cartridges can be employed in series, allowing a more targeted extraction, which could also simplify the following chromatographic analysis.

Once representative DOM is collected, new chromatographic approaches are needed to overcome co-elution and irreversible adsorption issues, typically experienced when employing conventional chromatographic analysis, such as liquid and gas chromatography (LC and GC). For this reason, one of the aims of this project is to fractionate DOM through the application of high-performance counter current chromatography (HPCCC), a form of liquid-liquid extraction (Figure 1). HPCCC is a semi-preparative technique which provides an alternative approach to the fractionation of DOM, providing the isolation of different fractions from collected DOM across a wide spectrum of polarity. In an HPCCC system, two immiscible solvents are introduced in the column, which is constituted of a polytetrafluoroethylene (PTFE) tubing connected to a rotating bobbin. When the coil rotates about its own axis and revolves around the centrifuge axis, the two phases are separated along the length of the column. This allows analytes to be separated according to their partition coefficient between the two liquid phases in use.

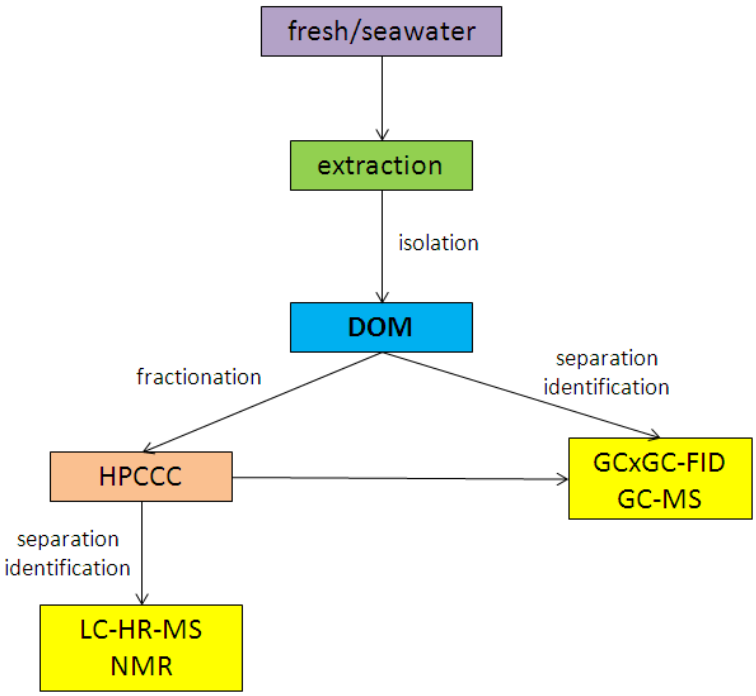


Fig. 1: Pathways employed in resolving DOM

The development of this analytical technique allows the separation of different classes of compounds according to their polarity (Figure 2). Further fractional analysis can be performed through secondary GC and LC modes, such as reversed-phase LC (RP-LC) or silver chromatography, coupled to high-resolution tandem mass spectrometry (HR-MS).

The use of the aforementioned chromatographic and detection approaches allows the simplification of this very complex mixture to an extent that single compounds can be isolated and understood in terms of fragmentation patterns and molecular structure, providing crucial information towards the identification of the main components characterising DOM. The isolation of such compounds can further the understanding of the ocean carbon cycle and carbon sequestration.

Completed studies: A preliminary review of the extraction techniques previously employed in DOM analysis highlighted the necessity to find a more efficient extraction method, able to enhance the sample recovery. To do so, liquid-liquid extractions of seawater samples are currently being developed, together with the in-line use of solid phase extraction (SPE) cartridges with different affinities (i.e. polystyrene-divinylbenzene and diol-functionalised sorbents), able to isolate both polar and apolar constituents from DOM.
In order to simplify DOM according to the polarity order of its components, high-performance counter current chromatography (HPCCC), a polarity-based form of liquid-liquid extraction technique has been employed to fractionate DOM. Results from early analyses pointed to the need for improved sample collection, preparation and clean-up procedures to avoid contamination of collected DOM from sample storage containers and SPE cartridges. These have now been implemented.
Multi-dimensional gas chromatography coupled with flame ionisation detection (GCxGC-FID) and GC-MS were employed to resolve semi-polar to apolar constituents of HPCCC fractionated DOM, allowing the identification, through library matching, of the following classes of compounds: alkenes, methyl esters and ethyl esters, mainly related to lignin-like materials naturally occurring in coastal or freshwater DOM.

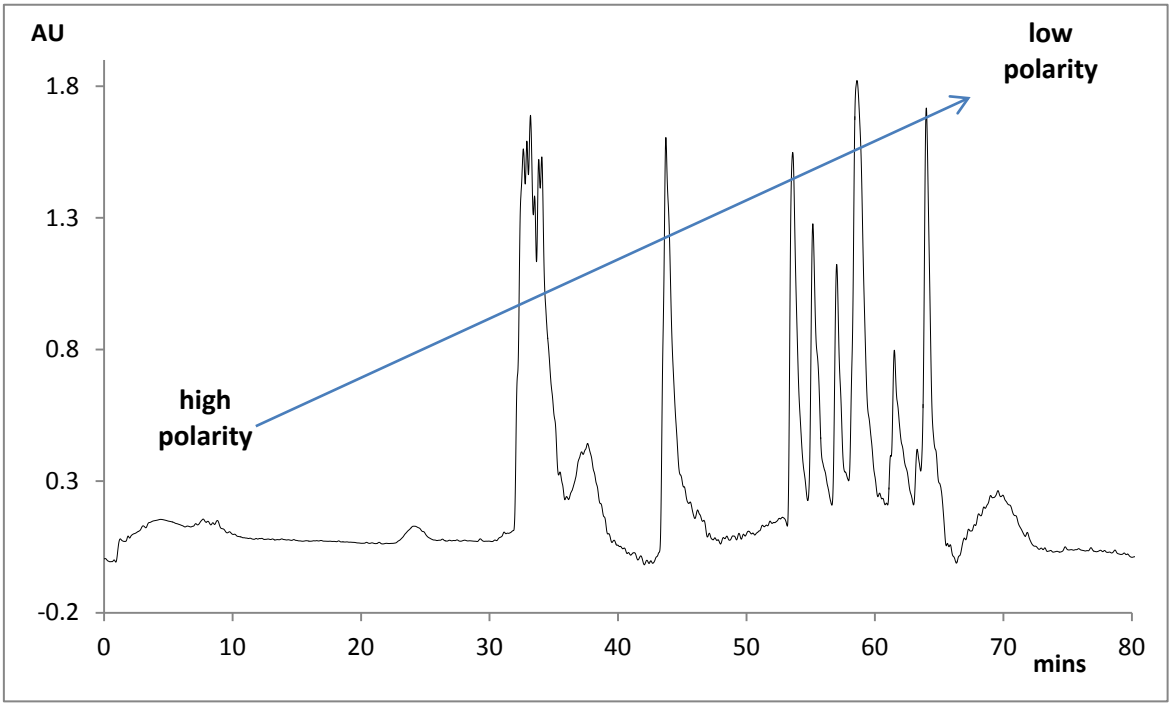


Fig. 2: Example for an HPCCC-UV (254 nm) fractionation of a DOM sample

RESEARCH STUDENTS

Students who completed their project during 2013 are marked with an asterisk.

Name	Degree	Commenced	Thesis Title	Supervisors
Aemi Syazwani Abdul Keyon	PhD	2011	Portable analytical technology for on-site determination of phytotoxins and pollutants in water	MC Breadmore, RM Guijt, C Bolch
Ala Alhusban	PhD	2012	Sequential injection capillary electrophoresis (SI-CE) for on-line monitoring of organic acids in bioprocesses	RM Guijt, MC Breadmore, N Güven
Sharon Bentwich*	Honours	2012	Characterisation and cellular effect of smart polymers for anticancer drug delivery	P Castignolles, M Jones, M Gaborieau
Michelle Camenzuli*	PhD	2010	Advances in HPLC column technology	RA Shalliker, GR Dennis
Esme Candish	PhD	2011	Novel polymeric monolithic devices to aid sample preparation in bioanalysis	EF Hilder, RA Shellie, A Gooley
Sung Tong Chin*	PhD	2009	Multidimensional GC and MS approaches for odorants in wine and related products	PJ Marriott, G Eyres
Chris Desire	PhD	2013	Polymer nanoparticles and their assembled supracolloidal monolithic structures for applications in separation science	EF Hilder, RD Arrua
Emer Duffy	PhD	2011	Development of centrifugal micro-fluidic disc (u-CD) platforms for automated analytical chemistry	B Paull, PN Nesterenko
Mari Egeness	PhD	2012	Modulation in two-dimensional liquid chromatography	RA Shellie, EF Hilder, HJ Cortes
Ross Farrell	PhD	2012	OPTIOAK – smelling the good in wood. Optimising oak aroma profiles for the wine through real-time aromatic grading and quality control	RA Shellie, MC Breadmore
Adam Gaudry	PhD	2010	Detection and identification of homemade inorganic and organic improvised explosive devices	MC Breadmore, RM Guijt
Daniel Gstöttenmayr	PhD	2011	Development of a novel ultrasensitive capillary electrophoresis-mass spectrometry system for the analysis of environmental pollutants	MC Breadmore, JP Quirino
Ben Ho*	Honours	2012	Assessing the impact of pharmaceuticals on stream ecosystems	PJ Marriott, M Grace
Shaghayegh Hossein	MSc	2011	Metallohelicates and their biological activity	J Aldrich-Wright, P Castignolles, M Gaborieau
Matthew Jacobs	PhD	2012	Multidimensional chromatography with resistively heated columns	RA Shellie, EF Hilder
Mala Jayamanne	PhD	2013	Biomarkers of nanoparticle exposure from metabolomic profiling	PJ Marriott, T Turney, P Wright

