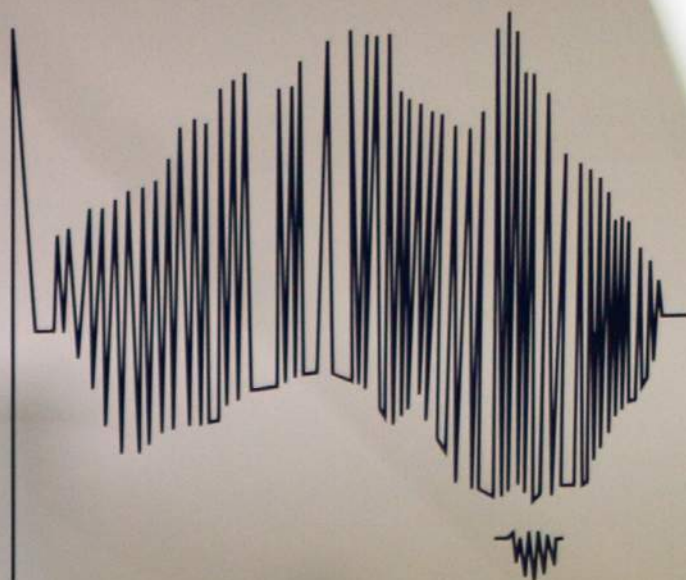


ACROSS

Australian Centre
for Research on
Separation Science



ACROSS ANNUAL REPORT

2014



UNIVERSITY *of*
TASMANIA



MONASH
University



University of
Western Sydney



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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 complex 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 also spans the spectrum between nanoscale technology and exploration, and macro-scale 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. Therefore 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:

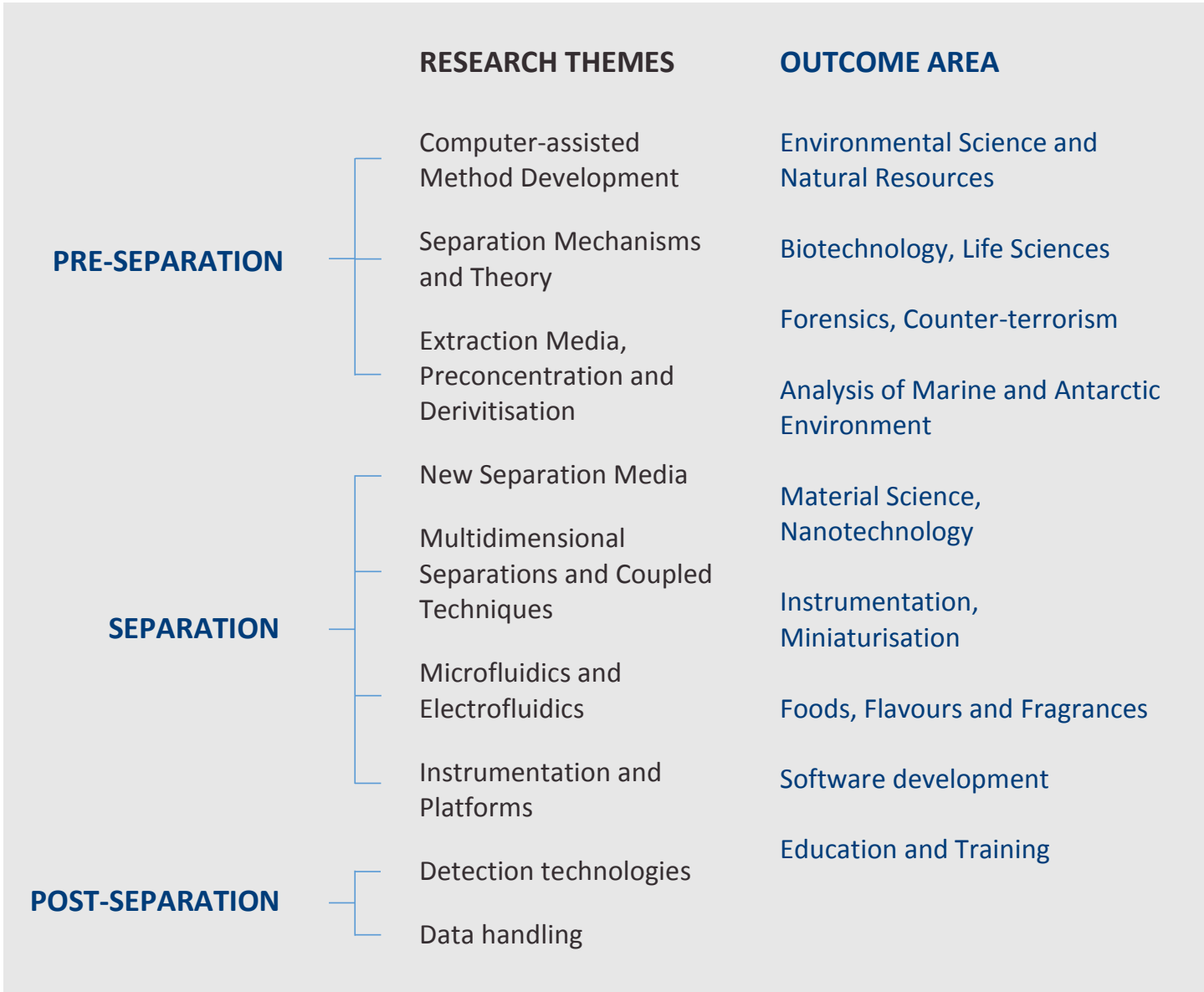
- (i) Maintain an outstanding level of international renown in research on separation science.
- (ii) Coalesce and enhance Australian research on separation science into an organised structure, operating with a coordinated research plan, which addresses and exploits the most exciting and innovative themes 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.

Further and greater advances in separation science will be an important driver behind a very broad spectrum of Australian science for the foreseeable future.

ACROSS Research Structure

Research in ACROSS has been established based upon 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-based 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.



Director's Report

Another year has passed us by, and I believe we can honestly label 2014 as a transformational year for ACROSS. However, before I discuss some of the big achievements and changes to our Centre over the past 12 months, I'd first like to acknowledge the contribution of our founding Director, Professor Paul Haddad, who stepped down as Director at the end of 2013 to enjoy his well-earned retirement, after 13 years steering what has been an ever growing, and sometimes unwieldy ship. Paul was of course front and centre during this period of growth and success for ACROSS, and it is his vision in establishing ACROSS, that we are all thankful for and acknowledge here. 2014 also saw the last of the Pfizer Analytical Research Centre (PARC) funding projects successfully completed, of which Paul was also Director. This marks the end of one element of what has been an extremely productive and positive industry-academia based collaboration. However, research projects with Pfizer continue through an on-going ARC Linkage Grant, and this will no doubt spawn further joint initiatives, given the productivity and trust built up during the life of PARC.

However, with all endings come beginnings, and despite retirement, Paul will remain a contributing member of ACROSS in his role as Emeritus Professor, and continue to fully support the activities of the Centre going forward, and I personally am pleased to be able to rely on Paul's sound advice and wealth of scientific knowledge and experience, as we take ACROSS forward through its next stage of development. For a full history of Paul's pivotal role in the leadership and development of ACROSS, see 'Cutting ACROSS Separation Science', The Analytical Scientist, Nov 2014.



***I'd first like to
acknowledge the
contribution of our
founding Director,
Professor Paul
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retirement.***

Brett Paull

Now back to 2014 and the year that was. As you'll be able to read throughout the report, 2014 marked another significant year of achievements for the Centre, with the news of major grant successes, growth in membership (most notable in post-graduate students), increased numbers of journal papers and conference presentations, and the hosting of our first full ACROSS conference ('The Gathering'), which was open to the full ACROSS membership from all of the ACROSS University nodes, and attended by ~80 members (which in itself highlights the measure of ACROSS in 2014). Although detailed below under 'Funding successes', I first wish to make special mention here of two significant initiatives launched in 2014.

***“ACROSS was host to no fewer than 35 national
and international scholars in 2014, the latter
originating across 17 different countries.”***

Firstly, 2014 saw the launch of ASTech, the ARC Training Centre for Portable Analytical Separation Technologies. ASTech is a joint initiative, set up to explore science and technologies that can lead to portable analytical separation systems that will enable point-of-sample analysis for complex samples in food, environmental, and clinical applications. ASTech is a partnership between the University of Tasmania and Trajan Scientific and Medical, with the University of Tasmania based ASTech investigators originating entirely from within the ranks of ACROSS. This significant initiative is being led by Professor Emily Hilder as Director (<http://astech.org.au/>). Secondly, 2014 marked the beginning of the second phase in the life of ARC Centre of Excellence for Electromaterials Science (ACES), following a successful funding ARC CoE bid, led by the University of Wollongong. Within this Centre, ACROSS researchers from the University of Tasmania are leading the Electrofluidics and Diagnostics Theme, which will see the establishment of a new research focus within ACROSS, and the growth of exciting fundamental research projects in the area of applied materials science, carried out in collaboration with leading materials scientists, based within ACES partner institutions within Australia and across the world (<http://www.electromaterials.edu.au/>).

So now on to our underlying developments and achievements in 2014. These I will summarise below, addressing the changes to the staffing profile of the Centre, our collective research outcomes for the period, the funding record achieved for 2014, and some significant awards and accolades bestowed upon individuals working within ACROSS.

Staffing Changes

In 2014 ACROSS said farewell to the following Post-doctoral Fellows and Visiting Scholars: Dr. Blagoj Mitrevski (Monash), Associate Professor Ming Jiang (Monash), Dr. Wei Boon Hon (UTas), Dr. Naama Karu (UTas), Dr. Philip Zakaria (UTas), Dr. Yi Heng Nai (UTas), Professor Zhenggui Wei (UTas) and Dr. Arianne Soliven (UWS). I'd like to mark their outstanding contributions to the Centre up to and throughout 2014, and wish them all the very best in their future endeavours.

However, joining us in 2014 were Dr. Georg Schuster, working with Professor Paul Haddad and Associate Professor Robert Shellie on an ARC funded Linkage project (UTas), Dr. Hong Heng See, working with Professor Michael Breadmore in the area of microfluidics (UTas), and Dr. Laura Tedone, also working with Associate Professor Shellie, once again on an ARC funded Linkage project (UTas). Additionally, Dr. Chadin Kulsing took up a position working with Professor Philip Marriott (Monash), and Dr. Sercan Pravadali-Cekic began a post-doctoral position working with Professor Andrew Shalliker (UWS). In 2014 ACROSS was also host to a significant number of Visiting Scholars and Honorary Associates, including Dr. Rob Haselberg, a visitor from the VU University, Amsterdam, Professor Charles Henry from Colorado State University, and Professor Hervé Cottet of the University of Montpellier II. For a full list of visiting researchers in 2014, including post-graduate student visitors, see page 24. In total ACROSS was host to no fewer than 35 national and international scholars in 2014, the latter originating across 17 different countries.

Research outcomes

In 2014 ACROSS continued to strengthen and expand its program of fundamental and applied research, with an increased number of researchers focusing on projects clustered within a number of distinctive themes, yet covering a very diverse spread of application areas and outputs. Based upon the collective projects and outputs for the year, these themes can be best categorised as (1) Environmental and Industrial Sciences, (2) Life Sciences, Food-stuffs and Natural Products, (3) Instrumental Technologies, and (4) Materials Science. The complete lists of conference presentations and research papers, presented and published in 2014, can be found within this report (page 47). From the collective outcomes listed, it is clear that ACROSS has shown particular growth in areas of microfluidics, portable instrumentation and materials chemistry over this reporting period, whilst maintaining its leading position in research into multidimensional separations, retention modelling and related theoretical aspects of chromatography.

The year has also seen a notable growth in the levels of industrial engagement with ACROSS, not only through several new funding partnerships (e.g. ARC Linkage), but through commercialisation and licencing of technologies developed from within ACROSS. For example, 2014 saw Professor Emily Hilder and the wider ‘MilliSpot’ team celebrate a significant milestone in announcing an agreement on licensing intellectual property, which could see the technology progress to market, and with Professor Michael Breadmore and the ‘Scantex’ team also signing a license agreement to bring their forensic scanning technology one step closer to a commercial technology. From within Professor Andrew Shalliker’s group at UWS, there was also considerable advances made in their patented ‘Active Flow Technology’, working in close collaboration with ThermoFisher Scientific on the road to product commercialisation.

In terms of actual metrics, 2014 saw a number of significant records reached. For example, 2014 saw ACROSS record it’s highest ever number of registered PhD and MSc students, at 57 across all three nodes. We also saw our collective research achieve its highest ever number of citations within a single year, at 1355 citations, a statistic boding well for the future as we strive to maintain our collective ERA rankings for research excellence. Turning to grant income, 2014 also saw ACROSS hit a new high, with ACROSS researchers

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listed as CIs on grants totaling no less than \$8.79M in 2014 (see complete list on page 44). Bolstered by the two large ARC Centre grants mentioned above, this figure also includes no fewer than 4 on-going ARC Future Fellowships, 7 ARC Discovery Grants, 8 ARC Linkage Grants and 1 ARC Linkage, Equipment and Facilities Grant. A truly outstanding portfolio of funding success and a true testament to the quality of our collective research efforts.

2014 saw numerous awards and recognition to ACROSS students and staff. The extensive and detailed list of student awards can be found on page 58. As for ACROSS staff, 2014 saw Professors Emily Hilder and Michael Breadmore listed within The Analytical Scientist’s ‘Top 40 under 40’ list of analytical chemistry high flyers, with Emily also being awarded the MR Banks Medal of the Royal Society of Tasmania. Dr. Rosanne Guijt was also successful in 2014 in being awarded a von Humboldt Fellowship. In addition to these personal awards, the international reputation of ACROSS members resulted in no fewer than 31 invites to present oral, keynote and plenary conference papers at leading international symposia in 2014.

So that was the year that was, and all that is left to say is how very proud I am to be able to deliver this annual report for 2014 on the collective achievements of the Australian Centre for Research on Separation Sciences (ACROSS).



Brett Paull

2014 ACROSS Performance at a Glance

Node	Research staff *	PhD, MSc students	BSc, Hons students	Grants (\$)	Publications	Conference presentations
UTas	22	33	2	8,037,217	55	74
Monash	2	12	0	508,746	15	9
UWS	5	12	1	242,950	16	27
ACROSS total	29	57	3	8,788,913	86	110

* Post-PhD

Key Personnel

Prof Brett Paull

Director, ACROSS (UTas)
DSc, PhD, BSc(Hons), FRSC, CChem
New Stars Professor, University of Tasmania



Brett Paull 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*.

- D Collins, EP Nesterenko, B Paull. Infrared photo-initiated fabrication of monolithic porous layer open tubular (monoPLOT) capillary columns for chromatographic applications. *RSC Adv.* 4 (2014) 28165-28170.
- E Duffy, DP Mitev, AA Kazarian, PN Nesterenko, B Paull. Separation and characterisation of detonation nanodiamond by capillary zone electrophoresis. *Electrophoresis.* 35 (2014) 1864-1872.
- X He, EP Nesterenko, PN Nesterenko, L Zhou, JD Glennon, JHT Luong, B Paull. Fabrication and characterisation of nano-templated carbon monolithic material. *Adv. Mats. Interface.* 5 (2013) 8572-8580.

Prof Paul Haddad

DSc, PhD, BSc(Hons), DipMilStud, FAA, FTSE, FRACI, FRSC, FFACS
Emeritus Distinguished Professor of Chemistry, University of Tasmania
Foundation Director, ACROSS
Foundation 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 an Emeritus Distinguished Professor of Chemistry and a former ARC Federation Fellow at the University of Tasmania, and is the former Director of ACROSS (2001-2013). 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.

- PR Haddad, PE Jackson. Ion Chromatography: Principles and Applications. *Journal of Chromatography Library*, Vol. 46, Elsevier Science Publishers, Amsterdam, The Netherlands, 1990, 798 pp.
- W Buchberger, PR Haddad. Effects of carrier electrolyte composition on separation selectivity in capillary zone electrophoresis of low molecular mass anions. *J. Chromatogr.* 608 (1992) 59-64.
- PR Haddad. Comparison of ion chromatography and capillary electrophoresis for the determination of inorganic ions. *J. Chromatogr. A.* 770 (1997) 281-290.

Prof Philip Marriott

Deputy Director, ACROSS (Monash)
PhD, BSc(Hons), FRACI, FFACS
Professor of Chemistry, Monash University, Distinguished Visiting Professor, Chung-Ang University, Korea.



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*.

- LW Sumner, A Amberg, D Barrett, R Beger, et al. Proposed minimum reporting standards for chemical analysis. *Metabolomics.* 3 (2007) 211-221.
- AC Lewis, N Carslaw, PJ Marriott, RM Kinghorn, P Morrison, AL Lee, KD Bartle, MJ Pilling. A larger pool of ozone-forming carbon compounds in urban atmospheres. *Nature.* 405 (2000) 778-781.
- P Marriott, R Shellie. Principles and Applications of Comprehensive two-dimensional Gas Chromatography. *TrAC-Trend. Anal. Chem.* 21 (2002) 573-583.

Prof Andrew Shalliker

Deputy Director, ACROSS (UWS)
DSc, PhD, BSc(Hons)
Professor, University of Western Sydney



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.

- F Gritti, I Leonardis, D Shock, P Stevenson, A Shalliker, G Guiochon. Performance of columns packed with the new shell particles, Kinetex-C18. *J. Chromatogr. A.* 1217 (2010) 1589-1603.
- G Guiochon, N Marchetti, K Mriziq, RA Shalliker. Implementations of two-dimensional liquid chromatography. *J. Chromatogr. A.* 1189 (2008) 109-168.
- RA Shalliker, BS Broyles, G Guiochon. Physical evidence of two wall effects in liquid chromatography. *J. Chromatogr. A.* 888 (2000) 1-12.

Dr Dario Arrua

PhD, BSc
ACROSS Postdoctoral Research Fellow, University of Tasmania



Dario Arrua graduated from the National University of Córdoba in Argentina, 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.

- RD Arrua, AP Hitchcock, WB Hon, M West, EF Hilder. Characterisation of polymer monoliths containing embedded nanoparticles by scanning transmission X-ray microscopy (STXM). *Anal. Chem.* 86 (2014) 2876-2881.
- RD Arrua, A Nordborg, PR Haddad, EF Hilder. Monolithic cryopolymers with embedded nanoparticles. I. Efficient capillary chromatography of proteins using neutral embedded nanoparticles. *J. Chromatogr. A.* 1273 (2013) 26-33.
- D Arrua, MC Strumia, MA Nazareno. Immobilization of caffeic acid on a polypropylene film: Synthesis and antioxidant properties. *J. Agric. Food Chem.* 58 (2010) 9228-9234.

A/Prof Andrew Bowie

PhD, MSc, BSc(Hons), MRSC, CChem
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. He relocated to the University of Tasmania in 2001 and in 2006 commenced a new position as Senior Research Scientist at the University of Tasmania, working jointly in the 'Carbon' 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.

- AR Bowie, P van der Merwe, F Quéroué, T Trull, et al. Iron budgets for three distinct biogeochemical sites around the Kerguelen Archipelago (Southern Ocean) during the natural fertilisation study, KEOPS-2. *Biogeosciences.* 12 (2014) 4421-4445.
- PW Boyd, AJ Watson, CS Law, ER Abraham, et al. Phytoplankton bloom upon mesoscale iron fertilisation of polar Southern Ocean waters. *Nature.* 407 (2000) 695-702.
- AR Bowie, EP Achterberg, RFC Mantoura, PJ Worsfold. Determination of sub-nanomolar levels of iron in seawater using flow injection with chemiluminescence detection. *Anal. Chim. Acta.* 36 (1998) 189-200.

Prof Michael Breadmore

PhD, BSc(Hons)
ARC Future 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 an associate editor of the *Australian Journal of Chemistry*, and a member of the editorial boards of *Electrophoresis*, *Journal of Chromatography A*, *Journal of Visualised Experiments* and *Aviation Security International*.



- MC Breadmore, KA Wolfe, IG Arcibal, WK Leung, D Dickson, BC Giordano, ME Powers, JP Ferrance, S Feldman, PM Norris, JP Landers. Microchip-based DNA purification from biological samples. *Anal. Chem.* 75 (2003) 1880-1886.
- MC Breadmore, JP Quirino. 100,000-fold concentration of anions in capillary zone electrophoresis using electroosmotic flow controlled counter-flow isotachophoretic stacking under field amplified conditions. *Anal. Chem.* 80 (2008) 6373-6381.
- AI Shallan, RM Guijt, MC Breadmore. Electrokinetic size and mobility traps for on-site therapeutic drug monitoring. *Angew. Chem. Int. Ed.* 54 (2015) 7359-7362.

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 (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.



- A Sutton, E Read, AR Maniego, Joel J Thevarajah, J-D Marty, M Destarac, M Gaborieau, P Castignolles. Purity of double hydrophilic block copolymers revealed by capillary electrophoresis in the critical conditions. *J. Chromatogr. A.* 1372 (2014) 187-195.
- Y Guillaneuf, P Castignolles. Using apparent molecular weight from SEC in controlled /living polymerization and kinetics of polymerization. *J. Polym. Sci. A. Polym. Chem.* 46 (2008) 897-911.
- JM Asua, S Beuermann, M Buback, P Castignolles, et al. Critically evaluated rate coefficients for free-radical polymerization, 5, Propagation rate coefficient for butyl acrylate. *Macromol. Chem. Phys.* 205 (2004) 2151–2160.

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 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.



- PJ Marriott, S-T Chin, B Maikhunthod, H-G Schmarr, S Bieri. Multidimensional gas chromatography. *TrAC-Trend. Anal. Chem.* 34 (2012) 1-21.
- S-T Chin, GT Eyres, PJ Marriott. Identification of potent odourants in wine and brewed coffee using gas chromatography-olfactometry and comprehensive two-dimensional gas chromatography. *J. Chromatogr. A.* 1218 (2011) 7487-7498.
- S-T Chin, PJ Marriott. Multidimensional gas chromatography beyond simple volatiles separation. *Chem. Commun.* 50 (2014) 8819-8833.

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.



- M Gray, GR Dennis, P Wormell, RA Shalliker, P Slonecker. Two dimensional reversed-phase-reversed-phase separations: Isomeric separations incorporating C18 and carbon clad zirconia stationary phases. *J. Chromatogr. A.* 975 (2002) 285-297.
- M Gray, GR Dennis, P Wormell, P Slonecker, RA Shalliker. Comprehensive two-dimensional separations of complex mixtures using reversed-phase reversed-phase liquid chromatography. *J. Chromatogr. A.* 1041 (2004) 101-110.
- GR Dennis, GLD Ritchie. Dilute-solution field gradient induced birefringence and molecular quadrupole moment of benzene. *J. Phys. Chem.* 95 (1991) 656-660.

A/Prof Greg Dicinoski

PhD, BAppSci(Hons), FRACI, CChem
Associate Professor, University of Tasmania

Greg Dicinoski holds the degrees of BAppSci(Hons) and PhD from the University of Central Queensland. Until 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.



- JP Hutchinson, CJ Evenhuis, C Johns, AA Kazarian, et al. Identification of inorganic improvised explosive devices by analysis of postblast residues using portable capillary electrophoresis instrumentation and indirect photometric detection with a light-emitting diode. *Anal. Chem.* 79 (2007) 7005-7013.
- AC Grosse, GW Dicinoski, MJ Shaw, PR Haddad. Leaching and recovery of gold using ammoniacal thiosulfate leach liquors (a review). *Hydrometallurgy.* 69 (2003) 1-21.
- JP Hutchinson, C Johns, MC Breadmore, EF Hilder, et al. Identification of inorganic ions in post-blast explosive residues using portable CE instrumentation and capacitively coupled contactless conductivity detection. *Electrophoresis.* 29 (2008) 4593-4602.

Dr Marion Gaborieau

PhD, MSc(Hons)
Research lecturer, University of Western Sydney

Marianne 'Marion' Gaborieau completed her PhD at the Max Planck Institute for Polymer Research in Mainz, Germany. Her research potential was recognized through the award of an Australian Postdoctoral Fellowship Industry (APDI) by the Australian Research Council. She holds a research lectureship in the School of Science and Health, and the Molecular Medicine Research Group at UWS. She is an expert in the use of Nuclear Magnetic Resonance (NMR) spectroscopy for the advanced characterisation of macromolecules, especially in the solid state. She also has a solid experience in separation science, in particular size-exclusion chromatography and capillary electrophoresis. Applications range from paints and adhesives to foods, bioplastics and drug delivery systems.



- C Gartner, BL Lopez, L Sierra, R Graf, HW Spiess, M Gaborieau. Interplay between structure and dynamics in chitosan films investigated with solid-state NMR, dynamic mechanical analysis and X-ray diffraction. *Biomacromolecules.* 12 (2011) 1380-1386.
- M Gaborieau, SPS Koo, P Castignolles, T Junkers, C Barner-Kowollik. Reducing the degree of branching in polyacrylates via midchain radical patching: a quantitative melt-state NMR study. *Macromolecules.* 43 (2010) 5492-5495.
- P Castignolles, R Graf, M Parkinson, M Wilhelm, M Gaborieau. Detection and quantification of branching in polyacrylates by size-exclusion chromatography (SEC) and melt-state ¹³C NMR spectroscopy. *Polymer.* 50 (2009) 2373-2383.

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.



- Al Shallan, RM Guijt, MC Breadmore. Electrokinetic size and mobility traps for on-site therapeutic drug monitoring. *Angew. Chem. Int. Ed.* 54 (2015) 7359-7362.
- Al Shallan, P Smejkal, M Corban, RM Guijt, MC Breadmore. Cost-effective three-dimensional printing of visibly transparent microchips within minutes. *Anal. Chem.* 86 (2014) 3124-3130.
- RD Henderson, RM Guijt, L Andrewartha, TW Lewis, T Rodemann, A Henderson, EF Hilder, PR Haddad, MC Breadmore. Lab-on-a-Chip device with laser-patterned polymer electrodes for high voltage application and contactless conductivity detection. *Chem. Commun.* 48 (2012) 9287-9289.

Prof Emily Hilder

PhD, BSc(Hons), FRACI, CChem
Professor and ARC Future Fellow, University of Tasmania
Director, ARC Training Centre for Portable Analytical Separation Technologies

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*.



- T Rohr, EF Hilder, JJ Donovan, F Svec, MJ Fréchet. Photografting and the control of surface chemistry in three-dimensional porous polymer monoliths. *Macromolecules.* 36 (2003) 1677-1684.
- EF Hilder, F Svec, MJ Fréchet. Latex-functionalized monolithic columns for the separation of carbohydrates by micro anion-exchange chromatography. *J. Chromatogr. A.* 1053 (2004) 101-106.
- M Talebi, RA Shellie, EF Hilder, NA Lacher, PR Haddad. Semiautomated pH gradient ion-exchange chromatography of monoclonal antibody charge variants. *Anal. Chem.* 86 (2014) 9794-9799.

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.



- KC Saunders, A Ghanem, WB Hon, EF Hilder, PR Haddad. Separation and sample pre-treatment in bioanalysis using monolithic phases: A review. *Anal. Chim. Acta.* 652 (2009) 22-31.
- RD Arrua, AP Hitchcock, WB Hon, M West, EF Hilder. Characterization of polymer monoliths containing embedded nanoparticles by scanning transmission X-ray microscopy (STXM). *Anal. Chem.* 86 (2014) 2876-2881.

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.



- N Karu, R Reifen, Z Kerem. Weight gain reduction in mice fed panax ginseng saponin, a pancreatic lipase inhibitor. *J. Agric. Food. Chem.* 55 (2007) 2824-2828.
- N Karu, GW Dicoski, M Hanna-Brown, PR Haddad. Determination of pharmaceutically related compounds by suppressed ion chromatography: I. Effects of organic solvent on suppressor performance. *J. Chromatogr. A.* 1218 (2011) 9037-9045.
- N Karu, JP Hutchinson, GW Dicoski, M Hanna-Brown, K Srinivasan, CA Pohl, PR Haddad. Determination of pharmaceutically related compounds by suppressed ion chromatography: IV. Interfacing ion chromatography with universal detectors. *J. Chromatogr. A.* 1253 (2012) 44-51.

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.



- MC Breadmore, JRE Thabano, M Dawod, AA Kazarian, JP Quirino, RM Guijt. Recent advances in enhancing the sensitivity of electrophoresis and electrochromatography in capillaries and microchips (2006-2008). *Electrophoresis.* 30 (2009) 230-248.
- AA Kazarian, EF Hilder, MC Breadmore. Online sample pre-concentration via dynamic pH junction in capillary and microchip electrophoresis. *J. Sep. Sci.* 34 (2011) 2800-2821.
- AA Kazarian, EF Hilder, MC Breadmore. Utilisation of pH stacking in conjunction with a highly absorbing chromophore, 5-aminofluorescein, to improve the sensitivity of capillary electrophoresis for carbohydrate analysis. *J. Chromatogr. A.* 1200 (2008) 84-91.

Prof Mirek Macka

PhD, RNDr, FRACI CChem, MRSC
Professor and ARC Future Fellow, University of Tasmania

Mirek Macka holds the degrees of RNDr 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 an Australian Research Council Research Fellowship and an Marie Curie Excellence Grant and Fellowship, and currently holds an 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*.



- M Macka, P Andersson, PR Haddad. Changes in electrolyte pH due to electrolysis during capillary zone electrophoresis. *Anal. Chem.* 70 (1998) 743-749.
- Z Walsh, S Abele, B Lawless, D Heger, P Klán, MC Breadmore, B Paull, M Macka. Photo-initiated polymerisation of monolithic stationary phases using visible region LEDs. *Chem. Commun.* 48 (2008) 6504-6506.
- M Ryvolová, J Preisler, P Krásenský, F Foret, PC Hauser, B Paul, M Macka. Single point of detection combined contactless conductometric, photometric and fluorimetric on-capillary detector for capillary separation methods. *Anal. Chem.* 82 (2010) 129-135.

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.



- P Mahbub, P Zakaria, R Guijt, M Macka, G Dicinoski, M Breadmore, P Nesterenko. Flow injection analysis of organic peroxide explosives using acid degradation and chemiluminescent detection of released hydrogen peroxide. *Talanta*. 143 (2015) 191-197.
- P Mahbub, A Goonetilleke, GA Ayoko. Prediction model of the build-up of volatile organic compounds on urban roads. *Environ. Sci. Technol.* 45 (2011) 4453-4459.
- P Mahbub, GA Ayoko, A Goonetilleke, P Egodawatta, S Kokot. Impacts of traffic and rainfall characteristics on heavy metals build-up and wash-off from urban roads. *Environ. Sci. Technol.* 44 (2015) 8904-8910.

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.



- D Mitev, R Dimitrova, M Spassova, Ch Minchev, S Stavrev. Surface peculiarities of detonation nanodiamonds in dependence of fabrication and purification methods. *Diam. Relat. Mater.* 16 (2007) 776-780.
- DP Mitev, AT Townsend, B Paull, PN Nesterenko. Direct sector field ICP-MS determination of metal impurities in detonation nanodiamond. *Carbon*. 60 (2013) 326-334.
- T Tsoncheva, M Dimitrov, L Ivanova, D Paneva, D Mitev, B Tsintsarski, I Mitov, S Stavrev, C Minchev. Iron oxide modified diamond blends containing ultradispersed diamond. *J. Colloid. Interface. Sci.* 300 (2006) 183-189.

Dr Yi-Heng Nai

PhD, B.Biotech(Hons)

ACROSS Postdoctoral Research Fellow, University of Tasmania

Yi Heng Nai completed his B.Biotech(Hons) and Doctorate degrees from University of Tasmania. The research focus of his doctorate was on the development of new strategies to directly fingerprint microbial communities using microbial ribosomal RNA and capillary electrophoresis. Following that, he stayed in ACROSS (Pfizer Analytical Research Centre) for a postdoctoral fellowship with the focus on the development of analytical methodology for conjugate vaccines.



- GA Blanco, YH Nai, EF Hilder, RA Shellie, GW Dicinoski, PR Haddad, MC Breadmore. Identification of inorganic improvised explosive devices using sequential injection capillary electrophoresis and contactless conductivity detection. *Anal. Chem.* 83 (2011) 9068-9075.
- SC Phung, YH Nai, SM Powell, M Macka, MC Breadmore. Rapid and sensitive microbial analysis by capillary isotachopheresis with continuous electrokinetic injection under field amplified conditions. *Electrophoresis*. 34 (2013) 1657-1662.
- YH Nai, SM Powell, MC Breadmore. Capillary electrophoretic system of ribonucleic acid molecules. *J. Chromatogr. A*. 1267 (2012) 2-9.

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*.



- GV Lisichkin, AY Fadeev, PN Nesterenko, AA Serdan, PG Mingalev, DB Furman. Chemistry of surface grafted compounds. GV Lisichkin (Ed), Fizmatlit, Moscow, Russia, 2003, 592p.
- PN Nesterenko, B Paull, P Jones. High performance chelation ion chromatography. *RSC Chromatography Monographs Series*. RM Smith (Ed), The Royal Society of Chemistry, Cambridge, UK, 2010, 303p.
- PN Nesterenko, PR Haddad. Diamond-related materials as potential new separation media in separation science. *Anal. Bioanal. Chem.* 396 (2010) 205-211.

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.



- JP Quirino, S Terabe. Exceeding 5000-fold concentration of dilute analytes in micellar electrokinetic chromatography. *Science*. 282 (1998) 465-468.
- JP Quirino, PR Haddad. Online sample preconcentration in capillary electrophoresis using analyte focusing by micelle collapse. *Anal. Chem.* 80 (2008) 6824-6829.
- A Wuethrich, PR Haddad, JP Quirino. Green sample preparation for liquid chromatography and capillary electrophoresis of anionic and cationic analytes. *Anal. Chem.* 87 (2015) 4117-4123.

Dr Sara Sandron

PhD, MSc, BSc

ACROSS Postdoctoral Research Fellow, University of Tasmania

Sara Sandron held a fellowship at the Experimental Pharmacologic and Clinical Unit, Oncologic Reference Centre in Italy, from 2006 to 2008. There 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.



- S Sandron, A Rojas, NW Davies, PN Nesterenko, R Wilson, PR Haddad, RA Shellie, B Paull. Chromatographic methods for the isolation, separation and characterisation of dissolved organic matter. *Environ. Sci. Process. Impacts*. 17 (2015) 1531-1567.
- S Sandron, B Heery, V Gupta, DA Collins, EP Nesterenko, PN Nesterenko, M Talebi, S Bernie, F Thompson, GG Wallace, D Brabazon, F Regan, B Paull. 3D printed metal columns for capillary liquid chromatography. *Analyst*. 139 (2014) 6343-6347.
- NW Davies, S Sandron, PN Nesterenko, B Paull, R Wilson, PR Haddad, RA Shellie, A Rojas. Comment on "Structural characterization of dissolved organic matter: a review of current techniques for isolation and analysis" by E. C. Minor, M. M. Swenson, B. M. Mattson, and A. R. Oyler. *Environ. Sci. Process. Impacts*. 17 (2015) 495-496.

Dr Georg Schuster

PhD, Dipl.-Ing.
ACROSS Postdoctoral Research Fellow, University of Tasmania

Georg Schuster obtained his degree as Dipl.-Ing. of Pharmaceutical Chemistry at the NTA Isny in Germany, where his thesis was focused on developing capillary electrophoresis methods for the analysis of liquid biopharmaceutical drug formulations. Later on he was working with Wolfgang Linder at the University of Vienna where he was awarded a Dr. rer. nat. for developing new stationary phases for hydrophilic liquid chromatography and investigating the retention mechanism thereof. His postdoctoral research at ACROSS is focused on predicting liquid chromatography retention data based on structure-retention relationships using molecular modelling tools.



- G Schuster, W Lindner. Comparative characterization of hydrophilic interaction liquid chromatography columns by linear solvation energy relationships. *J. Chromatogr. A.* 1273 (2013) 73-94.
- G Schuster, W Lindner. Additional investigations into the retention mechanism of hydrophilic interaction liquid chromatography by linear solvation energy relationships. *J. Chromatogr. A.* 1301 (2013) 98-110.
- G Schuster, W Lindner. Chocolate HILIC phases: development and characterization of novel saccharide-based stationary phases by applying non-enzymatic browning (Maillard reaction) on amino-modified silica surfaces. *Anal. Bioanal. Chem.* 400 (2011) 2539-2554.

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, flavour and fragrance chemistry, sample preparation, and modelling of chromatographic retention behaviour.



- P Marriott, R Shellie. Principles and applications of comprehensive two-dimensional gas chromatography. *TrAC- Trend. Anal. Chem.* 21 (2002) 573-583.
- PJ Marriott, R Shellie, C Cornwell. Gas chromatographic technologies for the analysis of essential oils. *J. Chromatogr. A.* 936 (2001) 1-22.
- R Shellie, P Marriott, P Morrison. Concepts and preliminary observations on the triple-dimensional analysis of complex volatile samples by using GC×GC-TOFMS. *Anal. Chem.* 73 (2001) 1336-1344.

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.