Name	Degree	Commenced	Thesis Title	Supervisors
Nicha Kawila*	PhD	2008	GC×GC analysis of the formation of the toxin acrylamide during processing of cereal grain foods	D Small, PJ Marriott
Manish Khandagale	PhD	2010	Non-discriminatory, universal and sensitive detection technologies for fluid based separation techniques in the pharmaceutical industry	PR Haddad, EF Hilder, RA Shellie
Aminreza Khodabandeh	PhD	2012	Polymer nanoparticles and their supracolloidal monolithic structures for applications in separation science	EF Hilder, RD Arrua
Sunny Lee Sun Kim	PhD	2011	Development of absolute molecular configuration strategies based on multidimensional separation with spectroscopic methodologies	PJ Marriott, K Tuck
Danijela Kokic	PhD	2010	Ultra-high resolution separations of complex samples derived from biological matrices	RA Shalliker, GR Dennis
Thomas Lawson	PhD	2012	Characterisation of shell proteins and their application	B Paull, PN Nesterenko
Jim Luong*	PhD	2011	Gas chromatographic applications and method developments with planar microfluidic devices	RA Shellie, HJ Cortes
Bussayarat Maikhunthod	PhD	2008	Herb and spice profiling by using GC×GC and MDGC methods	PJ Marriott, D Small
Alison Maniego	PhD	2013	Characterisation of smart polymers for anticancer drug delivery	P Castignolles, M Gaborieau, J Aldrich-Wright, Y Guillaneuf, M Jones
Eamon McGuire*	Honours	2012	Use of multidimensional gas chromatography technologies to detect illegal doping with beta-2 agonists in sport	PJ Marriott
Siti Umairah Mokhtar	PhD	2012	Development of routine approaches to high-resolution, fast chromatographic approaches for drug and metabolite assessment and profiling	PJ Marriott, O Drummer
Yi Heng (Ryan) Nai*	PhD	2009	A new approach for characterisation of microbial communities	MC Breadmore, S Powell, M Manefield
Diksha Narayan*	Honours	2013	Chitosan films for cell culture	M Gaborieau, M O'Connor, P Castignolles
Mitra Nouri Koupaei*	MSc	2010	Towards a better understanding of uraemic molecules	EF Hilder, RA Shellie, M Jose
Yada Nolvachai	PhD	2012	Development of multidimensional GC and LC methods with mass spectrometry for analysis of flavonoids and related polyphenols in natural materials	PJ Marriott, M Hearn

RESEARCH STUDENTS

Students who completed their project during 2013 are marked with an asterisk.

Name	Degree	Commenced	Thesis Title	Supervisors
Ansara Noori	PhD	2013	Atmospheric Monitoring by Integrated Miniaturized Spectro-Chemical Sensors on Small and Micro-Unmanned Aerial Vehicles	M Macka, A Lucieer
James Oliver	PhD	2010	Novel substrates for bioethanol production	P Castignolles, M Philipps, J Markham, P Peiris
Soo Hyun Park	PhD	2013	Rapid method development in pharmaceutical analysis using quality-by-design principles	PR Haddad, RA Shellie
Anton Peristyy	PhD	2011	Preparation and characterisation of diamond based stationary phases for ultra high performance liquid chromatography	B Paull, PN Nesterenko
Sui Ching Phung	PhD	2012	Isotachophoresis of Cells	MC Breadmore, S Powell, M Macka
Sercan Pravadali	PhD	2010	Analysis of complex samples using multidimensional separations and selective detection	RA Shalliker, GR Dennis, X Conlan
Leila Ranjbar Shourabi	PhD	2013	Multidimensional separation approaches for complex sample analysis	RA Shellie, MC Breadmore
Alfonso Rojas Cardona	PhD	2013	Resolving dissolved organic matter: New multi-dimensional separation	B Paull, PN Nesterenko, RA Shellie
Benjamin Savareear	PhD	2010	Characterisation of plant extracts using high resolution gas chromatography	RA Shellie, EF Hilder
Aliaa Shallan	PhD	2011	Microchip methods for the separation of drugs and metabolites in biological and environmental samples	MC Breadmore, RM Guijt
David Shock	PhD	2008 (P/T)	Selectivity in separations	RA Shalliker, GR Dennis
Akashdeep Singh*	Honours	2013	Characterisation of glucomannans for a better health	M Gaborieau, P Castignolles, K Chan, V Naumovski
Marie Sinoir*	PhD	2009	Zinc as a co-limiting micronutrient: Its distribution and modelling regarding climate change (change in pCO2) in the Tasman Sea	AR Bowie, PN Nesterenko, ECV Butler, M Mongin, C Hassler
Adam Sutton*	Honours	2013	Characterisation of smart block copolymers by capillary electrophoresis and NMR	P Castignolles, M Gaborieau, M Destarac
Mohammad Talebi*	PhD	2009	High performance ion-exchange stationary phases for biomolecules	EF Hilder, PR Haddad

Name	Degree	Commenced	Thesis Title	Supervisors
Boon Kim Tan	PhD	2008	Profiling of the danshen herb by using LC/MS, LC-NMR and GC×GC/MS methods	E Pang, PJ Marriott, CG Li, S Urban
Maryam Taraji	PhD	2013	Rapid method development in pharmaceutical analysis using quality-by-design principles	RA Shellie, PR Haddad
Danielle Taylor	Honours	2013	Characterisation of DNA-anticancer drug interactions by capillary electrophoresis	P Castignolles, M Gaborieau, J Aldrich-Wright
Joel Thevarajah	PhD	2013	Characterising chitosan to enable medical applications such as stem-cell growth substrate and drug delivery	M Gaborieau, P Castignolles, C Lefay, J Aldrich-Wright, M O'Connor
Mark Thomas	PhD	2011	Synthesis of polymer nanoparticles by RAFT in miniemulsion	EF Hilder, R Jones
Michelle Toutounji*	Honours	2012	Breakfast cereals: How much glucose does it release in our digestive system?	A Shrestha, P Castignolles, M Gaborieau
Mark Trudgett	PhD	2010	Advanced aspects of multidimensional HPLC	RA Shalliker
Ria Marni Tubaon	PhD	2012	Green Analytical Chemistry: Stacking in capillary electrophoresis and electrokinetic micropurification	JP Quirino, PR Haddad
Renee Webster	PhD	2012	Advanced molecular separation and characterisation techniques for trace oxidation and thermal degradation products of fuels	PJ Marriott, D Evans
Yong Foo Wong	PhD	2013	Comprehensive Analysis of Essential Oils in Australian and Malaysian Plant Species by using Advanced Gas Chromatography and Mass Spectrometry Techniques	PJ Marriott, P Perlmutter
Elizabeth Witthy*	Honours	2012	Determination of cell viability and morphology after exposure to the "smart" polymer, poly(acrylic acid)	M Jones, P Castignolles, M Gaborieau
Grace Zeying Wu*	PhD	2009	Comprehensive two-dimensional liquid chromatography of surfactants	PJ Marriott
Alain Wuethrich	PhD	2013	Green sample preparation in analytical chemistry: Stacking and solventless extraction	JP Quirino, PR Haddad
Li Yan*	MSc	2013	Portable liquid chromatographic separation platforms	B Paull, PN Nesterenko
Yiing Chiing Yap	PhD	2011	The microfluidic device: A novel in-vitro model of traumatic brain injury	T Dickson, MC Breadmore, A King, RM Guijt
Annie Xu Zeng	PhD	2012	Innovative chromatographic methods for fatty acids analysis in natural samples, biodiesels and related materials	PJ Marriott, A Patti

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J Luong, R Gras, HJ Cortes, RA Shellie. Multidimensional GC using planar microfluidic devices for the characterization of phenol antioxidants in fuels. *J. Sep. Sci.* 36 (2013) 2738-2745.