- PG Stevenson, A Soliven, GR Dennis, F Gritti, G Guiochon, RA Shalliker. π -Selective stationary phases: (III) Influence of the propyl phenyl ligand density on the aromatic and methylene selectivity of aromatic compounds in reversed phase liquid chromatography. *J. Chromatogr. A.* 1217 (2010) 5377-5383.
- A Soliven, GR Dennis, G Guiochon, EF Hilder, PR Haddad, RA Shalliker. Cyano bonded silica monolith-Development of an in situ modification method for analytical scale columns. *J. Chromatogr. A.* 1217 (2010) 6085-6091.
- A Soliven, D Foley, L Pereira, GR Dennis, RA Shalliker, K Cabrera, H Ritchie, T Edge. Enhancing the separation performance of the first-generation silica monolith using active flow technology: Parallel segmented flow mode of operation. *J. Chromatogr. A.* 1334 (2014) 16-19.

Dr Mohammad Talebi

PhD, MSc, BSc
ACROSS Research Assistant, University of Tasmania

Mohammad Talebi 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 optimisation 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.



- M Talebi, RA Shellie, EF Hilder, NA Lacher, PR Haddad. Semi-automated pH gradient ion-exchange chromatography of monoclonal antibody charge variants. *Anal. Chem.* 86 (2014) 9794-9799.
- M Talebi, RD Arrua, A Gaspar, NA Lacher, PR Haddad, EF Hilder. Epoxy-based monoliths for capillary liquid chromatography of small and large molecules. *Anal. Bioanal. Chem.* 405 (2013) 2233-2244.
- G Abedi, N Hatambeygi, M Talebi. Method development and validation for optimised separation of salicylic, acetyl salicylic and ascorbic acid in pharmaceutical formulations by hydrophilic interaction chromatography and response surface methodology. *J. Chromatogr. A.* 1218 (2011) 5995-6003.

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.



- JP Hutchinson, P Zakaria, AR Bowie, M Macka, N Avdalovic, PR Haddad. Latex-coated polymeric monolithic ion-exchange stationary phases. 1. Anion-exchange capillary electrochromatography and in-line sample preconcentration in capillary electrophoresis. *Anal. Chem.* 77 (2005) 407-416.
- P Zakaria, JP Hutchinson, N Avdalovic, Y Liu, PR Haddad. Latex-coated polymeric monolithic ion-exchange stationary phases. 2. Micro-ion chromatography. *Anal. Chem.* 77 (2005) 417-423.
- P Zakaria, M Macka, G Gerhardt, PR Haddad. Pulsed potentiometric detection in capillary electrophoresis using platinum electrodes. *Analyst.* 125 (2000) 1519-1523.

Technical and Administrative Staff

Ms Marina Lantz

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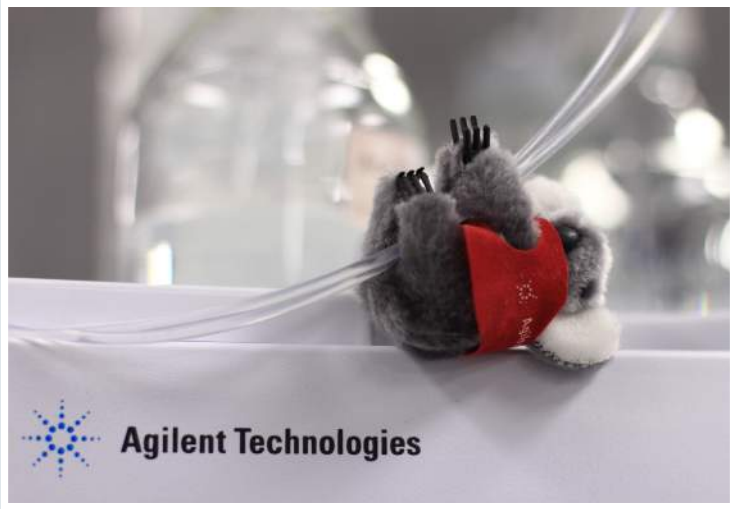
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Dr Kim Shepherd

Administrative Assistant, Monash University

Associate Members

Name	Affiliation	Duration	Location
Dr Mei-Lan Chen	Zhejiang Shuren University, China	December 2014 - December 2015	UTAS
Dr Wei-Qing Chen	Zhejiang Shuren University, China	December 2014 - December 2015	UTAS
Prof Hernan Cortes	Hernan J Cortes Consulting LLC, America	January 2013 - December 2015	UTAS
Dr Pascal Craw	CSIRO Marine And Atmospheric Research	June 2014 - June 2018	UTAS
Dr Jailson Cardoso Dias	Universidade Estadual de Campinas, Brasil	September 2012 - August 2014	UTAS
Dr Greg Dicinoski	Reserve Bank of Australia	March 2014 - December 2016	UTAS
Dr Adam Gaudry	KD Analytical, Australia	September 2014 - September 2015	UTAS
Dr Andrew Gooley	Trajan Scientific Australia Pty Ltd	February 2011 - December 2017	UTAS
Dr Christiano Funari	São Paulo Research Foundation, Brasil	November 2012 - November 2015	UTAS
Dr Cari Sanger-van de Griend	Kantisto BV, The Netherlands	September 2013 - September 2016	UTAS
Dr Estrella Sanz Rodriguez	University of Tasmania, Australia	July 2014 - July 2016	UTAS
Prof Zhenggui Wei	Nanjing Agricultural University, China	April 2013 - May 2015	UTAS



Research Students

Name	Degree	Started	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	MC Breadmore RM Guijt C Bolch
Jalal Althakafy	PhD	2014	PPCPs analysis: Potential unintended environmental impacts of modern chemicals	PJ Marriott M Grace
Nicolaas Bester	PhD	2013	Construction and application of a low-cost, low power capillary electrophoresis apparatus for independent and remotely-controlled monitoring of low concentration analytes	MC Breadmore RM Gujit HH See
Esme Candish	PhD	2011	Novel polymeric monolithic devices to aid sample preparation in bioanalysis	EF Hilder RA Shellie A Gooley
Farhan Cecil	PhD	2014	Detection in microseparation formats designed, modelled and fabricated utilising modern engineering technologies	M Macka PN Nesterenko A Henderson A Cole
Christopher Desire	PhD	2013	Polymer nanoparticles and their assembled supracolloidal monolithic structures for applications in separation science	EF Hilder RD Arrua
Emer Duffy	PhD	2011	Carbonaceous nanoparticles and carbon on carbon composite materials	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
Matthew Gardener	Honours	2014	New optical biosensors	EF Hilder
Ben Gaskell*	Honours	2014	New approaches to paperspray and extractive nano electrospray ionisation	EF Hilder RA Shellie
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

Name	Degree	Started	Thesis Title	Supervisors
Vipul Gupta	PhD	2013	Miniaturised chromatographic technologies via addative fabrication	B Paull PN Nesterenko
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
Andrew Jones	PhD	2014	Reaction flow chromatography	RA Shalliker G Dennis
Mohammad Sharif Khan	PhD	2014	Modulation studies in comprehensive two-dimensional gas chromatography	PJ Marriott ST Chin
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 Kocic	PhD	2010	Ultra-high resolution separations of complex samples derived from biological matrices	RA Shalliker GR Dennis
Chadin Kulsing	PhD	2013	Novel concepts in capillary electrophoresis	M Hearn PJ Marriott
Thomas Lawson	PhD	2012	Micro/Nanoparticle based composites.	B Paull PN Nesterenko
Feng Li	PhD	2014	Microfluidic Devices integrated with nanochannels for sample-in/answer-out analysis of pharmaceuticals and related compounds in body fluids	MC Breadmore RM Gujit
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	M Gaborieau P Castignolles J Aldrich-Wright M Jones
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
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 K Pas

Name	Degree	Started	Thesis Title	Supervisors
Ansara Noori	PhD	2013	Atmospheric monitoring by integrated miniaturised spectro-chemical sensors on small and micro-unmanned aerial vehicles	M Macka A Lucieer
James Oliver*	PhD	2010	Investigating and applying free solution capillary electrophoresis with direct UV detection to bioethanol research	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 Peristy	PhD	2011	Preparation and characterisation of diamond based stationary phases for ultra high performance liquid chromatography	PN Nesterenko B Paull
Sui Ching Phung	PhD	2012	Isotachophoresis of cells	MC Breadmore RM Guijt 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	Two-dimensional 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 PR Haddad 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 (P/T)	2008	Selectivity in separations	RA Shalliker GR Dennis
Adam Sutton	MSc	2014	Characterisation of double hydrophilic block copolymers	P Castignolles M Gaborieau F Li M Destarac
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
Faustino Tarongoy	PhD	2014	Selectivity enhancement in separation science using responsive materials	JP Quirino, PR Haddad
Danielle Taylor*	Honours	2013	Characterisation of DNA-anticancer drug interactions by capillary electrophoresis	P Castignolles, M Gaborieau, J Aldrich-Wright

Name	Degree	Started	Thesis Title	Supervisors
Joel Thevarajah	PhD	2013	Characterisation of chitosan and its films for tissue engineering	M Gaborieau P Castignolles M O'Connor R Wuhrer C Lefay
Michelle Toutounji	MSc	2014	Characterisation of sugars and starch in breakfast cereals to understand their digestibility	M Gaborieau P Castignolles A Shrestha R Ward
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
Renée Webster	PhD	2012	Advanced molecular separation and characterisation techniques for trace oxidation and thermal degradation products of fuels	PJ Marriott D Evans
Yabin Wen	PhD	2014	Rapid method development in pharmaceutical analysis using quality-by-design principles	RA Shellie PR Haddad
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 Whitty	MSc	2014	Assessment of the "smart" polymer poly(acrylic acid) for drug delivery	M Gaborieau P Castignolles M Jones
Alain Wuethrich	PhD	2013	Green sample preparation in analytical chemistry: Stacking and solventless extraction	JP Quirino PR Haddad
Dandan Yan	PhD	2013	Identification of the aromatic relevant compounds in hop essential oil by comprehensive two-dimensional gas chromatography - rapid scanning quadrupole mass spectrometry	RA Shellie A Koutoulis
Li Yan	PhD	2014	Portable liquid chromatographic separation platforms	M Macka PN Nesterenko B Paull R Stanley
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

Students who completed their project during 2014 are marked with an asterisk.

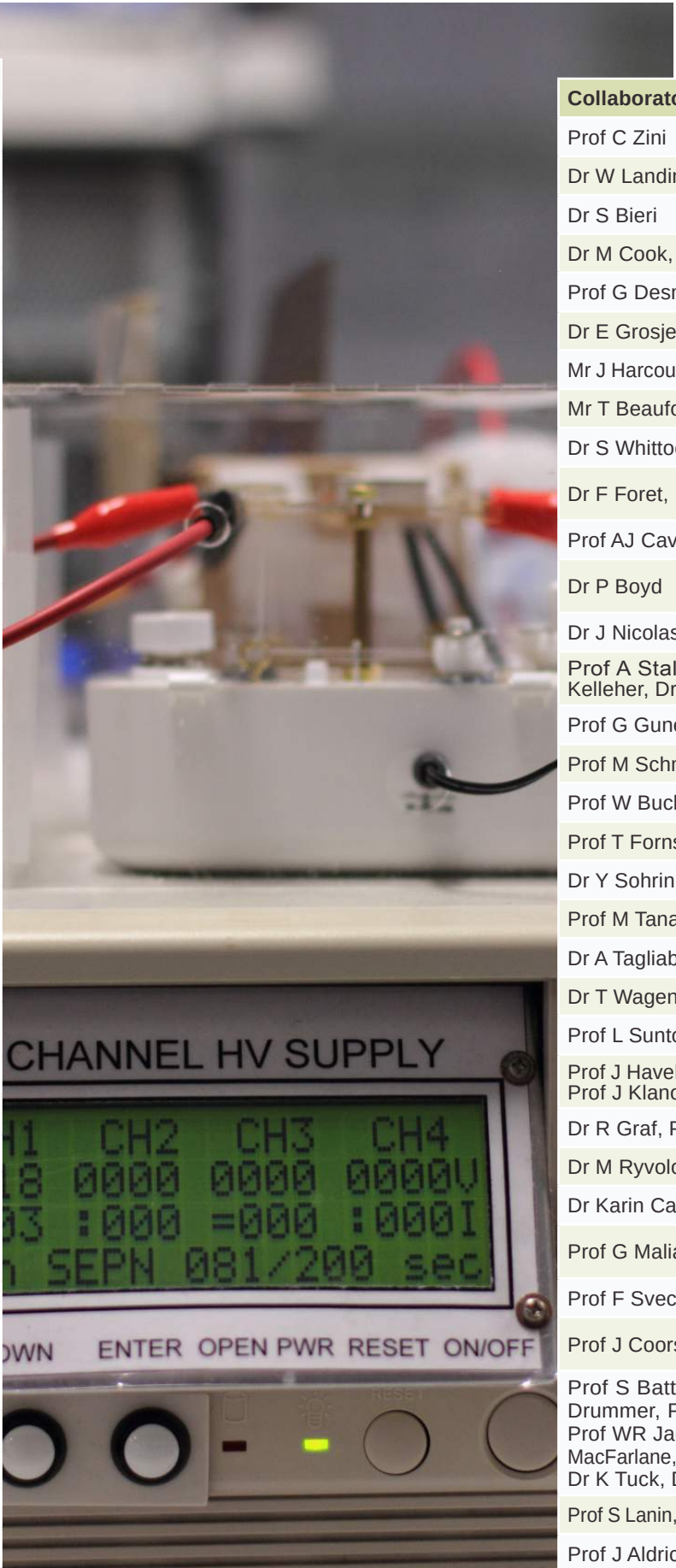
Visitors to ACROSS

Visitor	Country	Institution	Period of visit	Location
Prof Stefan Bon	United Kingdom	University of Warwick	1 month	UTas
Mr Joan Marc Cabot	Spain	University of Barcelona	6 months	UTas
Ms Michely Capobiango	Brazil	Federal University of Minas Gerais	1 year	Monash
Ms Marcella Casagrande	Brazil	Federal University of Rio Grande do Sul	1 year	Monash
Ms Zuzana Cieslarová	Brazil	University of Campinas	9 weeks	UTas
Prof Hervé Cottet	France	University of Montpellier II	2 weeks	UTas
Mr Milos Dvorak	Czech Republic	Brno University of Technology	1 year	UTas
Ms Elisenda Fornells	Spain	University of Barcelona	6 months	UTas
Prof Tadeusz Gorecki	Canada	University of Waterloo	3 months	UTas
Dr Wren Greene	Australia	Deakin University	2 weeks	UTas
Ms Constanze Hartmann	Germany	Erlangen University	3 months	Monash
Dr Rob Haselberg	The Netherlands	VU University	3 months	UTas
Mr Brendan Heery	Ireland	Dublin City University	10 weeks	UTas
Prof Charles Henry	America	Colorado State University	2 weeks	UTas
Mr Brendan Holland	Australia	Deakin University	1 week	UTas
Mr Jesse Hyslop	America	University of Montana	2 months	UTas
Prof Ming Jiang	China	Huazhong University of Science and Technology	1 year	Monash
Ms Umme Kalsoom	Australia	Edith Cowan University	12 months	UTas
Mr Itsuya Kawase	Japan	Gifu University	3 months	UTas
Ms Sabrina Kröger	Germany	Muenster University	3 months	Monash

Visitor	Country	Institution	Period of visit	Location
Mr Chunyapuk Kukusamude	Thailand	Khon Kaen University	9 months	UTas
Mr Jean-Baptiste Lena	France	University of Montpellier	10 months	UWS
Prof Matthew Linford	USA	Brigham Young University	2 weeks	UTas
Ms Nor Akma Binti Mamat	Malaysia	University of Technology	3 months	UTas
Ms Raissa Mastello	Brazil	Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP)	1 year	Monash
Dr Nantana Nuchtavorn	Thailand	Siam University	6 months	UTas
Mr Roman Papoušek	Czech Republic	Palacky Univeristy	3 months	UTas
Ms Pornpan Prapatpong	Thailand	Mahidol University	1 year	UTas
Ms Heide Rabanes	Philippines	Ateneo de Manila University	1 year	UTas
Mr Bhupinder Singh	USA	Brigham Young University	2 weeks	UTas
Ms Phimpha Soisungnoen	Thailand	Khon Kaen University	1 year	UTas
Dr Paul Stevenson	Australia	Deakin University	1 week	UTas
Ms Laura Tedone	Italy	University of Messina	1 year	UTas
Ms Lee Yien Thang	Malaysia	University of Technology	3 months	UTas
Ms Rachel West	United Kingdom	Warwick University	3 months	Monash

Collaborators and Industry Links

Collaborator	Institution / Company
Dr R Wuhrer	Advanced Materials Characterisation Facility, University of Western Sydney, New South Wales
Mr R Minett, Mr D Tunks	Agilent Technologies, Australia
Dr M Kratzmayer, Mr Fritz Bek	Agilent Technologies, Germany
Mr G Lee, Mr C Myerholtz	Agilent Technologies, USA
Dr D Gigmès, Dr Y Guillaneuf, Dr C Lefay, Dr JL Clement	Aix-Marseilles University, France
Mr G Hince, Dr I Snape	Australian Antarctic Division, Tasmania
Mr C Frost, Mr B Jones	Australian Customs Service, Canberra, ACT
Prof J Cooper-White	Australian Institute for Bioengineering and Nanotechnology, University of Queensland, Queensland
Dr M Ellwood	Australian National University, Canberra, ACT
Dr E Gilbert, Dr J Mata	Australian Nuclear Science and Technology Organisation (ANSTO), New South Wales
A/Prof A Horna	Bata University, Czech Republic
Dr P Sedwick	Bermuda Institute of Ocean Sciences, Bermuda
Prof JHT Luong	Biotechnology Research Institute, National Research Council, Canada
Dr H Bizzo	Brazilian Enterprise for Agricultural Research, Brazil
Prof M Linfood	Brigham Young University, USA
Dr T Rodemann, Dr A Townsend	Central Science Laboratories, University of Tasmania, Tasmania
Prof S Blain	Centre d'Océanologie de Marseille, France
Prof RG Gilbert	Centre for Nutrition and Food Science, University of Queensland, Queensland
Prof G Gas, Dr L Krcmova, Prof P Solich	Charles University, Czech Republic
Prof HK Choi	Chung-Ang University, Korea
Prof LC Wang	Chung Shiu University, Taiwan
Dr C Hassler, Dr C Mancuso-Nichols, Dr S Rintoul, A/Prof T Trull	CSIRO Marine and Atmospheric Research, Tasmania
Dr G Moad	CSIRO Materials Science and Engineering, Clayton, Victoria
Dr B Pejčić	CSIRO Perth, Western Australia
Prof BC Lin, Prof GW Xu, Dr ZD Zeng	Dalian Institute for Chemistry Physics, China
Dr J Adcock, Prof N Barnett, Dr X Conlan, Dr P Francis, Dr P Stevenson	Deakin University, Victoria
Dr D Evans, Mr P Rawson	Defence Science and Technology Organisation, Fishermans Bend, VIC
Dr HG Schmarr	Dienstleistungszentrum Ländlicher Raum – Rheinpfalz, Germany
Dr K Flook, Dr Y Liu, Mr D Moore, Mr CA Pohl, Dr J Schibler, Dr K Srinivasan	Thermo Scientific, California, USA
Dr W Winniford	Dow Chemical Company, USA
Mr B Schlensky	eDAQ, Sydney, New South Wales
Dr M Boyce	Edith Cowan University, Western Australia
Prof Z Cardeal	Federal University of Minas Gerais, Brazil
Prof C Rezende	Federal University of Rio de Janeiro, Brazil



Collaborator	Institution / Company
Prof C Zini	Federal University of Rio Grande do Sul, Brazil
Dr W Landing	Florida State University, USA
Dr S Bieri	Food Authority, Geneva, Switzerland
Dr M Cook, Dr P Pigou	Forensic Science Services, South Australia
Prof G Desmet, Prof S Eeltink	Free University of Brussels, Belgium
Dr E Grosjean, Dr G Logan	Geoscience Australia, Canberra, ACT
Mr J Harcourt, Ms G de Plater, Mr M Smith	Grey Innovation, Victoria
Mr T Beaufort	Grinders P/L, Melbourne, Victoria
Dr S Whittock	Hop Products Australia, Tasmania
Dr F Foret, Dr P Kuban	Institute of Analytical Chemistry, Academy of Sciences, Czech Republic
Prof AJ Cavaleiro	Institute of Chemistry of the Sao Paulo State University, Brazil
Dr P Boyd	Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Tasmania
Dr J Nicolas, Dr S Mura	Institut Galien Paris-Sud, University Paris-Sud, France
Prof A Stalcup, Dr D Brabazon, Dr B Kelleher, Dr EP Nesterenko	Irish Separation Science Cluster, Dublin City University, Ireland
Prof G Gunes	Istanbul Institute of Technology, Turkey
Prof M Schmidt	Johannes Gutenberg University, Germany
Prof W Buchberger, Dr Ivo Nischang	Johannes Kepler University Linz, Austria
Prof T Fornstedt, Dr J Samuelson	Karlstad University, Sweden
Dr Y Sohrin	Kyoto University, Japan
Prof M Tanaka	Kyoto Institute of Technology, Japan
Dr A Tagliabue	Laboratoire des Sciences du Climat et de l'Environnement, France
Dr T Wagener	Laboratoire d'Océanographie de Villefranche, France
Prof L Suntornsuk, Prof P Wilairat	Mahidol University, Thailand
Prof J Havel, Prof V Kanicky, Prof P Klan, Prof J Klanova	Masaryk University, Czech Republic
Dr R Graf, Prof HW Spiess	Max Planck Institute for Polymer Research, Germany
Dr M Ryvolova	Mendel University, Czech Republic
Dr Karin Cabrera	Merck, Germany
Prof G Maliaras	Microelectronics Centre of Provence, École des Minés de Saint-Étienne, France
Prof F Svec	Molecular Foundry, Lawrence Berkeley National Laboratory, USA
Prof J Coorssen, Dr M O'Connor	Molecular Medicine Research Group, University of Western Sydney, New South Wales
Prof S Batten, Prof A Chaffee, Prof O Drummer, Prof M Grant, Prof M Hearn, Prof WR Jackson, Prof D Lupton, Prof D MacFarlane, Prof T Patti, Prof P Perlmuter, Dr K Tuck, Dr D Turner	Monash University, Victoria
Prof S Lanin, Prof O Shpigun, Dr A Zatirakha	Moscow State University, Russia
Prof J Aldrich-Wright	NANO Group, University of Western Sydney, New South Wales

Collaborator	Institution / Company
Dr D Diamond	National Centre for Sensor Research, Dublin City University, Ireland
Dr T Naumovski, Prof K Chan	National Institute of Complementary Medicine, University of Western Sydney & University of Sydney, New South Wales
Prof M Gomes da Silva, Dr E Mateus, Prof A Ribeiro	New University of Lisbon, Portugal
Dr R Ward, Dr L Pallas	NSW Department of Primary Industries, Yanco, New South Wales
Prof M Destarac, Dr JD Marty, Dr S Harrison	Paul Sabatier University, France
Dr R Bemish, Mr O Drap, Dr W Farrell, Dr P Ferguson, Dr E Groeber, Dr M Hanna-Brown, Dr N Lacher, Dr R Robins, Dr R Szucs	Pfizer Inc., USA and United Kingdom
Dr I Lacik	Polymer Institute, Slovak Academy of Sciences, Slovakia
Prof H Hügel, Dr CG Li, Dr E Pang	RMIT University, Melbourne, Victoria
Prof Alberto Cavalheiro	São Paulo State University, Brazil
Prof S Shabala	School of Agricultural Science, University of Tasmania, Tasmania
Prof AJ Canty, Dr TW Lewis, Dr AJ Seen, Dr JA Smith	School of Chemistry, University of Tasmania, Tasmania
Dr A Lucieer	School of Land and Food, University of Tasmania, Tasmania
A/Prof A Koutoulis	School of Plant Science, University of Tasmania, Tasmania
Dr M Jones, Dr M Philips, Dr J Markham, Dr A Shrestha	School of Science and Health, University of Western Sydney, New South Wales
Dr M Jones	School of Zoology, University of Tasmania, Tasmania
Mr M Buchanan, Mr G Sidisky	Sigma Aldrich, Australia and USA
Dr C von Meuhlen	State University of Rio de Janeiro, Brazil
A/Prof S Battaglene, Dr Q Fitzgibbon	Tasmanian Aquaculture and Fisheries Institute, University of Tasmania, Tasmania
Prof R Stanley	Tasmanian Institute of Agriculture, University of Tasmania, Tasmania
Dr T Edge, Dr H Ritchie	ThermoScientific, United Kingdom
Dr A Gooley, Dr H.G. Wirth	Trajan Scientific and Medical, Victoria
Prof JM Lin	Tsinghua University, China
Dr V Schoemann	Université Libre de Bruxelles, Belgium
Prof J Glennon	University College Cork, Ireland
Dr J Harynuk	University of Alberta, Canada
Prof SM Rocha	University of Aveiro, Portugal
Prof P Hauser	University of Basel, Switzerland
Prof W Thormann	University of Bern, Switzerland
Dr J Dias, Prof L Kubota	University of Campinas, Brazil
Prof G Russell	University of Canterbury, New Zealand
Dr J Mosely	University of Durham, United Kingdom
Prof S Haswell	University of Hull, England & Deakin University, Victoria
Prof G Dugo, Prof P Dugo, Prof L Mondello, Dr P Tranchida	University of Messina, Italy
Prof H Cottet	University of Montpellier II, France
Prof U Karst, Dr S Nowak	University of Münster, Germany

Collaborator	Institution / Company
Dr M Lohan, Prof P Jones, Prof P Worsfold, Dr S Ussher	University of Plymouth, United Kingdom
Dr C Fellows	University of New England, New South Wales
Prof A Felinger	University of Pécs, Hungary
Prof J Corredor	University of Puerto Rico, Puerto Rico
Dr I Kempson	University of South Australia, South Australia
Prof P Doble	University of Technology, Sydney, New South Wales
Dr F Gritti, Prof G Guiochon	University of Tennessee, USA
Prof B Mizaikoff	University of Ulm, Germany
Prof SAF Bon	University of Warwick, United Kingdom
Prof G Wallace	University of Wollongong, New South Wales
Prof O Schmitz	University of Wuppertal, Germany
Mr R Hayes, Mr J Kelleher, Mr J Pearson	Victorian Police, Australia
Dr F Dehairs	Vrije Universiteit Brussel, Belgium
Prof CF Ivory	Washington State University, USA
Dr D Connolly	Waterford Institute of Technology, Ireland
Dr S Smith	Waters Corporation, United Kingdom
Dr P Lam	Woods Hole Oceanographic Institute, USA

Researcher Highlights

Aliaa Shallan

PhD Candidate ACROSS UTas

Point-of-care devices for better global health

Ms Aliaa Shallan has just submitted her PhD thesis under supervision of Dr. Guijt and Prof. Breadmore.

Working in the Australian Centre for Research on Separation Science (ACROSS) at the University of Tasmania, Ms Shallan developed a new method for nanofabrication through controlled dielectric breakdown. The method was applied for the analysis of positively and negatively charged pharmaceuticals for on-site therapeutic monitoring when blood levels are unpredictable. An example is monitoring antibiotic levels while treating sepsis, a critical condition with 30 to 50% mortality. This new method is simple, applicable to a wide range of pharmaceuticals and compatible with low cost microfabrication, and hence has the potential to bring therapeutic drug monitoring within the reach of many. The next step is to utilise the 3D-printing experience Ms Shallan has gained during her degree to fast prototype similar devices with different resins and to optimise the analysis for other pharmaceuticals.

- Al Shallan, AJ Gaudry, RM Guijt, MC Breadmore. Tuneable nanochannel formation for sample-in/answer-out devices. *Chem. Commun.* 49 (2013) 2816-2818.



- Al Shallan, P Smejkal, M Corban, RM Guijt, MC Breadmore. Cost-effective three-dimensional printing of visibly transparent microchips within minutes. *Anal. Chem.* 86 (2014) 3124-30.
- A Shallan, R Guijt, M Breadmore. Electrokinetic size and mobility traps for on-site therapeutic drug monitoring. *Angew. Chem. Int. Ed.* 54 (2015) 7359-7362.



Dario Arrua

Postdoctoral Researcher ACROSS UTas

Dario Arrua graduated from the Universidad Nacional de Córdoba (Córdoba, Argentina), where he obtained his Degree (2003) and PhD in Chemistry (2009). In 2009 he received a postdoctoral fellowship from CONICET (Argentinean Research Council) working on the development of polymeric materials with anti-radical activity.

Since 2010, Dario is a senior postdoctoral fellow at the Australian Centre for Research on Separation Science (University of Tasmania) working with Prof Emily Hilder. Dario has made contributions to the design of different polymer-based stationary phases for liquid chromatography. More recently, Dr Arrua started working in the design of polymer nanoparticles to be used as pseudostationary phases in electrokinetic chromatography.

Part of Dario's research work is performed in collaboration with recognised scientists both nationally and internationally. In collaboration with Prof Adam Hitchcock (McMaster University, Canada), Dr Takuji Ohigashi and Prof. Nobuhiro Kosugi (UVSOR, Japan), Dario is using scanning transmission x-ray microscopy (STXM) as a new technique for the characteri-

sation of stationary phases. Dr Arrua is also collaborating with Dr Deanna D'Alessandro (University of Sydney) exploring the application of metal-organic frameworks as stationary phases in separation science.

When not in the lab, Dario loves spending time with his boys playing soccer, watching sports or chasing a trout with his fishing rod.

- RD Arrua, AP Hitchcock, WB Hon, M West, EF Hilder. Characterisation of polymer monoliths containing embedded nanoparticles by scanning transmission x-ray microscopy (STXM). *Anal. Chem.* 86 (2014) 2876-2881.
- RD Arrua, A Nordborg, PR Haddad, EF Hilder. Monolithic cryopolymers with embedded nanoparticles. I. Efficient capillary chromatography of proteins using neutral embedded nanoparticles. *J. Chromatogr. A.* 1273 (2013) 26-33.
- D Arrua, MC Strumia, MA Nazareno. Immobilization of caffeic acid on a polypropylene film: synthesis and antioxidant properties. *J. Agric. Food Chem.* 58 (2010) 9228-9234.

Yada Nolvachai

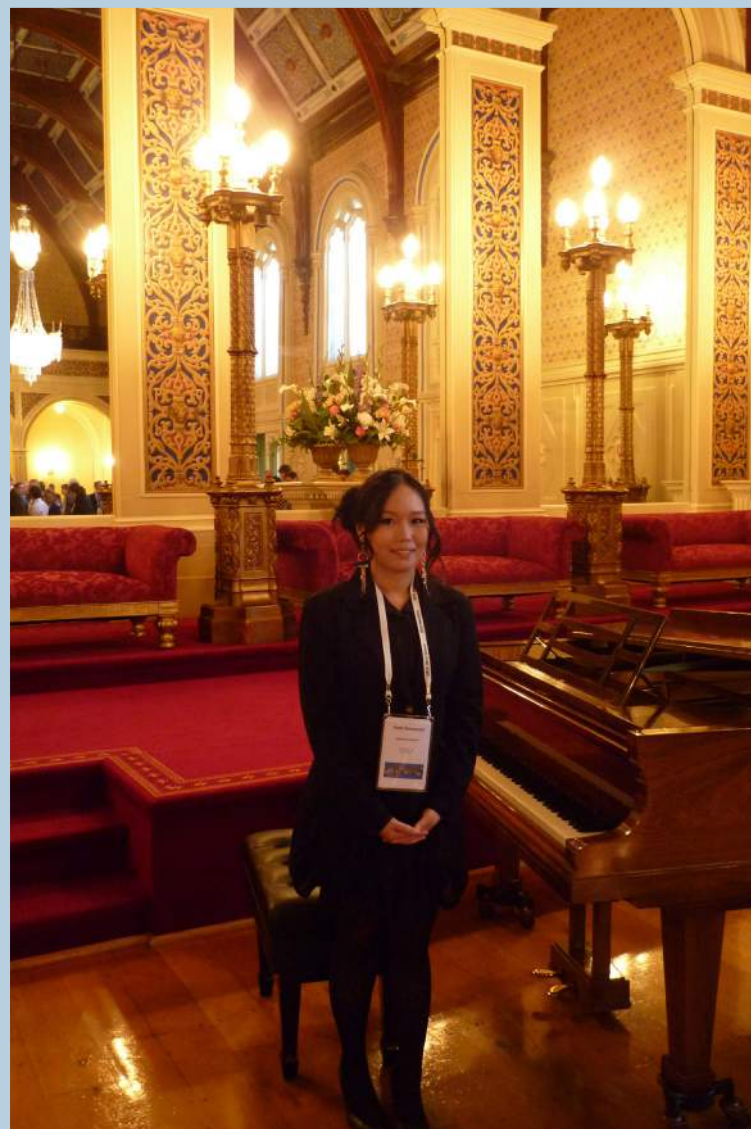
PhD Candidate ACROSS Monash

Yada Nolvachai (B Food Sci Tech (Hons), UQ) commenced her PhD candidature in September 2012, in the School of Chemistry, Monash University, with Prof Marriott. Her current PhD research focuses on software development based on thermodynamics and quantum mechanics (density functional theory and ab initio calculation) for material selection and design of novel materials for use in multidimensional GC (MDGC).

Although her Bachelor degree was in food science, her inherit background and skills are in the computational area, which has driven her into the area of material science. The focused materials are metal organic frameworks (MOF) and ionic liquids (IL) applied for enhanced selectivity and tuneability of target compounds in separation based on both experimental and modelling approaches. Her efforts in this area are to combine the existing database of material (stationary phase) descriptors based on linear solvation energy relationship (LSER) approaches and to correlate the database with the molecular structures of the material which ultimately allows translation of molecular language into chromatographic results guiding stationary phase selection and design of new phases.

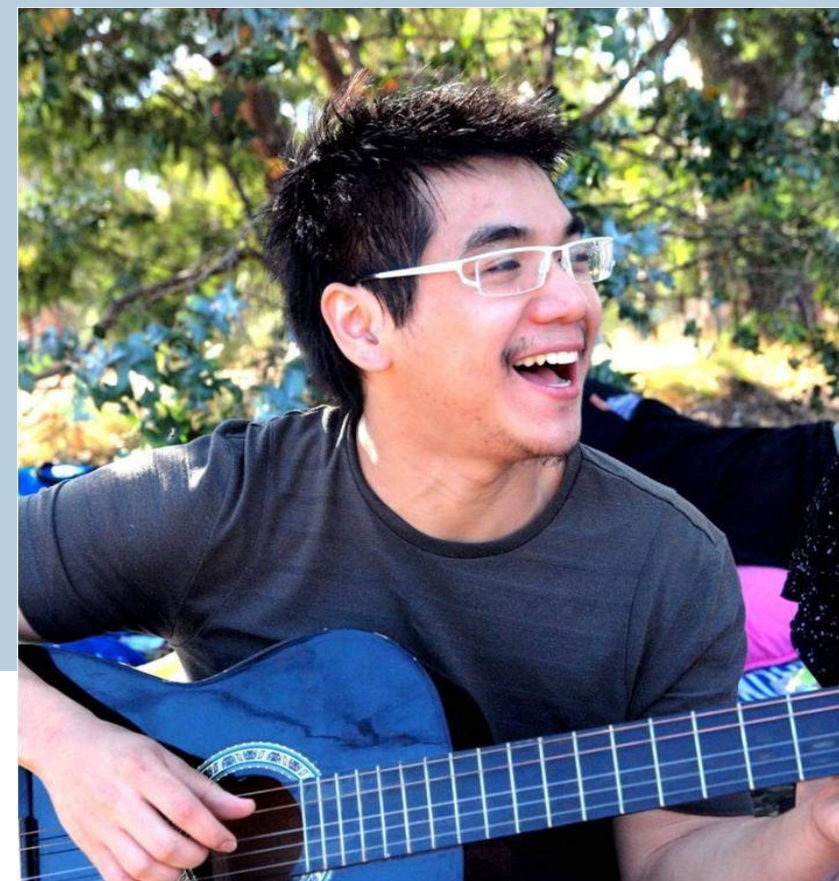
Her collaboration with scientists in Australia and worldwide is well noted. For example, she is working with Prof Batten, Dr Turner, and Dr Hawes, Monash, for application of novel MOF for selective separation in LC. She collaborated with Prof Hearn (Monash), Prof Pesek and Prof Matyska from San Jose State University, USA, for the characterisation and application of silica hydride particles for extraction of fatty acids and flavonoids. She went to USA for collaboration with Prof Armstrong at the University of Texas at Arlington for novel IL stationary phase synthesis and study of interconversion of oximes in IL. She is also collaborating with the ACROSS members Prof Paul Haddad, A/ Prof Robert Shellie and Dr Mohammad Talebi from UTAS for conversion of molecular parameters into stationary phase LSER descriptors. She has so far published 14 research papers and book chapters.