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Refereed conference papers

AR Bowie, F Quéroué, G Sarthou, F Chever., P van der Merwe, E Bucciarelli, AT Townsend, S Blain. Dissolved and particulate trace metals in the vicinity of the Kerguelen Islands, Southern Ocean, during the KEOPS2 experiment. 2013, *100. ASLO 2013 Aquatic Sciences Meeting*, New Orleans, USA, 17-22 February 2013.

CS Hassler, L Norman, E Angles, C Robinson, M Doblin, A Bowie, C Mancuso Nichols. Impact of bacterial phytoplanktonic and natural exopolymeric substances on iron biogeochemistry. 2013, *51. ASLO 2013 Aquatic Sciences Meeting*, New Orleans, USA, 17-22 February 2013.

A Tagliabue, JB Sallee, AR Bowie, PW Boyd, M Levy, S Swart. Towards Reconciling Iron Supply and Demand in the Southern Ocean. 2013, *84. ASLO 2013 Aquatic Sciences Meeting*, New Orleans, USA, 17-22 February 2013.

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Other publications

Plenary, keynote and invited conference presentations

MC Breadmore, AI Shallan, RM Guijt. Simple microdevice with controlled nanochannels for rapid detection of basic drugs in whole blood. Keynote lecture at *Australia-Pacific Capillary Electrophoresis (APCE 2013)*, Jeju, South Korea, 3-6 November 2013.

MC Breadmore, AI Shallan, YC Yap, RM Guijt. Rapid prototyping of polymer microchips using mass consumer-targeted technology. Invited lecture at *20th International Symposium on Electro- and Liquid Phase-Separation Techniques (ITP 2013)*, Tenerife, Spain, 6-9 October 2013.

P Castignolles, A Maniego, E Groison, J Thevarajah, M Mnatsakanyan, M Selim, RS Roi, E Read, M Destarac, F d'Agosto, B Charleux, C Lefay, Y Guillaneuf, J Aldrich-Wright, M Gaborieau. Capillary electrophoresis of branched polymers, copolymers and polysaccharides. Keynote lecture at *6th International Symposium on Separation and Characterization of Macromolecules (SCM-6)*, Dresden, Germany, 6-8 February 2013.

D Connolly, P Floris, A Alwy, B Paull. Characterisation of nano-agglomerated capillary polymer monoliths using scanning contactless conductivity detection. Invited lecture at *Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2013)*, Philadelphia, USA, 17-21 March 2013.

CT Desire, RD Arrua, M Talebi. NA Lacher, EF Hilder. Poly(ethylene glycol)-based monolithic capillary columns for hydrophobic interaction chromatography of immunoglobulin G subclasses and variants. Keynote lecture at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

PR Haddad. Studies on the separation of inorganic ions: a journey and an important destination. Award address, *American Chemical Society Spring Meeting*, New Orleans, USA, 8-12 April 2013.

PR Haddad. Developments in the design and usage of high performance ion-exchange columns. Plenary lecture at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

PR Haddad. Recent developments in the separation of inorganic ions by ion chromatography and capillary electrophoresis and their use in counter-terrorism applications. Plenary lecture at *São Paulo School of Advanced Science on Bioorganic Chemistry*, São Paulo, Brazil, 30 June – 5 July 2013.

PR Haddad, GW Dicinoski, EF Hilder, MC Breadmore, JP Hutchinson, CA Johns, RM Guijt, PN Nesterenko, GA Blanco, M Macka, A Gaudry. Capillary electrophoresis for pre- and post-blast detection of explosives. Plenary lecture at *13th Asia Pacific Symposium on Microscale Separation and Analysis (APCE 2013)*, Jeju, South Korea, 3-6 November 2013.

EF Hilder. Polymer monoliths for the efficient chromatography of small and large molecules. Invited lecture at *245th American Chemical Society National Meeting*, Louisiana, USA, 7-11 April 2013.

EF Hilder, RD Arrua, PR Haddad, K Dihm. Ordered monolithic structures as stationary phases for capillary chromatography. Plenary lecture presented at *37th International Symposium on Capillary Chromatography (ISCC 2013)*, Palm Springs, USA, 12-16 May 2013.

EF Hilder, RD Arrua, M Talebi, PR Haddad, CT Desire. Designing polymer monoliths for the efficient chromatography of small and large molecules. Keynote lecture at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

Y Li, P Smejkal, MC Breadmore, RM Guijt, F Foret, F Bek, **M Macka**. From chip-in-the-lab to lab-on-the-chip: Strategies for lowering the barriers to microfluidics. Invited lecture at *4th Australia and New Zealand Micro/Nanofluidics Symposium and Student Workshop*, Adelaide, Australia, 22-24 April 2013

M Macka. What are the major future issues in nutrition and diagnostics? Keynote lecture at *13th International Nutrition and Diagnostics Conference (INDC 2013)*, Olomouc, Czech Republic, 26-29 August 2013.

M Macka. Applicability of miniaturised microfluidics based diagnostics: Impediments to their use and the ways to counter them. Invited lecture at *13th International Nutrition and Diagnostics Conference (INDC 2013)*, Olomouc, Czech Republic, 26-29 August 2013.

M Macka. Platforms for field deployable microfluidic separation analysis: Where are we now, where are we going, and how can the synergy of chemistry, technology and engineering help us get there? Invited lecture at *1st International Conference on Chemical Technology (ICCT 2013)*, Mikulov, Czech Republic, 8-10 April 2013.

PJ Marriott. Advanced gas chromatography and quality of life – analysis for lifestyle proection. Plenary lecture at *17th ENQA Conference*, Belo Horizonte, Brazil, 6 - 9 October 2013.

PJ Marriott. A systems approach to volatile chemical analysis for forensics analysis. Keynote lecture at *Total Agilent Experience Symposium 2013*, Kuala Lumpur, Malaysia, 19 March 2013.

PJ Marriott. Evolution in the analytical sciences: Today and beyond. Plenary lecture at *Total Agilent Experience Symposium 2013*, Kuala Lumpur, Malaysia. 19 March 2013.

PJ Marriott. Evolving technologies in GC and GCMS for improved analytical measurements. Plenary lecture at *Total Agilent Experience Symposium 2013,* Bangkok, Thailand, 26 March 2013.

PJ Marriott. Multidimensional chromatography – past, present, future. Keynote lecture at *Multidimensional Chromatography Symposium*, Toronto, Canada, 8-9 January 2013.

PJ Marriott. Multidimensional gas chromatography – mass spectrometry for complex oil analysis. Keynote lecture at *Total Agilent Experience Symposium 2013*, Singapore, 22 March 2013.

PJ Marriott, S-T Chin, G Eyres. Advanced methods for assessment of aromas based on gas chromatography, olfactometry and mass spectrometry. Keynote lecture at *15th BCEIA Symposium, Beijing*, China 23-26 October 2013.

PJ Marriott, S-T Chin, AX Zeng, A Nosheen, B Mitrevski. Fatty acids: New analytical capability for profiling complex multi-dimensional compounds in diverse samples. Keynote lecture at *Australia-Pacific Capillary Electrophoresis (APCE 2013)*, Jeju, South Korea, 3-6 November 2013.

PJ Marriott, S-T Chin, AX Zeng, C Kouremenos. Selected methods in fatty acids, organic acids and amino acids analysis: Key components in metabolite monitoring. Keynote lecture at *DICP Symposium (XXXV) on New Separation/Analytical Methods and Metabolomics*, Dalian, China, 21-22 October 2013.

PJ Marriott, AX Zeng, A Nosheen, Y Nolvachai, B Mitrevski, S-T Chin. Fatty acids: New analytical capabilities for profiling complex multi-dimensional compounds in diverse samples. Plenary lecture at *Balaton Symposium*, Siofok, Hungary, 3-6 September 2013.

PN Nesterenko. High-performance chelation ion chromatography. Keynote lecture at *7th Conference on Ion Analysis (CIA 2013)*, Berlin, Germany, 18-20 September 2013.

PN Nesterenko. Nanocarbon adsorbents and their application in high-performance liquid chromatography. Keynote lecture at *2nd International Conference on Analytical Chromatography and Capillary Electrophoresis*, Tuapse, Russia, 26-31 May 2013.

B Paull, AA Kazarian, PN Nesterenko, MR Taylor, PR Haddad. Pushing for comprehensive pharmaceutical analysis with mixed mode phases. Keynote lecture at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

B Paull, AA Kazarian, PR Haddad, PN Nesterenko, MR Taylor. Ion-Exchange, Hydrophilic and Hydrophobic Interactions Affecting Selectivity for Neutral and Charged Solutes on Agglomerated Ion-Exchange and Commercial Mixed-Mode Stationary Phases. Invited lecture at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

B Paull, PN Nesterenko, D Conolly, EP Nesterenko, P Jones, A Moyna, N McGillicuddy. Analysis of Complex and High Salinity Samples for Trace Metals Using Monolithic Chelation Ion Chromatography. Invited lecture at *Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2013)*, Philadelphia, USA, 17-21 March 2013.

B Paull, PN Nesterenko, D Mitev, E Duffy, A Peristyy. Diamond Based Phases for Chromatography, from Micro to Nano: Production, Characterization and Application. Invited lecture at *Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2013)*, Philadelphia, USA, 17-21 March 2013.

JP Quirino, HR Rabanes, RM Tubaon, A Wuethrich, PR Haddad. Field enhanced sample injection for on-line concentration in capillary electrophoresis and solventless extraction and micropurification. Invited lecture at *20th International Symposium on Electro- and Liquid Phase-Separation Techniques (ITP 2013)*, Tenerife, Spain, 6-9 October 2013.

B Savareear, **RA Shellie**. GCx2GC and 2GCxGC using contra-directional thermal modulation. Invited lecture at *10th International Symposium of Comprehensive Multidimensional Gas Chromatography (10th GCxGC)*, Palm Springs, USA, 12-16 May 2013.

RA Shalliker. Active flow technology presenting the 'wall-less' chromatography column. Keynote lecture at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

P Smejkal, MC Breadmore, F Foret, RM Guijt, F Bek, **M Macka**. Chip-based isotachophoresis with indirect fluorescence detection using a field-deployable platform. Invited lecture at *Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2013)*, Philadelphia, USA, 17-21 March 2013.

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P Smejkal, MC Breadmore, RM Guijt, F Foret, F Bek, **M Macka**. Research-flexible vs. commercial fixed-purpose microfluidic chip platforms: Can we have the best of both worlds for field deployable analysis? Invited lecture at *BIT's 2nd Annual Conference and expo of Analytix 2013*, Suzhou, China, 21-23 March 2013.

Other conference presentations

AS Abdul Keyon. Capillary electrophoresis for saxitoxins and analogues: Comparison of detection methods. Oral presentation at *9th International Conference on Molluscan Shellfish Safety (ICMSS 2013)*, Sydney, Australia, 17-22 March 2013.

AS Abdul Keyon, RM Guijt, CJS Bolch, MC Breadmore. Transient isotachophoresis-capillary zone electrophoresis for the analysis of paralytic shellfish toxins in mussel sample. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Alhusban, N Gueven, RM Guijt, MC Breadmore. Online bioprocess monitoring by sequential injection capillary electrophoresis. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

RD Arrua, PR Haddad, EF Hilder. Preparation of highly ordered monolithic structures by unidirectional freezing and radical polymerisation. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

RD Arrua, WB Hon, A Hitchcock, M West, EF Hilder. Characterisation of polymer monoliths containing embedded nanoparticles by scanning transmission x-ray microscopy (STXM). Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

DN Bassanese, A Soliven, PG Stevenson, GR Dennis, NW Barnett, X Conlan, RA Shalliker. Investigating retention characteristics of a mixed mode stationary phase and the enhancement of monolith selectivity for HPLC. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

MC Breadmore. Microfluidic device with nanochannels for sample-in/answer-out capability of small molecules in blood. Poster presentation at *29th MicroScale Bioseparations (MSB 2013)*, Charlottesville, USA, 10-14 March 2013.

MC Breadmore, C Johns, A Gaudry, P Mahbub, P Zakaria, JP Hutchinson, EF Hilder, GW Dicinoski, RM Guijt, PN Nesterenko, M Macka, PR Haddad. Rapid separations of improvised explosives. Oral presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

M Camenzuli, H Ritchie, RA Shalliker. The analysis of natural products using active flow technology with multiplexed detection. Oral presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

E Candish, PA Dawes, A Gooley, HJ Wirth, RA Shellie, EF Hilder. At-line approach to direct solid phase extraction – mass spectrometry. Poster presentation at *61st American Society of Mass Spectrometry Conference on Mass Spectrometry and Allied Topics (ASMS 2013)*, Minneapolis, USA, 9-13 June 2013.

E Candish, HJ Wirth, A Gooley, RA Shellie, EF Hilder. High surface area polymer monoliths as adsorbents for solid phase extraction. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

E Candish, EF Hilder, RA Shellie, A Gooley HJ Wirth. Sample preparation using microextraction by packed sorbent. Poster presentation at *24th Australian and New Zealand Society for Mass Spectrometry Conference (ANZSMS24)*, Melbourne, Australia, 2-6 February 2013.

M Capobiango, Z Lourdes Cardeal, E Souza Oliveira, PJ Marriott. Profiles of volatile organic compounds of different banana wines. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

J Caslavska, MC Breadmore, W Thormann. Dynamic high-resolution computer simulation of isotachophoretic enantiomer separations. Poster presentation at *20th International Symposium on Electro- and Liquid Phase-Separation Techniques (ITP 2013)*, Tenerife, Spain, 6-9 October 2013.

P Castignolles, M Gaborieau. Hydrodynamic volume distributions for copolymers and branched polymers. Poster presentation at the *6th International Symposium on Separation and Charaterization of Macromolecules (SCM-6)*, Dresden, Germany, 6-8 February 2013.

P Castignolles, AR Maniego, JB Lena, A Sutton, Y Guillaneuf, M Gaborieau. Multiple detection SEC and capillary electrophoresis as complementary separation and characterization methods for branched polymer and polyelectrolytes. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

P Castignolles, A Sutton, E Groison, A Singh, J Thevarajah, M Selim, E Read, V Naumovski, K Chan, JD Marty, M Destarac, B Charleux, M Gaborieau. Distribution of "smartness" of copolymers: Composition of block statistical copolymers by capillary electrophoresis. Oral presentation at *34th Australasian Polymer Symposium (34APS)*, Darwin, Australia, 7-10 July 2013.

A Chaffee, PJ Marriott, WR Jackson, M Amer, B Mitrevski. Comparison of oil shale liquids with high S-content using multidimensional gas chromatography. Oral Presentation at *33rd Oil Shale Symposium*, Colorado, USA, 14-18 October 2013.

S-T Chin, G Eyres, PJ Marriott. Better sniffing – a story of high-resolution wine aroma analysis. Oral presentation at *37th International Symposium on Capillary Chromatography (ISCC 2013)*, Palm Springs, USA, 12-16 May 2013.

DA Collins, EP Nesterenko, B Paull. Fabrication of monoPLOT columns in wide bore capillaries using laminar flow polymerisation and in-process control of phase growth. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

G Delaittre, M Save, P Castignolles, M Gaborieau, J Rieger, B Charleux. pH- and thermoresponsive dynamic or crosslinked diblock copolymer micelles via nitroxide-mediated polymerization-induced self-assembly. Oral presentation at *10th International Conference on Advanced Polymers via Macromolecular Engineering (APME 2013)*, Durham, United Kingdom, 18-22 August 2013

C Desire, RD Arrua, M Talebi, EF Hilder. Poly(ethylene glycol)-based monolithic capillary columns for hydrophobic interaction chromatography of immunoglobulin G subclasses and variants. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

GW Dicinoski, **P Zakaria**, PR Haddad. Analysis of trace ions in complex samples using multidimensional capillary ion chromatography. Oral presentation at *Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2013)*, Philadelphia, USA, 17-21 March 2013.

E Duffy, X He, EP Nesterenko, S Krishnamurthy, D Brabazon, PN Nesterenko, B Paull. Porous graphitic carbon monoliths embedded with nanodiamonds and other temperature induced nanocarbons. Oral presentation at *12th International Conference on Frontiers of Polymers and Materials (ICFPAM 2013)*, Auckland, New Zealand, 8-13 December 2013.

E Duffy, D Mitev, PN Nesterenko, B Paull. Capillary zone electrophoresis for the characterisation and separation of detonation nanodiamond. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

E Duffy, PN Nesterenko, **B Paull**. Capillary zone electrophoresis for the characterisation and separation of detonation nanodiamond. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

AM Edge, D Foley, M Camenzuli, L Pereira, H Ritchie, RA Shalliker. Precision and reliability – an intercontinental study of curtain flow chromatography. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

AM Edge, LM Pereira, DJ Foley, RA Shalliker, H Ritchie. Use of curtain flow technology to improve detector sensitivity. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

M Egeness, H Cortes, EF Hilder, RA Shellie. RPLCxRPLC of dietary supplements using an 8-port valve interface. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

E Engel, J Ratel, S-T Chin, G Rose, PJ Marriott. Performance of candidate detectors for multiresidue analysis of pesticides in water by comprehensive two-dimensional gas chromatography. Poster presentation at *6th International Symposium on Recent Advances in Food Analysis (RAFA 2013)*, Prague, Czech Republic, 5-8 November 2013.

R Farrell, RA Shellie, MC Breadmore. Optioak: Optimising oak aromas through near real-time analysis. Poster presentation at *15th Australian Wine Industry Technical Conference 2013*, Sydney, Australia, 13-18 July 2013.