- CS Hawes, Y Nolvachai, C Kulsing, GP Knowles, AL Chaffee, PJ Marriott, SR Batten, DR Turner. Metal-Organic Frameworks as stationary phases for mixed-mode separation applications. *Chem. Commun.* 50 (2014) 3735-3737.
- Y Nolvachai, C Kulsing, RI Boysen, MT Matyska, JJ Pesek, PJ Marriott, MTW Hearn. Comparison of the performance of different silica hydride particles for the solid-phase extraction of non-volatile analytes from dark chocolate with analysis by gas chromatography-quadrupole mass spectrometry. *Food. Chem.* 174 (2015) 434-439.
- Y Nolvachai, C Kulsing, PJ Marriott. Thermally sensitive behavior explains unusual orthogonality observed in comprehensive two-dimensional gas chromatography comprising a single ionic liquid stationary phase. *Anal. Chem.* 87 (2015) 538-544.



Chadin Kulsing

Postdoctoral Researcher
ACROSS Monash



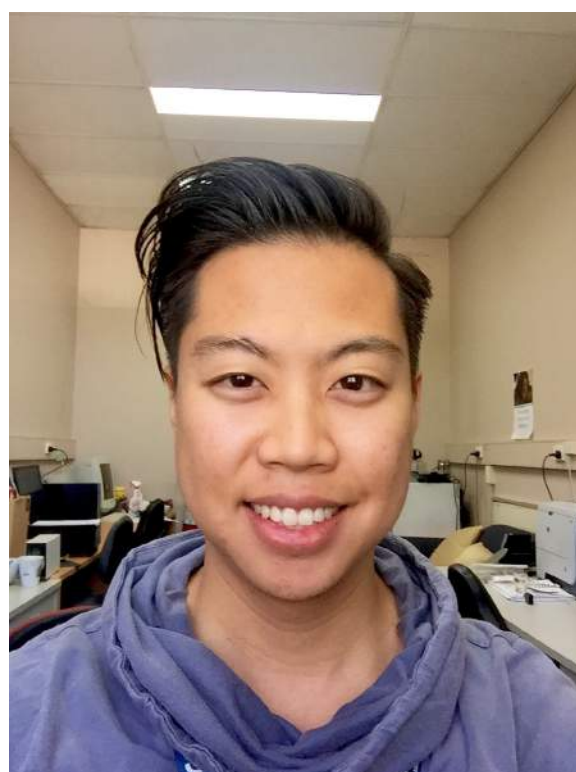
Chadin Kulsing (PhD, July 2015, Monash) completed his PhD with Prof Hearn's group and is now a postdoctoral researcher in the group of Prof Marriott. His background is on mathematics and pure science. The topic of his research thus involves the development/modification of fundamental concepts and theories for explanation of unexpected phenomena that cannot be explained according to conventional concepts, such as charges on the surface of particles modified with neutral ligands and peak broadening in aqueous/organic CE. His research interests cover thermodynamics, kinetics, surface, and solution chemistry in CE, GC and LC. He has found particular brightness in his life by applying his skills to support his colleagues, which allows him to participate into the areas of applied science including chromatographic analysis of fuels, food, spices, essential oils, pharmaceutical and personal care, drugs, insects and metabolomics.

His connection with the ACROSS members started in 2013 via collaboration with Prof Macka from UTAS who kindly educated and worked with him on UV-LED technology for the synthesis of porous layer open tubular capillaries applied in LC. This collaboration resulted in one paper and one review published in *Journal of Chromatography A* and *Trends in Analytical Chemistry*. After that his cross-discipline research skills are quite notable. The related areas include crystallography, small angle X-ray

scattering, scanning electron microscopy, zeta potential and computational areas which were applied to tackle chromatographic challenges such as stationary phase characterisation, protein structures in solution, chromatographic condition optimisation and column selection.

He is currently working on computational approaches for the understanding of separation mechanisms in multidimensional (MD) GC and ion fragmentation in QqQMS as well as novel materials and advanced hyphenation technologies, such as ionic liquid and metal organic framework stationary phases, MDGC-QTOFMS and UPLC-OrbitrapMS. He has published 20 research papers and book chapters.

- 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. *ChemPlusChem.* 79 (2014) 790-797.
- C Kulsing, R Knob, M Macka, P Junor, RI Boysen, MTW Hearn. Molecular imprinted polymeric porous layers in open tubular capillaries for chiral separations. *J. Chromatogr. A.* 1354 (2014) 85-91.
- C Kulsing, Y Nolvachai, PJ Marriott, RI Boysen, MT Matyska, JJ Pesek, MTW Hearn. Insights into the origin of the separation selectivity with silica hydride adsorbents. *J. Phys. Chem. B.* 119 (2015) 3063-3069.



Chester Vera

PhD Candidate ACROSS UWS

Chester Martin Vera was recently accepted into the PhD programme at UWS. He is the recipient of the Georges Guiochon Postgraduate Research Award, a PhD stipend in memory of Distinguished Scientist Georges Guiochon.

Chester Vera received his Bachelor of Science (Honours in Chemistry) in 2012 from the University of New South Wales, Kensington, Australia. After obtaining his Bachelor's degree he was employed at Phenomenex Australia as a Research Scientist where he was involved in method and application development for both High Performance Liquid Chromatography (HPLC) and Supercritical Fluid Chromatography (SFC).

Chester's PhD research field is supercritical fluid chromatography where he is investigating selectivity, separation and scale-up. He has published two papers that contrast the selectivity differences between HPLC and SFC as well as interesting selectivity characteristics of polynuclear aromatic hydrocarbons on phenyl-type stationary phases in SFC.

In late May of 2015 he was a member of the Scientific Advisory Committee for the first Virtual Symposium on Applied Separation Science (VSASS) and contributed to the symposium by presenting a talk on his recently published work, several poster presentations and a number of online workshops.

Chester hopes that the work conducted during his PhD will contribute towards building a greater understanding of the SFC, aiding in its uptake and use in both Industry and Academia.

- CM Vera, D Shock, GR Dennis, J Samuelsson, M Enmark, T Fornstedt, RA Shalliker. Contrasting selectivity between HPLC and SFC using phenyl-type stationary phases: A study on linear polynuclear aromatic hydrocarbons. *Microchem. J.* 119 (2015) 40-43.
- CM Vera, D Shock, GR Dennis, J Samuelsson, M Enmark, T Fornstedt, RA Shalliker. A preliminary study on the selectivity of linear polynuclear aromatic hydrocarbons in SFC using phenyl-type stationary phases. *Microchem. J.* 121 (2015) 136-140.

Sercan Pravadali-Cekic

Postdoctoral Researcher
ACROSS UWS

Dr. Sercan Pravadali-Cekic received her BSc. in Advanced Science (Forensic Science) (2010) and PhD in Analytical Chemistry (2015) from the School of Science and Health of University of Western Sydney. She is a post-doctorate researcher in the same department and has explored the employment of Active Flow Technology (AFT) columns in 2D-HPLC, and expanded on the applications of Reaction Flow Chromatography Post-Column Derivatisation (RF-PCD) and multiplexed detection.

She has authored and co-authored several scientific research papers and reviews. Her current research interests are mainly focused on the expansion of the capabilities of multiplexed RF-PCD with the aim of designing a fast new approach to selective derivatisation techniques. Alongside her research, she enjoys teaching and demonstrating and currently has three accepted manuscripts for the Journal of Visualized Experiments detailing a 'how-to' protocol for the use of AFT columns for various purposes.

Sercan has also had the honour of being a member of the scientific advisory committee of the first virtual symposium - Virtual Symposium on Applied Separation Science (VSASS), where she presented an oral presentation along with numerous virtual posters. Sercan is adamant to pursue the path of building an academic career whilst, being a part of the international scientific community.



- S Pravadali, DN Bassanese, XA Conlan, PS Francis, ZM Smith, JM Terry, RA Shalliker. Comprehensive sample analysis using high performance liquid chromatography with multi-detection. *Anal. Chim. Acta.* 803 (2013) 188-193.
- S Pravadali-Cekic, A Jones, AA Kazarian, B Paull, A Soliven, H Ritchie, M Camenzuli, GR Dennis, RA Shalliker. Using reaction flow chromatography for the analysis of amino acid: Derivatisation with fluorescamine reagent. *Microchem. J.* 121 (2015) 141-149.
- S Pravadali-Cekic, D Kocic, S Hua, A Jones, GR Dennis, RA Shalliker. Tuning a parallel segmented flow column and enabling multiplexed detection. *JoVE*, In Press (2015).



Prof. Mirek Macka

Lighting the way

Australian Research Council Future Fellow **Professor Mirek Macka** is an experienced industrial pharma researcher. Here, he discusses his expansive research project, which hopes to improve the portability of analytical instrumentation

What is your professional background, and how did this lead to your current position at the University of Tasmania, Australia?

I am an analytical chemist by education (MSc from the Masaryk University in Brno, Czech Republic), with 10 years' experience as an industrial pharma researcher in the Czech Republic and Switzerland, developing and validating analytical methods for high-performance liquid chromatography (HPLC). My peer reviewed scientific work has featured in such international publications as the *Journal of Chromatography*.

I moved to Australia in 1994, where I completed my PhD at the University of Tasmania. I subsequently held a series of competitive prestigious research fellowships: an Australian Research Council (ARC) Fellowship (2000-05); European Commission senior level Marie Curie Excellence fellowship and grant (2006-10); and my current position, ARC Future Fellowship (2012-16).

How have light emitting diode (LED) functions, called 'solid-state light sources' (SSLs), impacted technological developments over the course of the 21st Century?

From the simple red and green indicator lights on electrical devices used during the 1960s and 1980s, LEDs have continued to develop their rising optical power for a number of applications in virtually all areas of science, technology and life in general. In analytical chemistry, visionary work includes the introduction of a miniaturised LED-based oximeter in the early 1970s, followed by a rising number of optical sensing applications, especially in the 1990s. Nowadays, LEDs are truly omnipresent. One can read every week about a new application or device based on LEDs (and/or their lasing 'cousins' laser diodes – known to many in laser pointers, but also present in dozens of scientific and consumer devices such as CD/DVD players and distance measurement devices).

You project is expansive, encompassing four work packages that seek to address the issue of traditional light sources resulting in lack of portability. Can you outline these work

packages and what you are hoping to achieve with each of them?

The low cost, small size and ruggedness of SSLs supports portability. The work packages span two large fields – optical detection and imaging, and microfluidics. In optical detection it is mainly the ability of SSLs to be pulsed at extremely fast rates. While this allows time-resolved fluorescence detection and imaging, which is technically very demanding, other usage that is much less demanding is attaining wavelength multiplexing through pulsing a series of different wavelength LEDs. In microfluidics the potential involves detection as well, but SSLs can also achieve rapid heating of extremely small volumes, and designing valves and actuators, which is an area where the small volumes in microfluidics present a challenge. On the application side, we hope that contributions to portability of analytical instrumentation will be the main outcomes of the ARC Future Fellowship project.

Is there currently a lag in uptake of these new technologies in some areas? Why is this the case?

The lag is shorter than it has been in the past, simply because of the better availability of information. However, a lag will always exist, more so in areas where a convincing commercial potential is not obvious at this stage. Multi- and transdisciplinary research is a way to overcome barriers presented here. In the past, research was often seen as purely academic or basic – this was certainly the case with SSLs and the discovery of electroluminescence in 1907, before their immense industrial potential was unveiled in the 1950s.

Can you point to any direct impacts that this research might have?

In healthcare, the majority of tests still need to be completed in a specialised lab – blood analysis in a pathology lab, for example. Only a small percentage of tests can be carried out directly at the GP's practice, and rarely at home. Imagine if we could conduct simpler 'orientation' tests, to analyse levels of iron in blood, for instance, which is often the cause of tiredness and requires two visits to a GP, a blood test and up to one week to obtain results. Another factor is that low-cost point-of-care tests could save huge amounts. There is consensus that without enough technological progress, our medical care will become financially challenging, even in the wealthiest countries.

Omnipresent light

University of Tasmania researchers are exploring the exciting potential of solid-state light sources, developing novel tools and sparking new collaborations. This foundational work is expected to enhance Australia’s future ability in point-of-care and portable analysis and imaging

SOLID-STATE LIGHT SOURCES (SSLs), known primarily as light emitting diodes (LEDs) and laser diodes (LDs), have the potential to revolutionise the lighting industry. Often referred to as the light sources of the 21st Century, with new devices appearing almost daily, they have replaced traditional incandescent lighting that is deemed outdated and insufficient in supporting the requirements posed by modern life, science and technology. Their applications are vast and varied, spanning a wide range of fields, including chemistry and separation science, and they offer unique advantages for portable and remote analysis where devices must be compact, lightweight, robust and energy efficient. Historically used in the creation of signs, signals and displays, the potential for SSLs to evolve to provide a plethora of novel illumination tools and devices is increasing rapidly. Other benefits afforded by this technology include low cost and reduced maintenance.

HISTORY OF LEDs
Reflecting on the history of SSLs, Mirek Macka, chemistry Professor at the University of Tasmania and Australian Research Council (ARC) Future Fellow states: “LEDs are based on the discovery of the electroluminescence effect – the emission of light from semiconductors upon application of voltage – over 100 years ago.

This means these electroluminescent ‘solid-state’ materials convert electricity into light, at a given percentage conversion efficiency – which is very important (especially in lighting) as the rest of the input electric energy gets converted to heat, an undesirable process”.

Macka has received a number of prestigious and competitive scholarships for his innovative work on separation and detection science, and its utilisation in solving real-world problems. In recent years, he and his team of researchers have been examining the potential and applications of SSLs, exploring decades worth of basic research and scientific curiosity – the demonstration of near infra-red (NIR) LDs in the 1950s, and the introduction of visible light red LEDs in the 1960s, for instance – and revealing SSLs’ potential in numerous significant applications. In recent decades, as more technological advances emerge, new LEDs have been created with emissions shifting towards the shorter wavelength – for example, from red to yellow and green, and blue LEDs, which were invented in 1990.

ACROSS TWO FIELDS
More recently, in 2014, the Nobel Prize in Physics was awarded to Isamu Akasaki, Hiroshi Amano and Shuji Nakamura ‘for the invention of efficient blue LEDs which has enabled bright

and energy-saving white light sources’, firmly establishing LEDs as a crucial area for further exploration. This is the impetus driving Macka’s research project on SSLs for bioimaging and microfluidics – two fields that could benefit significantly from this technology.

The team employs a number of techniques to address the capability of SSLs in comparison to traditional light sources in chemistry and life sciences: “The methods we use range from photometric and fluorometric detection in microfluidic devices (capillary or chip-based) to optical gas or aerosol sensors, from point-detection to visualisation, and, outside of optical, SSLs are used for photopolymerisations or rapid heating within a microdevice,” Macka elaborates. Using specific work packages, the Tasmania-based researchers are identifying areas where SSLs can make a difference across a number of disciplines and commercial platforms.

SSLs FOR BIOIMAGING
Bioimaging, a non-invasive method for analysing biological processes in real time, uses a range of sophisticated technologies and devices. “Many bioimaging techniques typically use lasers, and while their performance is extremely powerful, they are very expensive and large, thus not applicable anywhere where portability is required,” comments Macka. “This is where LEDs and LDs have their strength: in supporting technologies and devices that are relatively low cost and small, and therefore can be portable.”

It is this area in particular where Macka and his research team hope to use and develop their expertise. The group is exploring the

potential for LEDs in such techniques as pulsed illumination of macroscopic objects including food, plants and minerals. with the aim of developing a novel alternative in imaging spectroscopy. This project focuses on the opportunities afforded by combining SSLs with time-resolved fluorescence (TRF) and quantum dot (QD) nanoparticles as fluorophors, with the end goal of providing a cost-effective, small and simplified portable device.

POTENTIAL IN MICROFLUIDICS
During the 1990s, microfluidics – a multidisciplinary field spanning between engineering, physics, chemistry, biochemistry, nanotechnology and biotechnology, which examines the design of systems in which small volumes of fluids are handled – emerged as a promising field. “Microfluidics benefits from LEDs and LDs as they provide light sources for optical detection, but also as low-cost, elegant light sources for photolithography, or for what could be called analytical photochemistry. One example of this is photopolymerising porous polymer structure in selected sections of the microfluidic channel that can fulfil function from simple filtration to acting as a chromatographic separation micro column,” Macka explains.

This project explores miniaturised microfluidic chips and their components, and the challenges posed by their simplification or redesign. One area the team is focusing on is the development of fluidic components on-chip, which also aim to minimise external needs such as power and compressed air.

FUTURE HORIZONS
Looking ahead, the team will continue to explore the vast and growing role of SSLs

in life sciences and chemistry, developing impactful applications. “The reality is that usage of LEDs or LDs in a device of consumer electronics and other mass-produced goods – such as major industrial applications in many areas including medical, water purification, security, forensic and military – will ‘outshine’ any scientific use by several orders of magnitude,” Macka explains. Once completed, the team hopes the project will provide a foundation for broader research in SSLs as well as the identification of new uses and the pursuit of new research avenues and commercial opportunities. Importantly, the team aims to break cross-disciplinary barriers, enabling the benefits of SSLs to be reaped across numerous fields.

Macka has received a number of prestigious and competitive scholarships for his innovative work on separation and detection science, and its utilisation in solving real-world problems

SOLID-STATE LIGHT SOURCES FOR PORTABLE BIOIMAGING AND MICROFLUIDS

OBJECTIVE
To address the capability of solid-state light sources (SSLs) in comparison to traditional light sources in chemistry and life sciences.