D Foley, L Pereira, **AM Edge**, D Milton, H Ritchie, RA Shalliker. Improving column performance with parallel segmented flow chromatography. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

CS Funari, RL Carneiro, AJ Cavalheiro, EF Hilder. Green chromatographic fingerprinting: Combining quality of separation and sustainability in analytical chromatography. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

CS Funari, **M Egeness**, R Carneiro, A Cavalheiro, HJ Cortes, EF Hilder, RA Shellie. Multivariate optimisation of a green UHPLC approach for fingerprinting Brazilian green propolis. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

CS Funari, M Khandagale, RL Carneiro, AJ Cavalheiro, EF Hilder. A trade off between separation, detection and sustainability in liquid chromatographic fingerprinting. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Gooley, E Candish, PA Dawes, E Dawes, EF Hilder. Rapid sample preparation protocols using microextraction by packed sorbent. Poster presentation at *Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2013)*, Philadelphia, USA, 17-21 March 2013.

R Gras, J Luong, H Cortes, RA Shellie. Multi-dimensional gas chromatography with a planar microfluidic device for the characterization of volatile oxygenated organic compounds. Poster presentation at *37th International Symposium on Capillary Chromatography (ISCC 2013)*, Palm Springs, USA, 12-16 May 2013.

D Gstoettenmayr, MC Breadmore, JP Quirino. Development of a flowing sample interface for stacking in capillary electrophoresis. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

PUBLICATIONS

D Gstoettenmayr, MC Breadmore, JP Quirino. Development of a flowing sample interface for stacking in capillary electrophoresis. Oral presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

X He, EP Nesterenko, L Zhou, JD Glennon, JHT Luong, PN Nesterenko, D Brabazon, Bt Paull. Production of Nano-templated Porous Graphitised Carbon Monoliths and their Physical and Electrochemical Characterisation. Oral presentation at *7th CASi Conference on Analytical Science*, Cork, Ireland, 1-2 July 2013.

EF Hilder, RD Arrua, K Dihm. Preparation of ordered monolithic structures by unidirectional freezing and radical polymerisation. Oral presentation at *34th Australasian Polymer Symposium (34APS)*, Darwin, Australia, 7-10 July 2013.

C-H Hung, AA Kazarian, B Paull, PN Nesterenko, A Miles, **D Jensen**, A Dadson, M Linford. Evaluation of performance in reversed-phase, and ion-exchange modes of the flare C18/amino polymer/nanodiamond mixed-mode column. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

MR Jacobs, M Edwards, T Górecki, RA Shellie. GCxGC analysis of Antarctic petroleum spills. Poster presentation at *37th International Symposium on Capillary Chromatography (ISCC 2013)*, Palm Springs, USA, 12-16 May 2013.

N Karu, NW Davies, R Wilson, RA Shellie, M Jose, R Thomson, WE Hoy, B McMorran, S Foote, EF Hilder. Mass spectrometry for determination of renal disease biomarkers in urine. Poster presentation at *24th Australian and New Zealand Society for Mass Spectrometry Conference (ANZSMS24)*, Melbourne, Australia, 2-6 February 2014.

N Karu, MN Koupaei, T Rodemann, R Wilson, E Candish, RA Shellie, MD Jose, EF Hilder. Multiple approaches for understanding the metabolic changes in chronic kidney disease. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

AA Kazarian, PN Nesterenko, B Paull, MR Linford. Liquid chromatography characterisation of structurally similar core shell stationary phases based on layer-by-layer nanodiamond/polyamine architecture. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

AA Kazarian, MR Taylor, PR Haddad, PN Nesterenko, B Paull. Comprehensive analysis (APIs, excipients and inorganic ions) of binary and ternary pharmaceutical preparations using mixed-mode chromatography. Poster presentation at *São Paulo School of Advanced Science on Bioorganic Chemistry*, São Paulo, Brazil, 30 June-5 July 2013.

AA Kazarian, MR Taylor, PR Haddad, PN Nesterenko, **B Paull**. Ion exchange, hydrophilic and hydrophobic interactions affecting selectivity for neutral and charged solutes on agglomerated ion-exchange and commercial mixed-mode stationary phases. Oral presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

M Khandagale, PR Haddad, JP Hutchinson, GW Dicinoski. Effects of eluent temperature and elution bandwidth on detection response for aerosol-based detectors. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

M Khandagale, EF Hilder, RA Shellie, PR Haddad. Utility of the eluent temperature and flow rate for improved response homogeneity of corona-charged aerosol detector. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

M Khandagale, JP Hutchinson, GW Dicinoski, PR Haddad. High temperature liquid chromatography-aerosol detector analysis: Effect of elution bandwidth on detection response. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

A Khodabandeh, RD Arrua, C Desire, SAF Bon, EF Hilder. High internal phase emulsions stabilized by both functionalized polymeric nanoparticles and polymeric surfactants: First step to prepare new class of separation media. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

L Kim, S-T Chin, K Tuck, PJ Marriott. Novel comprehensive preparative multidimensional gas chromatography – mass spectrometry approach for high resolution oil analysis. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

L Kim, B Mitrevski, PJ Marriott. Absolute molecular configuration strategies using preparative gas chromatography and multidimensional gas chromatography with spectroscopy. Poster presentation at *37th International Symposium on Capillary Chromatography (ISCC 2013)*, Palm Springs, USA, 12-16 May 2013.

R Knob, MC Breadmore, RM Guijt, J Petr, M Macka. A novel approach for preparation of porous layer open tubular capillary columns using polymerisation mixture displacement with an immiscible liquid. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

D Kocic, RA Shalliker, H Ritchie. High through-put and high sensitivity LC-MS analysis of amino acids using active flow technology chromatography columns. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

C Kulsing, R Knob, M Macka, R Boysen, M Hearn. Molecular imprinted polymer porous layer open tubular (MIP-PLOT) capillaries for chiral separations. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

C Kulsing, Y Nolvachai, AX Zeng, S-T Chin, B Mitrevski, PJ Marriott. From molecular structures of ionic liquids to predicted retention of fatty acid methyl esters in comprehensive two-dimensional gas chromatography. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

C Lefay, J Thevarajah, D Taylor, G Mangiante, A Charlot, J Bernard, E Fleury, M O'Connor, P Castignolles, **M Gaborieau**. Solid-state NMR of conjugated polysaccharides and polymers for biomedical applications. Oral presentation at *6th International Symposium on Separation and Characterization of Macromolecules (SCM-6)*, Dresden, Germany, 6-8 February 2013.

C Lefay, G Moreira, Y Guillaneuf, M Gaborieau, P Castignolles, D Gigmes. pH- and Thermoresponsive Modification of polysaccharides by nitroxide-mediated polymerization Oral presentation at *10th International Conference on Advanced Polymers via Macromolecular Engineering (APME 2013)*, Durham, United Kingdom, 18-22 August 2013.

C Lefay, **G Moreira**, Y Guillaneuf, M Gaborieau, P Castignolles, D Gigmes. Modification of polysaccharides by nitroxide-mediated polymerization. Oral presentation at *European Polymer Congress (EPF 2013)*, Pisa, Italy, 16-21 June 2013.

J Luong, R Gras, RA Shellie, H Cortes. Multidimensional gas chromatography and planar microfluidics with tandem sulphur chemiluminescence and flame ionization detection for sulphur compounds analysis. Oral presentation at *37th International Symposium on Capillary Chromatography (ISCC 2013)*, Palm Springs, USA, 12-16 May 2013.

AR Maniego, D Ang, Y Guillaneuf, C Lefay, D Gigmes, JR Aldrich-Wright, M Gaborieau, P Castignolles. Separation of hydrophilic polyacrylates according to the topology using capillary electrophoresis in critical conditions. Poster presentation at *34th Australasian Polymer Symposium (34APS)*, Darwin, Australia, 7-10 July 2013.

AR Maniego, D Hathenbruck, M Gaborieau, P Castignolles. Separation of hydrophilic polyacrylates according to the topology using capillary electrophoresis in the critical conditions. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

PJ Marriott, AX Zeng, S-T Chin. Integrated multidimensional and comprehensive two-dimensional gas chromatography analysis of fatty acid methyl esters. Poster presentation at *Australia-Pacific Capillary Electrophoresis (APCE 2013)*, Jeju, South Korea, 3-6 November 2013.

PJ Marriott, L Kim, K Tuck, B Mitrevski. Absolute molecular configuration strategies using preparative gas chromatography and multidimensional gas chromatography with spectroscopy. Poster presentation at *Australia-Pacific Capillary Electrophoresis (APCE 2013)*, Jeju, South Korea, 3-6 November 2013.

PJ Marriott, A Zeng, A Nosheen, Y Nolvachai, B Mitrevski, S-T Chin. Taking a good dose of high separation medication for gas chromatography analysis of fatty acid methyl esters. Oral presentation at *10th International Symposium of Comprehensive Multidimensional Gas Chromatography (10th GCxGC)*, Palm Springs, USA, 12-16 May 2013.

G McEneff, L Barron, B Kelleher, B Paull, B Quinn. LC-MS/MS analysis of pharmaceuticals in the Irish aquatic environment. Poster presentation at *39th International Symposium of High Performance Liquid Chromatography and Related Techniques (HPLC)*, Amsterdam, The Netherlands, 16-20 June 2013.

G McEneff, L Barron, B Kelleher, B Paull, B Quinn. LC-MS/MS analysis of pharmaceuticals in the aquatic environment. Oral presentation at *Irish Mass Spectrometry Society (IMSS) Conference*, Dublin, Ireland, 1 May 2013.

N McGillicuddy, EP Nesterenko, PN Nesterenko, J Omamogho, JD Glennon, B Paull. High performance chelation ion chromatography of alkaline earth, transition and lanthanide metal cations using a new IDA-silica core-shell stationary phase. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

N McGillicuddy, **EP Nesterenko**, PN Nesterenko, J Omamogho, JD Glennon, B Paull. Monolithic porous silica and core-shell silica functionalised with chelating groups for high-performance chelation ion chromatography. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

B Mitrevski, L Kim, PJ Marriott. Hybrid comprehensive two-dimensional – multidimensional gas chromatography (GCxGC-MDGC): Potential and applications. Oral presentation at *10th International Symposium of Comprehensive Multidimensional Gas Chromatography (10th GCxGC)*, Palm Springs, USA, 12-16 May 2013.

SU Mokhtar, PJ Marriott, OH Drummer. Performance of gas chromatography – triple quadrupole mass spectrometry for broad screening drug identification. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

YH Nai, R Jones, MC Breadmore. Sieving polymer synthesis by reversible addition fragmentation chain transfer polymerization. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

PN Nesterenko, ON Fedyanina, A Peristyy, B Paull. Diamond based stationary phases in chromatography: Emphasise on separation selectivity, hydrolytic and thermal stability. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

PN Nesterenko, DP Mitev, B Paull, AT Townsend. New look on a problem of the purity and purification of detonation nanodiamonds. Oral presentation at *11th International Conference on Advanced Carbon Nano Structures (ACNS 2013)*, Saint Petersburg, Russia, 1-5 July 2013.

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Y Nolvachai, C Kulsing, RI Boysen, MTW Hearn, MT Matyska, JJ Pesek, PJ Marriott. Novel surface characterisation, extraction and separation studies of milligram-scale silica hydride particles. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

Y Nolvachai, C Kulsing, CS Hawes, DR Turner, SR Batten, PJ Marriott. Metal-organic framework in tips for liquid phase separations. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

Y Nolvachai, C Kulsing, CS Hawes, DR Turner, SR Batten, PJ Marriott. Metal-organic framework in tips for liquid phase separations. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

A Noori, A Lucieer, M Macka. Infra-red light emitting diodes (IR-LEDS) as light sources for methane and natural gas detection for portable and remote analysis platforms. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

JD Oliver, M Gaborieau, EF Hilder, P Castignolles. Simple and robust separation of hydrolysed pectin and hemicellulose by capillary electrophoresis and high performance liquid chromatography. Oral presentation at *6th International Symposium on Separation and Characterization of Macromolecules (SCM-6)*, Dresden, Germany, 8-12 February 2013.

JD Oliver, **AT Sutton**, P Castignolles. Separation of carbohydrates by free solution capillary electrophoresis with direct UV detection. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

JD Oliver, AT Sutton, M Phillips, J Markham, P Peiris, P Castignolles. Fermentation of complex polysaccharide mixes to ethanol and other valued products. Poster presentation at *6th International Symposium on Separation and Characterization of Macromolecules (SCM-6)*, Dresden, Germany, 8-12 February 2013.

SH Park, RA Shellie, GW Dicinoski, M Talebi, C Johns, PR Haddad, R Szucs, JW Dolan, CA Pohl. Prediction of retention of inorganic anions in ion-exchange chromatography based on quantitative structure-retention relationships. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

L Pereira, D Foley, **AM Edge**, D Milton, H Ritchie, RA Shalliker. Curtain flow chromatography – improve sensitivity and efficiency in HPLC. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

L Pereira, D Foley, A Soliven, A Edge, H Ritchie, RA Shalliker. Active flow management coupled to monolithic columns. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

A Peristyy, PN Nesterenko, B Paull. Adsorption of inorganic ions by sintered detonation nanodiamond. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Peristyy, PN Nesterenko, B Paull. Cation and anion exchange properties of sintered detonation nanodiamond. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

SC Phung, YH Nai, SM Powell, M Macka, MC Breadmore. Isotachophoresis (ITP) of cells. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

P Prapatpong, M Macka, MC Breadmore, RM Guijt. In capillary derivatization, stacking and analysis of memantine in plasma by V-photometric and laser induced fluorescence detection. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

P Prapatpong, M Macka, MC Breadmore, RM Guijt, L Suntornsuk, JP Quirino, A Wuethrich. Strategies for analysis of selected anti-Alzheimer drugs. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

S Pravadali, RA Shalliker, H Ritchie. A preliminary investigation into two-dimensional HPLC coupled with active flow technology (AFT) columns. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

L Ranjbar, MC Breadmore, RA Shellie. Two-dimensional liquid chromatography-capillary electrophoresis. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

S Sandron, B Kelleher, N Davies, R Wilson, PN Nesterenko, B Paull. High performance counter current chromatography for the separation of a complex environmental matrix: Dissolved organic matter (DOM). Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

S Sandron, B Kelleher, EP Nesterenko, PN Nesterenko, B Paull. Novel single and multi-dimensional chromatographic approaches to a better understanding of dissolved organic matter (DOM). Oral presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

AI Shallan, RM Guijt, MC Breadmore. 3D-printed microchips. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

AI Shallan, RM Guijt, MC Breadmore. 3D-printed microchips. Oral presentation at *4th Symposium and Student Workshop*, Adelaide, Australia, 22-24 April 2013.

RA Shalliker, D Kocic, L Pereira, T Edge, J Mosely, H Ritchie, D Foley, X Conlan. High through-put and high sensitivity analyses using active flow technology chromatography with mass spectral detection. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

RA Shalliker, H Ritchie. Active flow technology presenting the 'infinite diameter column' in a curtain flow mode of operation. Oral presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

RA Shalliker, A Soliven, M Selim, M Camenzuli, G Dennis, H Ritchie. Post column derivatisation using reaction flow chromatography. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

P Smejkal, MC Breadmore, RM Guijt, F Foret, F Bek, M Macka. Research-flexible vs. commercial fixed-purpose microfluidic chip platforms: Can we have the best of both worlds for flexible field deployable electrodriven analysis? Chip-ITP with indirect fluorescence detection. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

P Smejkal, C Johns, JP Hutchinson, RM Guijt, EF Hilder, PR Haddad, M Macka, PN Nesterenko, AJ Gaudry, GW Dicinoski, MC Breadmore. Separation of explosives on a purpose designed instrument. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

P Soisungnoen, B Paull, PN Nesterenko, AA Kazarian. Investigation of ion exchange selectivity for simultaneous separation of organic and inorganic anions and cations on a mixed bed – mixed mode column. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Soliven, D Foley, L Pereira, AM Edge, H Ritchie, GR Dennis, RA Shalliker. Improving the performance of narrow-bore HPLC columns using active flow technology. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Soliven, D Foley, L Pereira, **AM Edge**, D Milton, H Ritchie, RA Shalliker. Active flow technology coupled to monolithic columns. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Soliven, M Selim, S Pravadali, L Johny, S Srivastava, X Conlan, GR Dennis, H Ritchie, RA Shalliker. Selective detection using reaction flow chromatography. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

M Talebi, NA Lacher, EF Hilder, PR Haddad. Well-controlled pH gradient cation-exchange chromatography-mass spectrometry for charge heterogeneity profiling of monoclonal antibodies. Oral presentation at *24th Australian and New Zealand Society for Mass Spectrometry Conference (ANZSMS24)*, Melbourne, Australia, 2-6 February 2014.

M Talebi, RA Shellie, EF Hilder, NA Lacher, PR Haddad. A semi-automated pH gradient-based ion-exchange chromatography system for the separation of monoclonal antibody charge variants. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

M Taraji, RA Shellie, GW Dicinoski, M Talebi, PR Haddad, R Szucs, JW Dolan, CA Pohl. Method development in pharmaceutical analysis: Assessment of column selectivity in hydrophilic interaction liquid chromatography using improved quantitative structure-retention relationships models. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

D Taylor, J Aldrich-Wright, MD Temple, P Castignolles. Separation of DNA bound with cisplatin, Hoechst33258 and ethidium bromide by capillary electrophoresis in the critical conditions. Poster presentation at *34th Australasian Polymer Symposium (34APS)*, Darwin (Australia), 7-10 July 2013.