KEY COLLABORATORS
Professor Dermot Brabazon, Dublin City University, Ireland • **Professor Purnendu (Sandy) K Dasgupta**, University of Texas Arlington, USA • **Dr Frantisek Foret**, Institute of Analytical Chemistry, Academy of Sciences of the Czech Republic, Czech Republic • **Professor Milton Hearn**, Monash University, Australia • **Professor Cornelius F Ivory**, Washington State University, USA • **Dr Lenka Kujovská Krčmová**, Charles University, Faculty of Pharmacy, Czech Republic • **Dr Pleun Maaskant**, Tyndall National Institute, Ireland • **Associate Professor Jan Petr**, Palacký University, Czech Republic • **Professor Leena Suntornsuk**, Mahidol University, Thailand • **Dr Markéta Vaculovičová**, Mendel University, Czech Republic

PARTNERS
Australian Centre for Research on Separation Science (ACROSS)

FUNDING
Australian Research Council (ARC) Future Fellowship, Level 3

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Professor Mirek Macka
ARC Future

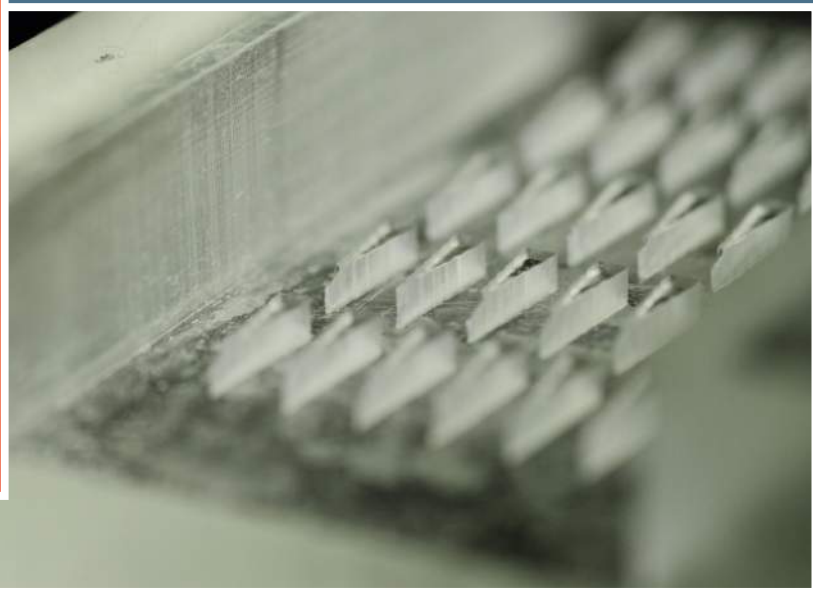
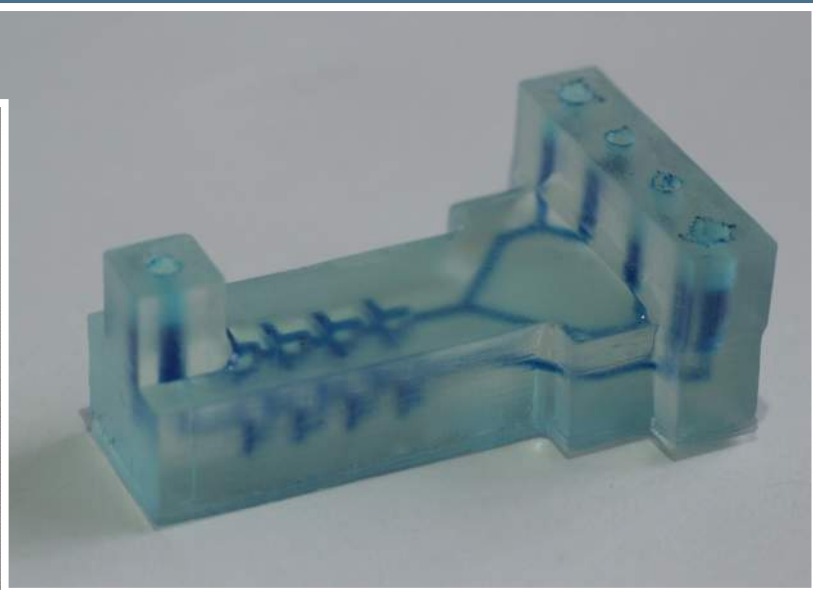
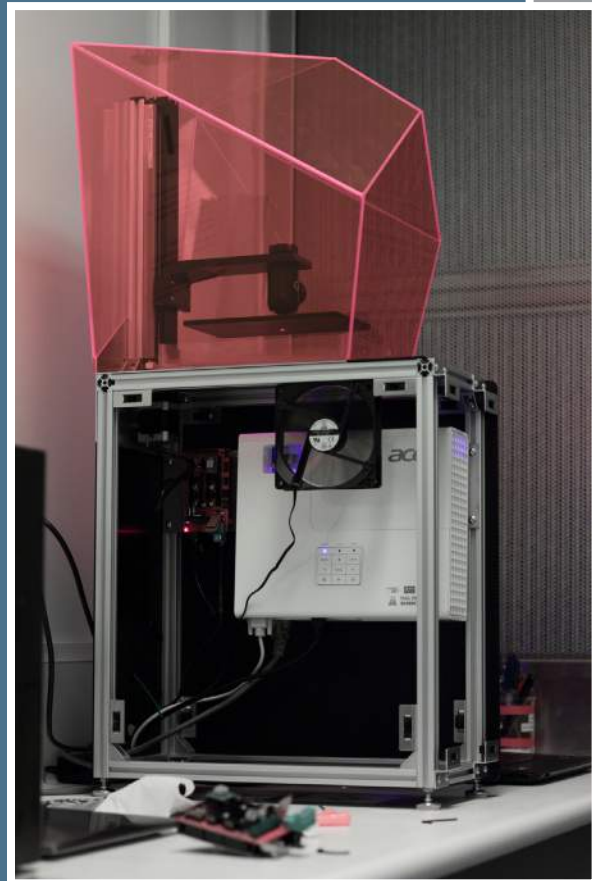
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 **MIREK MACKA** received his MSc in Analytical Chemistry from the Masaryk University, Czech Republic in 1981. After an initial career in pharma industry in Czechoslovakia and Switzerland, he completed his PhD at UTAS, Australia in 1997. In his academic research career, as a senior research fellow at the UTAS School of Chemistry, he was a founding member of ACROSS.





Prof. Pavel Nesterenko

Powers of separation

Analytical chemist and expert separation scientist **Professor Pavel Nesterenko** discusses with *International Innovation* his recent research into the use of nanodiamond constructed materials in chromatography, as well as his previous experience in the field and his plans for future work

Can you begin by outlining the focus of your recent research into nanodiamond?

Nanodiamond, especially that originating from detonation synthesis, is one of the most interesting and enigmatic nanocarbon materials. The mystery lies in the unidentified structure of detonation nanodiamond (DND) particles, which, according to the most comprehensive hypothesis, consists of a central diamond core with an sp^{2+x} intermediate layer and an outer sp^2 graphene-type layer. Additionally, DND has a very complex surface chemistry with 10-15 different functional groups; making it very difficult to explain some of its unusual surface chemistry and particle behaviour.

So, the challenge we are faced with is to understand the adsorption properties of DND – and to overcome this challenge, we need to investigate the material carefully and find the most efficient way of using it.

When did you begin to specialise in separation science? Has your academic background influenced your work in other ways?

My MSc degree, awarded in 1979 by Lomonosov Moscow State University, is in petroleum chemistry and organic catalysis. My corresponding research project concerned the synthesis of ω -functional organosilicon compounds and their use in the chemical modification of silica gel. This class of adsorbents was innovative at the time, and demonstrated excellent separation selectivity and efficiency in gas chromatography and high-performance liquid chromatography; you may still find a few of them in the catalogues of various companies. Since then, I have stuck with the task of preparing and characterising new and often non-traditional adsorbents for various applications in separation science.

With time, my academic background – especially after obtaining my DSc degree in 1999 – led me towards a stronger involvement in editorial, consulting, mentoring and other related activities. I am a member of the editorial boards of eight international journals, and Editor-in-Chief for one of them; such activities are probably typical for scientists who have published around 300 papers. It takes time away from my laboratory research, of course, but it also provides a much broader insight into current problems and achievements in my research area.

What is your research's main objectives?

The key targets of any separation are high efficiency, optimum selectivity and high speed. These targets can be achieved in many different ways – but currently, in the area of liquid chromatography, the most significant efforts are associated with the use of extreme separation conditions such as ultra-high pressure (up to 120-150 MPa) and high temperature (up to 200-300 °C).

The main goal of our project is to develop advanced, efficient, selective, pressure-, temperature- and chemically-stable adsorbents based on nanodiamond. A secondary goal is to characterise the adsorption properties of different types of synthetic diamonds and compare these with traditional liquid chromatography adsorbents. The final goal is to demonstrate the new and improved efficiency and selectivity of diamond-based phases within important chromatographic applications, highlighting their potential for future commercial exploitation.

Another significant aspect of your research has been your investigation into chromatographic properties of

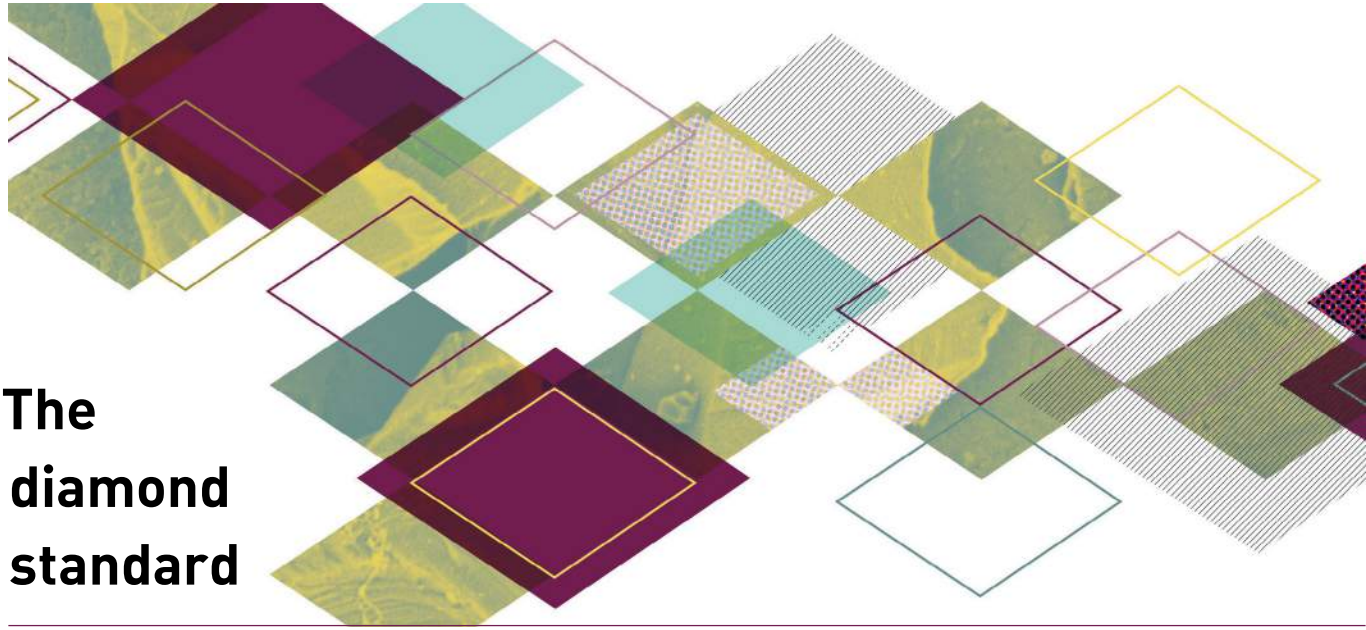
microparticulated high-pressure, high-temperature (HPHT) diamond. Were you surprised by any of your findings?

As mentioned above, the surface chemistry of DND is unproven, so it was important to use a proper diamond prepared by classic static synthesis in order to compare adsorption properties. Microparticulated HPHT diamond represented a good option; although additional fractionation of particles by size and purification was also required to prepare a suitable chromatographic adsorbent.

We achieved a very good separation efficiency of 120,000 theoretical plates in ultra high-performance liquid chromatography – and this is not a limit; we believe that the use of particles with a narrower distribution of size and better column packing technology will allow us to obtain much higher separation efficiencies. Also, the use of nonporous particles for column packing offers additional possibilities for separation of biological macromolecules at high mobile phase linear velocities and, hence, may enable us to decrease the separation time without losing column efficiency.

Are you able to give an insight into your future research plans?

We have completed a project on the purification, characterisation and application of adsorbents composed purely of detonation nanodiamond. However, we can see even bigger potential in the preparation and application of carbon-nano-carbon composite materials. Of course, these materials could be useful in other technologies – as supercapacitors and electrodes in energy storage devices, for example.



The diamond standard

Materials scientists at the **University of Tasmania** have made inroads in recent years towards improving chromatography with specially prepared diamond-based adsorbents. Now, their discoveries may pave the way to new solutions in separation science

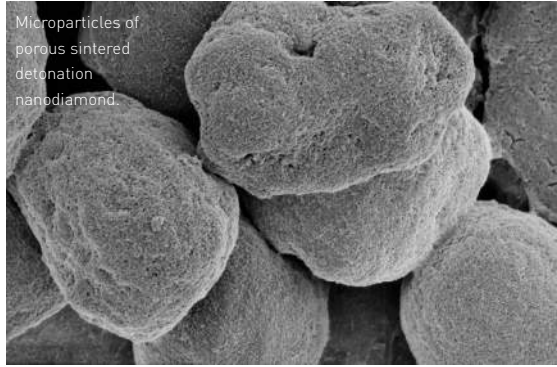
SEPARATION SCIENCE IS a branch of analytical chemistry concerned with the various methods that can be employed to segregate the chemical constituents of a mixture. Among these methods is chromatography, a process that many may be familiar with in its basic form: the separation of ink on dampened blotting paper. The mechanism behind this colour separation is relatively simple; the water, or mobile phase, moves through the paper, the stationary phase. As the water meets the ink, which contains a mixture of differently coloured chemicals, it pushes them forward with the ink like a wave, but each distinct chemical within the mixture will travel at a different speed. The colours therefore become separated into bands.

This rudimentary form of liquid chromatography is sufficient to separate the constituents of a basic mixture like ink, but the mixtures dealt with in analytical chemistry are much more complex and varied. It is for this reason that, in the 112 years since liquid chromatography was discovered, a whole range of more specialised techniques has evolved, each drawing on the same principle. In today's chemistry lab,

the mobile phase is usually a high-temperature (up to 400 °C), high-pressure liquid (up to 130 MPa), or supercritical fluid, and the stationary phase is usually a carefully selected microparticulate chemically and thermally resistant substance that will retain the components of the mixture in just the right way.

GOING THROUGH PHASES
Liquid chromatography has applications across many fields of research, both in purifying and isolating chemicals and characterising mixtures. Different applications call for different stationary phase materials, but it is almost always desirable for such materials to be chemically stable and have low thermal expansion combined with high thermal conductivity, because chromatography so often calls for high-pressure, high-temperature conditions. There are other application-specific requirements too; candidate substrates to be used in biological separations, for example, must not deactivate purified substrates. The search for optimal stationary phase materials, therefore, is a demanding one.

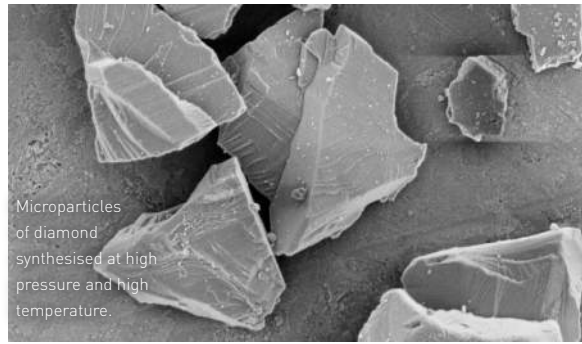
However, one team at the University of Tasmania in Australia has found a promising solution. Professor Pavel Nesterenko leads a laboratory in the University's Faculty of Science, Engineering and Technology, and is also



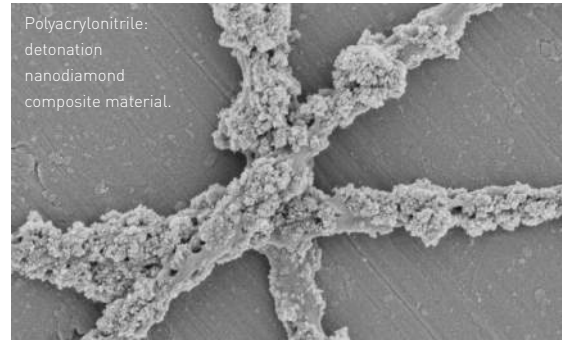
Microparticles of porous sintered detonation nanodiamond.

a participant in the Australian Centre for Research on Separation Science (ACROSS) consortium. Since 2005, his work has focused on a particularly interesting candidate material for use as the stationary phase: diamond. Diamonds respond well to heat and pressure, are chemically inert and resistant to damage from acids, and also exhibit high biocompatibility and low cytotoxicity, rendering them suitable for biochemical applications. "We are trying to explore all of these advantages in separation science," Nesterenko summates.

THE CRUCIAL AREA
The idea of using diamonds as a chromatographic stationary phase, in itself, is not new. Microdiamonds have already been tested in high-performance liquid chromatography with some success – but their usefulness is limited by their comparatively low surface area to volume ratio. Substances with a higher surface area to volume ratio have a higher capacity to adsorb particles, because there are more opportunities for such particles to stick to them; at 1 m²/g,



Microparticles of diamond synthesised at high pressure and high temperature.



Polyacrylonitrile:detonation nanodiamond composite material.

microdiamonds have a lower capacity than most other stationary phase materials, which have developed surfaces up to 600 m²/g. For this reason, microdiamond stationary phases are only suitable for a relatively small number of applications.

In a 2010 paper, Nesterenko and his collaborators reviewed the potential applications of diamond substrates, and proposed a number of possible solutions towards improving the surface area that could be achieved with diamond-related materials. First, they suggested using an extremely fine diamond powder that was already commercially available: detonation nanodiamond (DND). This form of diamond, which is produced when explosives are detonated in an oxygen-deficient environment, has a much smaller size (usually in the order of 4-5 nm – around 800 times smaller than the usual microdiamond substrate used in chromatography) and with a vastly improved surface area of 170-250 m²/g.

A GEM OF A SOLUTION
There is another factor to be considered, however: column backpressure. When the mobile phase passes through the stationary phase, a certain pressure is required to ensure it flows at the right velocity. The pressure needed increases as the diameter of the particles decreases – and this factor renders nanodiamond itself unusable. For this reason, Nesterenko and his colleagues began to use microdisperse sintered detonation nanodiamonds (MSDNs). These particles are acquired when a sintering process is applied to DND, fusing the nanodust into porous particles a few microns across, and therefore similar in size to diamonds already in use. With the right preparation, a respectable surface area of 250m²/g can be achieved with MSDNs.

Six years after beginning their investigations into the possibility of using diamonds in chromatography, Nesterenko's group succeeded in securing funding from the Australian Research Council (ARC) to pursue a more specific project, aimed at characterising the adsorption properties of MSDNs and, for the first time, investigating how the surfaces of such particles could be modified to improve their efficacy in chromatography. Only recently completed, the project has produced a number of innovative and surprising results – some of which in areas the researchers themselves did not expect.

PAVING THE WAY
In fact, this research topic was so innovative that, before the team could even begin working on the DNDs, they had to develop their own tools to improve the diamonds' purity. Many published purification methods were accessible, but their respective products could not be compared because there was no way to analyse their chemical impurities with accuracy and sensitivity. Nesterenko and his colleagues therefore developed a new technique using inductively coupled plasma source mass spectroscopy to analyse diamond nanoparticles directly, picking out impurities consisting of any one of 55 target elements that could interfere with adsorption.