D Taylor, C Ferris, A Maniego, M in het Panhuis, M Gaborieau, P Castignolles, Characterisation of gellan gum by capillary electrophoresis. Poster presentation at *6th International Symposium on Separation and Characterization of Macromolecules (SCM-6)*, Dresden, Germany, 6-8 February 2013.

D Taylor, J Thevarajah, C Lefay, M O'Connor, P Castignolles, M Gaborieau. Characterisation of chitosan-peptide films for stem cell culture by solid state NMR. Poster presentation at *6th International Symposium on Separation and Characterization of Macromolecules (SCM-6)*, Dresden, Germany, 6-8 February 2013.

D Taylor, J Thevarajah, D Narayan, C Lefay, M O'Connor, P Castignolles, M Gaborieau. Chitosan films grafted with peptides for stem cell culture. Oral presentation at *34th Australasian Polymer Symposium (34APS)*, Darwin, Australia, 7-10 July 2013.

J Thevarajah, DL Taylor, C Lefay, P Castignolles, **M Gaborieau**. Chitosan and its conjugates for medical applications. Oral presentation at *34th Australasian Polymer Symposium (34APS)*, Darwin, Australia, 7-10 July 2013.

J Thevarajah, DL Taylor, C Lefay, Y Guillaneuf, M O'Connor, P Castignolles, M Gaborieau. Characterising chitosan and its conjugates for biomedical applications. Poster presentation at *34th Australasian Polymer Symposium (34APS)*, Darwin, Australia, 7-10 July 2013.

MJE Trudgett, RA Shalliker. Towards accelerated peak production rates via comprehensive online multidimensional frequency transform separations. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

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RM Tubaon, PR Haddad, JP Quirino. High-sensitivity analysis of anionic sulphonamides in capillary electrophoresis using a synergistic stacking approach. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

M Vázquez, E Duffy, X He, E Vereshchagina, J Ducrée, EP Nesterenko, PN Nesterenko, B Paull, **D Brabazon**. Centrifugal microfluidic disc integrating carbon monoliths for solid-phase micro-extraction. Poster presentation at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

M Vázquez, X He, E Duffy, E Vereshchagina, J Ducrée, EP Nesterenko, PN Nesterenko, D Brabazon, B Paull. Solid-phase micro-extraction centrifugal microfluidic disc integrating carbon monolithic stationary phases. Oral presentation at *20th International Symposium on Electro- and Liquid Phase-Separation Techniques (ITP 2013)*, Tenerife, Spain, 6-9 October 2013.

R Webster, D Evans, PJ Marriott. Multidimensional gas chromatography – mass spectrometry of alkyldihydrofuranones and their effects in thermally stressed jet fuels. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

YF Wong, PJ Marriott, B Saad, A Makahleh. Rapid quantitative determination of vitamin E homologues through the use of gradient elution reversed-phase UPLC method. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Wuethrich, PR Haddad, JP Quirino. On-line sample concentration in partial-filling chiral electrokinetic chromatography – mass spectrometry. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Wuethrich, PR Haddad, JP Quirino. Suppressed electroosmotic flow in capillary electrophoresis using hydrogel. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

L Yan, M Macka. Off-the-shelf instrumentation options for low-cost portable fluorescence microscopy. Poster presentation at *4th Australia and New Zealand Micro/Nanofluidics Symposium and Student Workshop*, Adelaide, Australia, 22-24 April 2013.

L Yan, **PN Nesterenko**. Determination of traces of magnesium and strontium in calcite based fragments of marine microorganisms using high performance chelation ion chromatography. Poster presentation at *Conference on Ion Analysis (CIA-2013)*, Berlin, Germany, 18-20 April 2013

L Yan, B Paull, MN Müller, PN Nesterenko. Determination of alkaline-earth metals in complex samples using high performance chelation ion chromatography. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

L Yan, AI Shallan, B Arnold, MC Breadmore, M Macka. Low-cost portable off-the shelf fluorescence microscopy for visualisation of microfluidics. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

YC Yap, TC Dickson, AE King, MC Breadmore, RM Guijt. Rapid fabrication of PMMA microchip using a CO2 laser processing with stainless steel pinhole. Poster presentation at *4th Australia and New Zealand Micro/Nanofluidics Symposium and Student Workshop*, Adelaide, Australia, 22-24 April 2013.

YC Yap, RM Guijt, T Dickson, A King, MC Breadmore. Stainless steel pinholes for fast fabrication of high-performance capillary electrophoresis devices by CO2 laser ablation. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

P Zakaria, P Mahbub, AJ Gaudry, RM Guijt, PN Nesterenko, M Macka, GW Dicinoski, PR Haddad, MC Breadmore. Rapid screening of homemade explosives using sequential injection - capillary electrophoresis. Oral presentation at *Trace Explosives Detection Conference (TED 2013)*, Philadelphia, USA, 8-12 April 2013.

P Zakaria, P Mahbub, GW Dicinoski, MC Breadmore. Rapid preblast screening for inorganic improvised explosive devices. Poster presentation at *11th International Symposium on the Analysis and Detection of Explosives 2013 (ISADE 2013)*, The Hague, The Netherlands, 7-10 October 2013.

P Zakaria, P Mahbub, GW Dicinoski, MC Breadmore. Rapid preblast screening for inorganic improvised explosive devices. Poster presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

A Zatirakha, O Shchukina, A Loshin, A Smolenkov, PN Nesterenko, O Shpigun. Novel ways of increasing the performance of the stationary phases for ion chromatography. Oral presentation at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

AX Zeng, S-T Chin, A Patti, PJ Marriott. Profiling of forest soil fatty acids using comprehensive two-dimensional gas chromatography with mass spectrometry detection. Poster presentation at *21st Annual RACI Research and Development Conference (R&D Topics 2013)*, Canberra, Australia, 11-13 December 2013.

Lectures to Universities and Companies

MC Breadmore. Sample -in/answer out electrophoretic systems. Invited seminar at Palacký University, Olomouc, Czech Republic, 14 October 2013.

MC Breadmore. Sample-in/answer out electrophoretic systems, Invited seminar at institute of Analytical Chemistry of the ASCR, Brno, Czech Republic, 16 October 2013.

MC Breadmore. Microfludic and electrophroetic research at UTas, Invited seminar at Seoul National University, Seoul, South Korea, 7 November 2013.

P Castignolles. Branching, composition of polymers by capillary electrophoresis. Invited seminar at Rhodia, Aubervilliers, France, January 2013.

M Gaborieau, **P Castignolles**. Molecular weight, branching, composition of polymers by liquid chromatography (SEC/GPC) and capillary electrophoresis. Invited seminar at the Institute of Chemical and Engineering Sciences, Singapore, Singapore, January 2013.

M Gaborieau, **P Castignolles**. SEC/GPC, capillary electrophoresis and (solid-state) NMR of branches polymers and copolymers and polyelectolytes. Invited seminar at the Laboratoire de Chimie des Polymeres, Université Pierre et Marie Curie, Paris, January 2013.

EF Hilder. Recent developments in polymer monoliths at ACROSS. Invited seminar at Thermo Scientific, Sunnyvale, USA, 17 May 2013.

EF Hilder. Nanostructured polymeric materials for chromatography and sample preparation. Invited seminar at Agilent Technologies, Santa Clara, USA, 12 April 2013.

M Macka. Research-flexible vs. commercial fixed-purpose microfluidic chip platforms: Can we have the best of both worlds for field deployable analysis? Invited lecture at Zhengzhou University, Zhengzhou, China, 23-29 March 2013.

M Macka. Small is beautiful: Chemical analysis in micro- and nano-space. Invited seminar at Macquarie University, Sydney, 3 May 2013.

M Macka. Separations at ACROSS down under. Invited seminar at Palacky University, Olomouc, Czech Republic, 24 June 2013.

PJ Marriott. Multidimensional gas chromatography: Past, present & future. Invited seminar at Agilent Technologies, California, USA, 14 January 2013.

PJ Marriott. Multidimensional separations in GC: Algae-derived bio-fuels, advanced olfactometry, hybrid GC×GC-MDGC studies, and prep-GC with NMR. Invited seminar at School of Chemistry, University of Queensland, 4 March 2013.

PJ Marriott. Multidimensional separations in GC: Biofuels; olfactometry; hybrid GC×GC-MDGC studies. Invited seminar at Agilent Technologies, Santa Clara, USA, 15 January 2013.

PJ Marriott, S-T Chin, Graham Eyres. Aromas, flavours, perfumes: Methods for analysis and assessment. Invited seminar at Sunbor / Suntory Corporation, Japan, 7 November 2013.