Looking at more than 50 separate samples with this new tool, the team generated results that were less than encouraging: the diamonds were at best 99.88 and at worst 94.51 per cent pure by weight. Luckily, the researchers were also able to use their novel method to assist in the development of microwave-assisted purification technologies; in the process, they created the world's first chromatography-suitable, 99.95 per cent pure DNDs.

FURTHER EXAMINATION
These discoveries occurred almost as a byproduct of Nesterenko and his collaborators' work. Yet the areas that received their concerted focus gave rise to even greater breakthroughs. The Tasmanian researchers accomplished significant progress towards the characterisation of porous structure, particulate size distribution and zeta-potential measurements in nanodiamonds as well as MSDNs, microparticulated diamonds and high-pressure, high-temperature diamonds – results that will act as a basis for proposing applications for these materials. Unusual adsorption properties of diamonds were also revealed, some of them for the first time – including the zwitterionic properties of DNDs, and a tethering effect that helped the corresponding adsorbents to retain various bio-organic containing phosphoric or phosphonic acid functional groups.

The group's investigations into high-pressure, high-temperature diamonds in chromatographic applications – the first of its kind – demonstrated that diamond is hydrophilic and contains charged groups. These experiments also highlighted the potential resilience of diamond as a substrate; after prolonged use at high temperatures between 180 and 200 °C, there was no visible change in adsorption properties of the material.

Taken together, this impressive portfolio of results highlights the potential of diamonds as a stationary phase in chromatography – a potential that Nesterenko and his collaborators will be well placed to capitalise on in future.

MICRO-DISPERSE SINTERED NANODIAMONDS: A NEW CLASS OF VERSATILE ADSORBENT FOR HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

OBJECTIVE
To discover efficient ways of using diamond-based materials in separation science.

KEY COLLABORATORS
Professor Brett Paull; Dr Ashley Townsend,
University of Tasmania, Australia

Associate Professor Matthew R Linford, Brigham Young University, USA

Professor Inna I Kulakova, Moscow State University, Russia

Dr Dimitar P Mitev, Bulgarian Academy of Sciences, Bulgaria

FUNDING
Australian Research Council (ARC)

University of Tasmania

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PROFESSOR PAVEL NESTERENKO
obtained his MSc, PhD and DSc from Lomonosov Moscow State University. In 2007 he joined the Australian

Centre for Research on Separation Science at the University of Tasmania as Professor in Separation Science. Nesterenko's research area is associated with the development, investigation and application of non-traditional adsorbents and stationary phases for the various separation techniques and specific applications including high-performance chelation ion chromatography, chiral phase chromatography of enantiomers, ligand-exchange chromatography, simultaneous determination of anions and cations and determination of traces of metals in complex samples.



Centre Achievements

Grants (2014 Funding)

Australian Research Council (ARC)

Future Fellowship

Bowie AR. *Natural iron fertilisation of oceans around Australia: linking terrestrial dust, marine biogeochemistry and climate.* \$108,982.

Breadmore MC. *Highly integrated miniaturised total analysis systems for pharmaceuticals in biological and environmental samples.* \$217,911.

Macka M. *Solid-state light sources for bio-imaging and microfluidics.* \$227,792.

Quirino JP. *Green sample preparation technologies for analytical chemistry.* \$175,843.

Discovery Grants

Barnett NW, Francis PS, Conlan XA, Stevenson PG, Shalliker RA, Haswell SJ, Fielden PR, Goddard NJ. *Microfluidic Separation Science: Innovative Technology for Characterising Complex Chemical Systems.* \$110,000.

Hearn MTW, Haddad PR, Boysen R, Reinhard I, Quirino JP. *Selectivity enhancement in separation science using responsive materials.* \$160,000.

Hilder EF. *Polymer nanoparticles and their assembled supracolloidal monolithic structures for applications in separation science.* \$110,000.

Marriott PJ, Chaffee A, Mitrevski B. *Ultra-high resolution hybrid comprehensive-multidimensional gas and supercritical fluid chromatography for explicit characterisation of petrochemicals.* \$250,000.

Nesterenko PN, Paull B, Shellie RA, Haddad PR, Davies NW, Wilson RR, Kelleher B. *Resolving dissolved organic matter: New multi-dimensional separation approaches.* \$160,000.

Paull B. *Lectin based open tubular micro-reactors for probing protein-protein binding.* \$106,666.

Shellie RA. *A field-portable comprehensive multidimensional gas chromatograph.* \$105,000.

Linkage Grants

Barnett NW, Conlan XA, Francis PS, Stevenson PG, Shalliker RA, Scott C, Purcell S. *Identification and isolation of new pharmaceutical opiate analogues: Today's problem tomorrows solutions.* \$61,000.

Breadmore MC, Guijt RM, Barber R. *Miniaturised electro-phoretic systems for distributed environmental sensing.* (Grey Innovation Pty Ltd) \$100,000.

Doble PA, Macka M. *Chip liquid chromatography-inductively coupled plasma-mass spectrometry: A new hyphenated microfluidic instrument for metallomics.* (Agilent Technologies) \$52,500.

Grace MR, Marriott PJ, Coleman RA, Pettigrove V, Rosi-Marshall EJ. *Impacts of pharmaceuticals and personal care products on Australian aquatic ecosystem.* (Melbourne Water) \$142,746.

Haddad PR, Shellie RA, Dicinoski GW, Szucs R, Pohls C, Dolan JW. *Rapid method development in pharmaceutical analysis using quality-by-design principles.* (LC Resources Inc; Pfizer; Thermo Fisher Scientific Australia) \$350,000.

Marriott PJ, Evans DJ. *Oxidation product generation during heating and storage of bio-fuels and alternative fuels assessed by multidimensional gas chromatography.* (DSTO) \$95,000.

Shellie RA, Koutoulis A, Whittock SP. *Hop (Humulus lupulus L.) for distinctive beer.* (Hop Products Australia) \$88,750.

Virtue P, Nicol S, Kawaguchi S, Nichols P, Hilder EF, Bengtson Nash S. *Utilising innovative fishing technology to address key questions on the biology of Antarctic krill.* (Aker BioMarine, Australian Antarctic Division, CSIRO-Division of Marine Research, Griffith University) \$163,602.

Linkage Infrastructure, Equipment And Facilities (LIEF)

Vickers JC, Small DH, Nowak BF, Hilder EF, Hallegraef GM. *Establishment of a digital transmission electron microscopy facility.* \$380,000.

Industrial Transformation Training Centres

Hilder EF, Shellie RA, Haddad PR, Breadmore MC, Paull B, Nesterenko PN, Guijt RM. *ARC Training Centre for Portable Analytical Separation Technologies.* (Trajan Scientific and Medical Pty Ltd) \$848,145.

Ross T, Stanley R, Close D, Tamplin M, Breadmore MC, O'Cass A, Fei J, Harker P, Clark A, Gudex B. *ARC Training Centre for Innovative Horticultural Products.* (Woolworths, Houstons Farm) \$686,835.

ARC Centres Of Excellence

Wallace GG, Forsyth M, MacFarlane DR, Officer DL, Cook M, Dodds SM, Spinks GM, Gursel A, Moulton S, in het Panhuis M, Kapsa R, Higgins M, Mozer A, Crook J, Innis P, Coote M, Wang X, Howlett P, Paull B. *ARC Centre of Excellence for Electromaterials Science (ACES).* \$3,571,428.

National Health And Medical Research Council

Thomson RJ, Hoy W, McMorran BJ, Jose MD, Hilder EF, Charlesworth JC. *To search for genetic causes of renal disease in the Tiwi Island Aboriginal population.* \$156,810.

Government

Breadmore MC, Dicinoski GW. *Development of a commercial-ready pre-blast explosive analyser for inorganic-based homemade explosives (HME) screening.* (Department Of The Prime Minister And Cabinet) \$192,500.

E Candish. *Endeavour Research Fellowship.* (Department of Education) \$20,000.

Maniego AR, Gaborieau M, Castignolles P, Nicolas J. *Endeavour Research Fellowship.* (Department of Education) \$20,000.

Marriott PJ. *Improved quantitative and qualitative analysis of oxidative heteroaromatic species in middle distillate fuels using multidimensional gas chromatographic techniques.* (Department of Defence) \$15,000.

Shalliker RA. *Joint Research Engagement Engineering Cadetship – David Shock.* (Department of Industry, Innovation, Science, Research and Tertiary Education) \$5,000.

Thevarajah JJ, Gaborieau M, Castignolles P, Cottet H, Graf R. *Endeavour Research Fellowship.* (Department of Education) \$20,000.

Industry / Foundations

Bowie AR, Ratnarajah L. *Effects of natural iron fertilisation by whales on the Southern Ocean carbon cycle.* (Holsworth Wildlife Research Endowment) \$7,000.

Gaborieau M, Castignolles P. *NMR spectroscopy of polymers.* (Evoqua Water Technologies Membrane Systems Pty Ltd) \$2,000.

Gaborieau M, Castignolles P. *Two dimensional separation SEC x CE of poly(acrylic acid)* (Polymer Standard Services GmbH (PSS, Germany)) \$5,500.

Hilder EF, Shellie RA, Candish E. *Elite scholarship support – Esme Candish.* (SGE Analytical Science) \$3,750.

Marriott PJ. *Development of enantioselective analysis of tea tree oils.* (Australian Tea Tree Oil Industry Association) \$6,000.

Paull B. *Method development for the detection and HPLC analysis of Priostar dendrimers.* (Starpharma Pty Limited) \$12,176.

Paull B, Nesterenko PN. *Dextran sulfate characterisation.* (Selborne Biological Services (Australia) Pty Ltd) \$2,805.

Paull B, Nesterenko PN. *The development of new adhesive polymers and their application to material sourced from human teeth.* (Australian Dental Research Foundation) \$7,400.

Shellie RA, Breadmore MC, Farrell RR. *Optimising oak expression in wine through real-time flavour profiling of maturation products.* (Australian Grape and Wine Authority) \$10,848.

Miscellaneous

Arrua RD. *Beamtime at UVSOR Synchrotron Facility, Japan. Project title: Comprehensive characterization of monolithic polymers by scanning transmission X-ray microscopy (STXM).* (UVSOR Synchrotron Facility, Japan) \$2,374.

Gaborieau M. *Conference Travel Grant.* (School of Science and Health, University of Western Sydney) \$1,250.

Gaborieau M, Castignolles P. *Minor Equipment Grant.* (School of Science and Health, University of Western Sydney) \$6,200.

Gaborieau M, Castignolles P. *Sample preparation for CE and NMR.* (University of Western Sydney) \$12,000.

Paull B. Group Staff Development funding, 'ACROSS Gathering Event'. (University of Tasmania) \$8,100.

Publications

Books and Book Chapters

M Camenzuli, GR Dennis, HJ Ritchie, RA Shalliker. Antioxidant Screening of Beverages using the Online HPLC–DPPH* Assay Incorporating Active Flow Technology Chromatography Columns, in *Processing and Impact on Antioxidants in Beverages*, VR Preedy (Ed), Academic Press, Massachusetts, USA, 2014, 277-287.

Refereed Journal Articles

AA Alhusban, AJ Gaudry, MC Breadmore, N Gueven, RM Guijt. On-line sequential injection-capillary electrophoresis for near-real-time monitoring of extracellular lactate in cell culture flasks. *J. Chromatogr. A.* 1323 (2014) 157-162.

MW Amer, B Mitrevski, WR Jackson, AL Chaffee, PJ Marriott. Multidimensional and comprehensive two-dimensional gas chromatography of dichloromethane soluble products from a high sulfur Jordanian oil shale. *Talanta.* 120 (2014) 55-63.

RD Arrua, AP Hitchcock, WB Hon, M West, EF Hilder. Characterization of polymer monoliths containing embedded nanoparticles by Scanning Transmission X-ray Microscopy (STXM). *Anal. Chem.* 86 (2014) 2876-2881.

C Barner-Kowollik, S Beuermann, M Buback, P Castignolles, B Charleux, ML Coote, RA Hutchinson, T Junkers, I Lacik, GT Russell, M Stach, AM VanHerk. Critically evaluated rate coefficients in radical polymerization - 7. Secondary-radical propagation rate coefficients for methyl acrylate in bulk. *Polym. Chem.* 5 (2014) 204-212.

DN Bassanese, A Soliven, PG Stevenson, GR Dennis, NW Barnett, RA Shalliker, XA Conlan. Investigating retention characteristics of a mixed-mode stationary phase and the enhancement of monolith selectivity for high-performance liquid chromatography. *J. Sep. Sci.* 37 (2014) 1937-1943.

SA Boer, Y Nolvachai, C Kulsing, LJ McCormick, CS Hawes, PJ Marriott, DR Turner. Liquid-phase enantioselective chromatographic resolution using interpenetrated, homochiral framework materials. *Chem. Eur. J.* 20 (2014) 11308-11312.

MC Breadmore, C Sanger-van de Griend. In-capillary sample concentration in CE. *LC-GC North Amer.* 32 (2014) 174-186.

D Caldarola, DP Mitev, L Marlin, EP Nesterenko, B Paull, B Onida, MC Bruzzoniti, RM DeCarlo, C Sarzanini, PN Nesterenko. Functionalisation of mesoporous silica gel with 2-[(phosphonomethyl)-amino] acetic acid functional groups. Characterisation and application. *Appl. Surf. Sci.* 288 (2014) 373-380.

J Caslavska, MC Breadmore, W Thormann. Dynamic high-resolution computer simulation of isotachophoretic enantiomer separation and zone stability. *Electrophoresis.* 35 (2014) 625-637.

S-T Chin, PJ Marriott. Multidimensional gas chromatography beyond simple volatiles separation. *Chem. Commun.* (2014) 8819-8833.

S-T Chin, Y Nolvachai, PJ Marriott. Enantiomeric separation in comprehensive two-dimensional gas chromatography with accurate mass analysis. *Chirality.* 26 (2014) 747 - 753.

DA Collins, EP Nesterenko, B Paull. Infra-red photo-initiated fabrication of monolithic porous layer open tubular (monoPLOT) capillary columns for chromatographic applications. *RSC Adv.* 4 (2014) 28165-28170.

DA Collins, EP Nesterenko, B Paull. Porous layer open tubular columns in capillary liquid chromatography. *Analyst.* 139 (2014) 1292-1302.

AWM Diah, JP Quirino, W Belcher, CI Holdsworth. Investigation of the doping efficiency of poly(styrene sulfonic acid) in poly(3,4-ethylenedioxythiophene)/poly(styrene sulfonic acid) dispersions by capillary electrophoresis. *Electrophoresis.* 35 (2014) 1976-1983.

E Duffy, DP Mitev, PN Nesterenko, AA Kazarian, B Paull. Separation and characterisation of detonation nanodiamond by capillary zone electrophoresis. *Electrophoresis.* 35 (2014) 1864-1872.

S El Deeb, H Waetzig, D Abd El-Hady, HM Albishri, C Saenger-van de Griend, GKE Scriba. Recent advances in capillary electrophoretic migration techniques for pharmaceutical analysis. *Electrophoresis.* 35 (2014)170-189.

P Floris, B Twamley, PN Nesterenko, B Paull, D Connolly. Fabrication and characterisation of gold nano-particle modified polymer monoliths for flow-through catalytic reactions and their application in the reduction of hexacyanoferrate. *Microchim. Acta.* 181 (2014) 249-256.

CS Funari, RL Carneiro, AM Andrade, EF Hilder, AJ Cavalheiro. Green chromatographic fingerprinting: An environmentally friendly approach for the development of separation methods for fingerprinting complex matrices. *J. Sep. Sci.* 37 (2014) 37-44.

CS Funari, RL Carneiro, AJ Cavaleiro, EF Hilder. A trade off between separation, detection and sustainability in liquid chromatographic fingerprinting. *J. Chromatogr. A.* 1354 (2014) 34-42.

AJ Gaudry, YH Nai, RM Guijt, MC Breadmore. Polymeric microchip for the simultaneous determination of anions and cations by hydrodynamic injection using a dual-channel sequential injection microchip electrophoresis system. *Anal. Chem.* 86 (2014) 3380-3388.

MC Gor, K Samykanno, N Mantri, E Pang, P Marriott. Development of molecular markers associated with strawberry quality traits using a subtracted diversity array. *Acta Hort.* 1049 (2014) 343-348.

K Gras, J Luong, R Gras, HJ Cortes, RA Shellie. Determination of furfurals in Manuka honey using piston-cylinder liquid-liquid extraction and gas chromatography. *J. Chromatogr. A.* 1362 (2014) 43-48.

F Gritti, J Pynt, A Soliven, GR Dennis, RA Shalliker, G Guiochon. Effect of parallel segmented flow chromatography on the height equivalent to a theoretical plate III - Influence of the column length, particle diameter, and the molecular weight of the analyte on the efficiency gain. *J. Chromatogr. A.* 1333 (2014) 32-44.

CS Hawes, Y Nolvachai, C Kulsing, GP Knowles, AL Chaffee, PJ Marriott, SR Batten, DR Turner. Metal-organic frameworks as stationary phases for mixed-mode separation applications. *Chem. Commun.* 50 (2014) 3735-3737.

BJ Holland, JL Adcock, PN Nesterenko, A Peristyy, PG Stevenson, NW Barnett, XA Conlan, PS Francis. The importance of chain length for the polyphosphate enhancement of acidic potassium permanganate chemiluminescence. *Anal. Chim. Acta.* 842 (2014) 35-41.

U Kalsoom, MC Breadmore, RM Guijt, MC Boyce. Evaluation of potential cationic probes for the detection of proline and betaine. *Electrophoresis.* 35 (2014) 3379-3386.

AA Kazarian, PN Nesterenko, P Soisungnoen, R Burakham, S Srijaranai, B Paull. Comprehensive analysis of pharmaceutical products using simultaneous mixed-mode (ion-exchange/reversed-phase) and hydrophilic interaction liquid chromatography. *J. Sep. Sci.* 37 (2014) 2138-2144.



M Keremidarska, A Ganeva, D Mitev, T Hikov, R Presker, L Pramatarova, N Krasteva. Comparative study of cytotoxicity of detonation nanodiamond particles with an osteosarcoma cell line and primary mesenchymal stem cells. *Biotechnol. Biotechnol. Equip.* 8 (2014) 733-739.

ASA Keyon, RM Guijt, CJ Bolch, MC Breadmore. Droplet microfluidics for postcolumn reactions in capillary electrophoresis. *Anal. Chem.* 86 (2014) 11811-11818.