PJ Marriott, BS Mitrevski, S-T Chin, R Webster. New applications in multidimensional separations in GC: Algae-derived bio-fuels, advanced olfactometry, and hybrid GCxGC-MDGC studies. Invited seminar at University of Alberta, Edmonton, USA, 11 January 2013.

AA Kazarian, MR Taylor, PR Haddad, PN Nesterenko, **B Paull**. Ion exchange, hydrophilic and hydrophobic interactions affecting selectivity for neutral and charged solutes on agglomerated ion-exchange and commercial mixed-mode stationary phases. Invited seminar at Pfizer Global, Kent, UK, 24 June 2013.

JP Quirino. Capillary electrophoresis. Invited lecture at Xavier University, Cagayan de Oro, Philippines, 26 February 2013.

Workshops

MC Breadmore. Electroseparations. Tutorial at *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.
MC Breadmore, NS Swami. Electrokinetics for sample preparation in microfluidic systems. *Workshop at 29th MicroScale Bioseparations (MSB 2013)*, Charlottesville, USA, 10-14 March 2013.

P Castignolles, M Gaborieau. SEC and capillary electrophoresis for polymer separation and characterisation at *RACI NSW Polymer Group workshop on Macromolecular Characterisation*, Parramatta, Australia, 15 November 2013.

EF Hilder. Polymer Monoliths. Tutorial at *39th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013)*, Amsterdam, The Netherlands, 16-20 June 2013.

M Macka. Solid-state light sources: Utilize the benefits of light emitting diodes and laser diodes as the light sources of the 21st century. Short course presented at *Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2013)*, Philadelphia, USA, 17-21 March 2013.

PJ Marriott. Comprehensive and multidimensional gas chromatography. Graduate Workshop Course at Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil, 11-12 October 2013.

Student Awards

C Desire. Winner of the Original Research Publication Award for "CT Desire, RD Arrua, M Talebi, NA Lacher, EF Hilder. Poly(ethylene glycol)-based monolithic capillary columns for hydrophobic interaction chromatography of immunoglobulin G subclasses and variants.", RACI Analytical & Environmental Chemistry Division, 2013.

R Farrell. Fellowship at the *1st International Mass Spectrometry School* (Siena, Italy, 15-30 September 2013), IMSF International Mass Spectrometry Foundation and Italian Chemical Society Division of Mass Spectrometry, 2013.

R Farrell. GWRDC travel scholarship to visit ZHAW Zurich University of Applied Sciences Switzerland, Grape and Wine Research and Development Corporation, 2013.

D Gstoettenmayr. Winner of "3 Minute Thesis" People's Choice Award at the *Graduate Research Conference (SEiR) 2013*, Hobart, Australia, 5-6 September 2013.

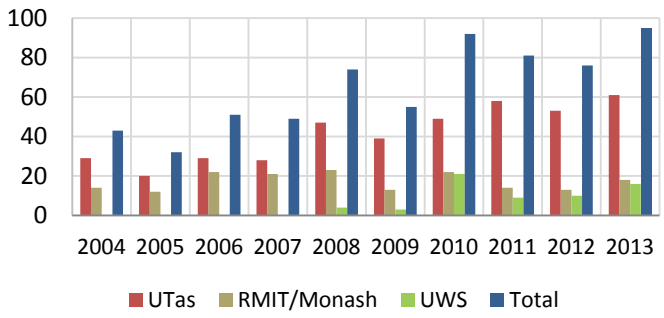
D Gstoettenmayr. Shortlisted (best 11) for Best Poster Award for "D Gstoettenmayr, MC Breadmore, JP Quirino. Development of a flowing sample interface for stacking in capillary electrophoresis." at the *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

D Gstoettenmayr. Winner of the First Prize Oral Presentation Award at the *21st Annual RACI Research and Development Conference*, Canberra, Australia, 11-13 December 2013.

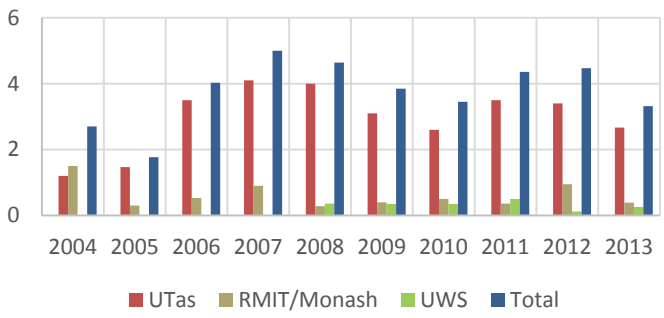
AI Shallan. Fresh Science 2013 national finalist, Melbourne, Australia, 30 April 2013.

L Yan. Shortlisted (best 11) for Best Poster Award for "L Yan, AI Shallan, B Arnold, MC Breadmore, M Macka. Low-cost portable off-the shelf fluorescence microscopy for visualisation of microfluidics." at the *40th International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2013 Hobart)*, Hobart, Australia, 18-21 November 2013.

APPENDIX



ACROSS Journal Publications



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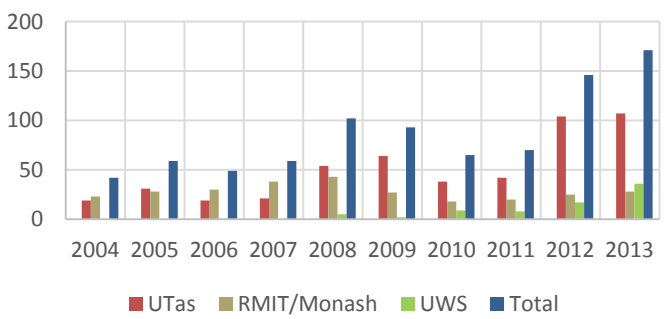
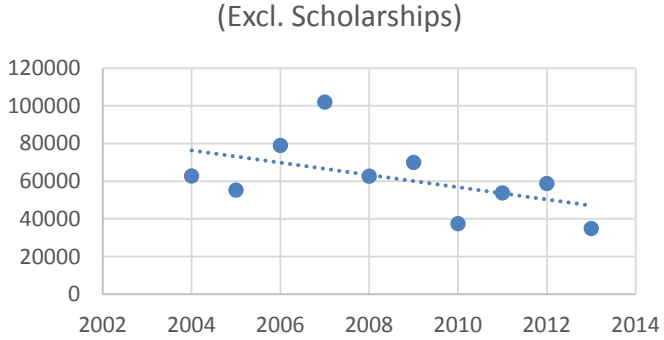
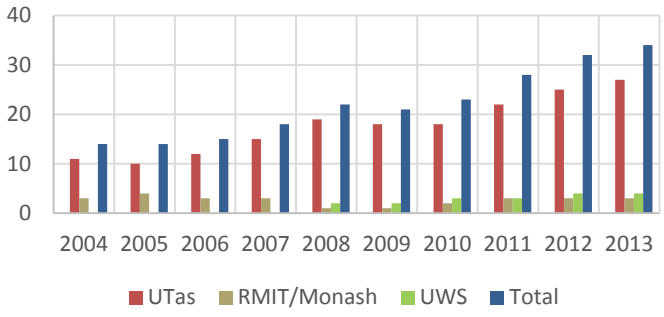


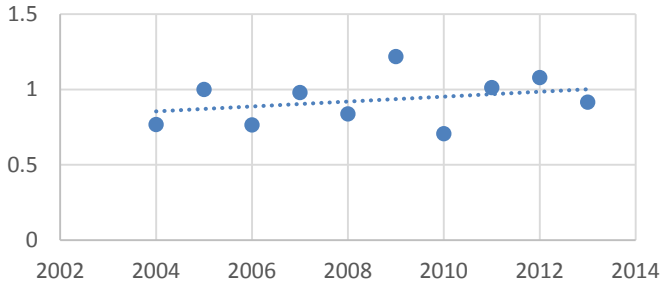
ACROSS Conference Presentations



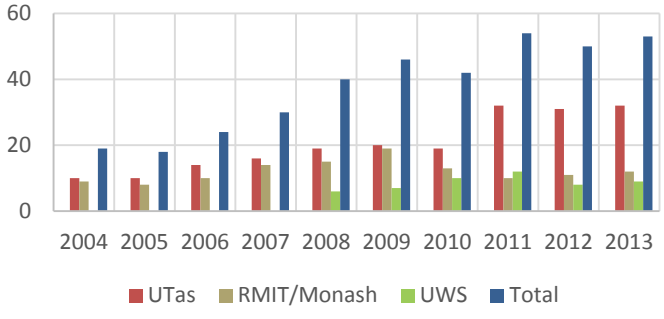
ACROSS Grant Spend per Publication ($)
(Excl. Scholarships)



ACROSS Research Staff



ACROSS Publication per Researcher
(Staff plus PhD/MSc)



ACROSS PhD/MSc Students

ACROSS

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