ASA Keyon, RM Guijt, CJS Bolch, MC Breadmore. Transient isotachopheresis-capillary zone electrophoresis with contactless conductivity and ultraviolet detection for the analysis of paralytic shellfish toxins in mussel samples. *J. Chromatogr. A.* 1364 (2014) 295-302.

ASA Keyon, RM Guijt, A Gaspar, AA Kazarian, PN Nesterenko, CJ Bolch, MC Breadmore. Capillary electrophoresis for the analysis of paralytic shellfish poisoning toxins in shellfish: Comparison of detection methods. *Electrophoresis.* 35 (2014) 1496-1503.

MM Khandagale, EF Hilder, RA Shellie, PR Haddad. Assessment of the complementarity of temperature and flow-rate forresponse normalisation of aerosol-based detectors. *J. Chromatogr. A.* 1356 (2014) 180-187.

C Kirkin, B Mitrevski, G Gunes, PJ Marriott. Combined effects of gamma-irradiation and modified atmosphere packaging on quality of some spices. *Food Chem.* 154 (2014) 255-261.

C Kirkin, B Mitrevski, G Gunes, PJ Marriott. Essential-oil analysis of irradiated spices by using comprehensive two-dimensional gas chromatography. *ChemPlusChem.* 79 (2014) 798-803.

D Kocic, S Hua, GR Dennis, RA Shalliker. Using active flow technology columns to achieve near 'direct' injection through-put in HPLC-MS. *Microchem. J.* 118 (2015) 193-197.

E Kondo, PJ Marriott, RM Parker, KA Kouremenos, P Morrison, M Adams. Metabolic profiling of yeast culture using gas chromatography coupled with orthogonal acceleration accurate mass time-of-flight mass spectrometry: Application to biomarker discovery. *Anal. Chim. Acta.* 807 (2014) 135-142.

C Kukusamude, S Srijaranai, M Kato, JP Quirino. Cloud point sample clean-up and capillary zone electrophoresis with field enhanced sample injection and micelle to solvent stacking forthe analysis of herbicides in milk. *J. Chromatogr. A.* 1351 (2014) 110-114.

C Kukusamude, S Srijaranai, JP Quirino. Stacking and separation of neutral and cationic analytes in interface-free two-dimensional heart-cutting capillary electrophoresis. *Anal. Chem.* 86 (2014) 3159-3166.

C Kukusamude, S Srijaranai, JP Quirino. Anionic microemulsion to solvent stacking for on-line sample concentration of cationic analytes in capillary electrophoresis. *Electrophoresis.* 35 (2014) 1478-1483.

C Kulsing, R Knob, M Macka, P Junor, RI Boysen, MTW Hearn. Molecular imprinted polymeric porous layers in open tubular capillaries for chiral separations. *J. Chromatogr. A.* 1354 (2014) 85-91.

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. *ChemPlusChem.* 79 (2014) 790-797.

D Lannuzel, PC van der Merwe, AT Townsend, AR Bowie. Size fractionation of iron, manganese and aluminium in Antarctic fast ice reveals a lithogenic origin and low iron solubility. *Mar. Chem.* 161 (2014) 47-56.

Y Lu, D Wang, C Kong, C Jia, MC Breadmore. Analysis of melamine in milk powder and liquid milk by capillary zone electrophoresis after electrokinetic supercharging. *Food. Anal. Methods.* 35 (2014) 3310-3316.

M Macka, T Piasecki, PK Dasgupta. Light-Emitting Diodes for Analytical Chemistry. *Annu. Rev. Anal. Chem.* 7 (2014) 183-207.

G McEneff, L Barronc, B Kelleher, B Paull, B Quinn. A year-long study of the spatial occurrence and relative distribution of pharmaceutical residues in sewage effluent, receiving marine waters and marine bivalves. *Sci. Total Environ.* 476-477 (2014) 317-326.

CS Milroy, GR Dennis, RA Shalliker. Targeted isolations from complex samples using two-dimensional HPLC; Part 3: A semi-continuous heart cutting mode at high sample loads. *J. Liq. Chromatogr. Rel. Tech.* 37 (2014) 230-246.

DP Mitev, AT Townsend, B Paull, PN Nesterenko. Microwave-assisted purification of detonation nanodiamond. *Diamond & Rel. Mats.* 48 (2014) 37-46.

DP Mitev, AT Townsend, B Paull, PN Nesterenko. Screening of elemental impurities in commercial detonation nanodiamond using sector field inductively coupled plasma-mass spectrometry. *J. Mater. Sci.* 49 (2014) 3573-3591.

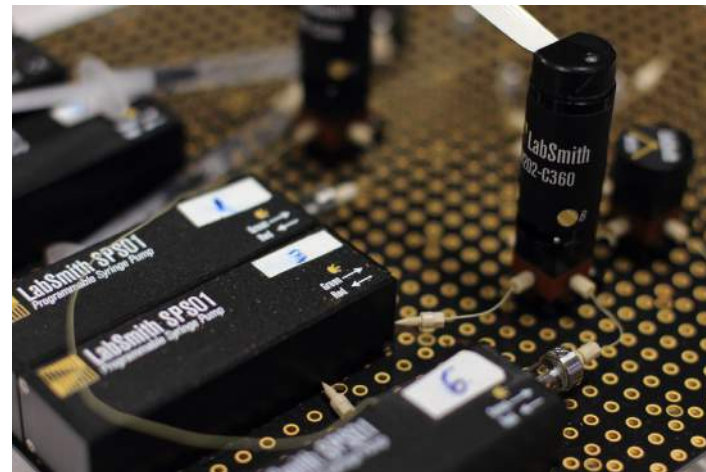
B Mitrevski, PJ Marriott. Evaluation of quadrupole-time-of-flight mass spectrometry in comprehensive two-dimensional gas chromatography. *J. Chromatogr. A.* 1362 (2014) 262-269.

S Mukdasai, E Moore, JD Glennon, X He, EP Nesterenko, PN Nesterenko, B Paull, M Pravda, S Srijaranai. Comparison of electrochemical property between multiwalled carbon nanotubes and porous graphitized carbon monolith modified glassy carbon electrode for the simultaneous determination of ascorbic acid and uric acid. *J. Electroanal. Chem.* 731 (2014) 53-59.

Y Nolvachai, C Kulsing, RI Boysen, MTW Hearn, PJ Marriott. Miniaturized molecularly imprinted polymer extraction method for the gas chromatographic analysis of flavonoids. *J. Sep. Sci.* 37 (2014) 1018-1025.

JD Oliver, M Gaborieau, P Castignolles. Ethanol determination using pressure mobilization and free solution capillary electrophoresis by photo-oxidation assisted ultraviolet detection. *J. Chromatogr. A.* 1348 (2014) 150-157.

JD Oliver, AA Rosserc CM Fellows, Y Guillaneuf, J-L Clement, M Gaborieau, P Castignolles. Understanding and improving direct UV detection of monosaccharides and disaccharides in free solution capillary electrophoresis. *Anal. Chim. Acta.* 809 (2014) 183-193.



WJ Percy, L Shabala, MC Breadmore, RM Guijt, J Bose, S Shabala. Ion transport in broad bean leaf mesophyll under saline conditions. *Planta.* 240 (2014) 729-743.

AA Peristyy, ON Fedyanina, B Paull, PN Nesterenko. Diamond based adsorbents and their application in chromatography. *J. Chromatogr. A.* 1357 (2014) 68-86.

F Queroue, AT Townsend, PC van der Merwe, D Lannuzel, G Sarthou, E Bucciarelli, AR Bowie. Advances in the offline trace metal extraction of Mn, Co, Ni, Cu, Cd, and Pb from open ocean seawater samples with determination by sector field ICP-MS analysis. *Anal. Methods.* 6 (2014) 2837-2847.

JP Quirino, M Kato. Separation of cationic analytes by non-ionic micellar electrokinetic chromatography using polyoxyethylene lauryl ether surfactants with different polyoxyethylene length. *J. Sep. Sci.* 37 (2014) 2613-2617.

HR Rabanes, AM GuidoteJr, JP Quirino. Micellar electrokinetic chromatography of the constituents in Philippine lagundi (Vitex negundo) herbal products. *Microchem. J.* 112 (2014) 153-158.

J Samuelsson, A Cavazzini, RA Shalliker, T Fornstedt. Regeneration of a silica monolithic rod column using harsh methods followed by firm thermodynamic and kinetic validation. *J. Sep. Sci.* 37 (2014) 906-911.

S Sandron, B Heery, V Gupta, DA Collins, EP Nesterenko, PN Nesterenko, M Talebi, S Beirne, F Thompson, GG Wallace, D Brabazon, F Regan, B Paull. 3D printed metal columns for capillary liquid chromatography. *Analyst.* 139 (2014) 6343-6347.

S Sandron, PN Nesterenko, MV McCaul, B Kelleher, B Paull. Normal-phase high-performance counter-current chromatography for the fractionation of dissolved organic matter from a freshwater source. *J. Sep. Sci.* 37 (2014) 135-142.

S Sandron, R Wilson, R Larragy, MV McCaul, PN Nesterenko, B Kelleher, B Paull. Investigation into dissolved neutral sugars and their microbial conversion in natural and artificially produced dissolved organic matter using ion chromatography with pulsed amperometric detection and reversed-phase liquid chromatography-high resolution mass spectrometry. *Anal. Methods.* 6 (2014) 107-114.

B Savareear, MR Jacobs, RA Shellie. Multiplexed dual first-dimension comprehensive two-dimensional gas chromatography–mass spectrometry with contra-directional thermal modulation. *J. Chromatogr. A*. 1365 (2014) 183-190.

M Selim, A Soliven, M Camenzuli, GR Dennis, HJ Ritchie, RA Shalliker. A two-component post-column derivatisation method utilising reaction flow chromatography. *Microchem. J.* 116 (2014) 87-91.

AI Shallan, RM Guijt, MC Breadmore. Electrokinetics for sample preparation of biological molecules in biological samples using microfluidic systems. *Bioanalysis*. 6 (2014) 1961-1974.

AI Shallan, P Smejkal, M Corban, RM Guijt, MC Breadmore. Cost-effective three-dimensional printing of visibly transparent microchips within minutes. *Anal. Chem.* 86 (2014) 3124-3130.

RA Shalliker, H Ritchie. Segmented flow and curtain flow chromatography: Overcoming the wall effect and heterogeneous bed structures. *J. Chromatogr. A*. 1335 (2014) 122-135.

A Soliven, GR Dennis, EF Hilder, RA Shalliker, PG Stevenson. The development of the in situ modification of 1st generation analytical scale silica monoliths. *Chromatographia*. 77 (2014) 663-671.

A Soliven, D Foley, L Pereira, GR Dennis, RA Shalliker, K Cabrera, H Ritchie, T Edge. Enhancing the separation performance of the first-generation silica monolith using active flow technology: Parallel segmented flow mode of operation. *J. Chromatogr. A*. 1334 (2014) 16-19.

A Soliven, D Foley, L Pereira, GR Dennis, RA Shalliker, K Cabrera, H Ritchie, T Edge. Assessing the performance of curtain flow first generation silicamonomoliths. *J. Chromatogr. A*. 1351 (2014) 56-60.

A Soliven, D Foley, L Pereira, S Hua, T Edge, H Ritchie, GR Dennis, RA Shalliker. Improving the performance of narrow-bore HPLC columns using active flow technology. *Microchem. J.* 116 (2014) 230-234.

AT Sutton, E Read, AR Maniego, JJ Thevarajah, J-D Marty, M Destarac, M Gaborieau, P Castignolles. Purity of double hydrophilic block copolymers revealed by capillary electrophoresis in the critical conditions. *J. Chromatogr. A*. 1372 (2014) 187-195.

M Talebi, RA Shellie, EF Hilder, NA Lacher, PR Haddad. Semiautomated pH gradient ion-exchange chromatography of monoclonal antibody charge variants. *Anal. Chem.* 86 (2014) 9794–9799.

JJ Thevarajah, M Gaborieau, P Castignolles. Separation and characterization of synthetic polyelectrolytes and polysaccharides with capillary electrophoresis. *Adv. Chem.* (2014) 11 pages.

RM Tubaon, PR Haddad, JP Quirino. High-sensitivity analysis of anionic sulfonamides by capillary electrophoresis using a synergistic stacking approach. *J. Chromatogr. A*. 1349 (2014) 129-134.

RM Tubaon, H Rabanes, PR Haddad, JP Quirino. Capillary electrophoresis of natural products: 2011-2012. *Electrophoresis*. 35 (2014) 190-204.

M Vazquez, D Moore, X He, A Ben Azouz, EP Nesterenko, PN Nesterenko, B Paull, D Brabazon. Focussed ion beam serial sectioning and imaging of monolithic materials for 3D reconstruction and morphological parameter evaluation. *Analyst*. 139 (2014) 99-104.

RL Webster, PM Rawson, DJ Evans, PJ Marriott. Synthetic phenolic antioxidants in middle distillate fuels analyzed by gas chromatography with triple quadrupole and quadrupole time-of-flight mass spectrometry. *Energy Fuels*. 28 (2014) 1097-1102.

YF Wong, C Hartmann, PJ Marriott. Multidimensional gas chromatography methods for bioanalytical research. *Bioanalysis*. 6 (2014) 2461-2479.



A Wuethrich, PR Haddad, JP Quirino. Chiral capillary electromigration techniques - mass spectrometry - hope and promise. *Electrophoresis*. 35 (2014) 2-11.

A Wuethrich, PR Haddad, JP Quirino. Off-line sample preparation by electrophoretic concentration using a micropipette and hydrogel. *J. Chromatogr. A*. 1369 (2014) 186-190.

A Wuethrich, PR Haddad, JP Quirino. Online Sample Concentration in Partial-Filling Chiral Electrokinetic Chromatography – Mass Spectrometry. *Chirality*. 26 (2014) 734-738.

A Wuethrich, PR Haddad, JP Quirino. Zero net-flow in capillary electrophoresis using acrylamide based hydrogel. *Analyst*. 139 (2014) 3722-3726.

EV Yusenko, FP Kapsargin, PN Nesterenko. Determination of fluoride ions in urinary stones by ion chromatography. *J. Anal. Chem.* 69 (2014) 474-479.

AV Zatirakha, AD Smolenkov, AV Pirogov, PN Nesterenko, OA Shpigun. Preparation of characterisation of anion exchangers with dihydroxy-containing alkyl substitutes in the quaternary ammonium functional groups. *J. Chromatogr. A*. 1323 (2014) 104-114.

Z Zeng, J Li, HM Hugel, G Xu, PJ Marriott. Interpretation of comprehensive two-dimensional gas chromatography data using advanced chemometrics. *TrAC-Trend. Anal. Chem.* 53 (2014) 150-166.

Non Refereed Articles

LS Kim, K Tuck, PJ Marriott. Preparative gas chromatography (Prep-GC). *Reference Module in Chemistry, Molecular Sciences and Chemical Engineering*. J Reedijk (Ed), MA Waltham, Elsevier, Massachusetts, USA, 2014.

M Macka. Lighting the way. *International Innovation*. 175 (2014) 163-165, Research Media, Bristol, UK.

P Marriott, B Mitrevski. Innovative solutions for enhanced illicit drugs profiling using comprehensive two-dimensional gas chromatography and mass spectrometry technologies. *Monograph Series No. 50*. (2014) National Drug Law Enforcement Research Fund (NDLERF), Canberra, Australia.

L Ranjbar, RA Shellie, MC Breadmore. Capillary electrophoresis, low molecular mass ions. *Reference Module in Chemistry, Molecular Sciences and Chemical Engineering*. J Reedijk (Ed), MA Waltham, Elsevier, Massachusetts, USA, 2014.



OTHER PUBLICATIONS

Plenary, Keynote and Invited Conference Papers

MC Breadmore. Electrokinetics for sample preparation. Invited oral paper at *CE in the Biotechnology & Pharmaceutical Industries (CE Pharm 2014)*, Seattle, USA, 12-16 October 2014.

MC Breadmore, D Gstoettenmayr, A Gaudry, A Alhusban, HH See, JP Quirino and R Guijt. Development and applications of sequential injection – capillary electrophoresis systems. Invited oral paper at *21st International Symposium on Electro- and Liquid Phase-Separation Techniques & 20th Latin-American Symposium on Biotechnology, Biomedical, Biopharmaceutical, and Industrial Applications of Capillary Electrophoresis (ITP&LACE 2014)*, Natal, Brazil, 4-8 October 2014.

MC Breadmore, AI Shallan, AJ Gaudry, RM Guijt. Microfluidic devices for the separation of small molecules for environmental and biological samples. Invited oral paper at *Fourth International Workshop on Analytical Miniaturization and NANOTECHNOLOGIES (WAMNANO2014)*, Copenhagen, Denmark, 23-24 June 2014.

MC Breadmore, AI Shallan, RM Guijt. Microfluidic devices with integrated nanochannels for rapid detection of drugs in body fluids. Invited oral paper at *NanoBio Australia 2014*, Brisbane, Australia, 6-10 July 2014.

B French, B Green, J McPhee, **M Macka.** Neglected and underutilised plants provide opportunities for enhanced nutrition in developing countries. Invited oral paper at *14th International Nutrition & Diagnostics Conference (INDC 2014)*, Prague, Czech Republic, 2-5 September, 2014.

PR Haddad, GW Dicoski, EF Hilder, MC Breadmore, JP Hutchinson, CA Johns, RM Guijt, PN Nesterenko, M Macka, A Gaudry. A comparison of ion chromatography and capillary electrophoresis for the separation of inorganic anions and cations. Invited keynote oral paper at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 10-15 May 2014.

PR Haddad, MM Khandagale, RA Shellie, EF Hilder. Strategies for achieving universal response and calibration for aerosol-based detectors in liquid chromatography. Invited keynote oral paper at *38th International symposium on capillary chromatography (ISCC 2014)*, Riva del Garda, Italy, May 2014.

PR Haddad, SH Park, M Taraji, RA Shellie, GW Dicoski, G Schuster, M Talebi, R Szucs, CA Pohl, JW Dolan. Prediction of retention behaviour in reversed-phase, HILIC and ion chromatography based on chemical structures of analytes. Invited keynote oral paper at *30th International Symposium on Chromatography (ISC 2014)*, Salzburg, Austria, 14-18 September 2014.

PR Haddad, SH Park, M Taraji, RA Shellie, GW Dicoski, G Schuster, M Talebi, R Szucs, CA Pohl, JW Dolan. Prediction of retention times in reversed-phase, HILIC and ion chromatography based on chemical structures of analytes. Invited keynote oral paper at *14th Asia-Pacific International Symposium on Microscale Separations and Analysis (APCE 2014)*, Kyoto, Japan, 1-10 December 2014.

EF Hilder. Synthesis and application of polymer monoliths in liquid chromatography. Invited tutorial at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 11-15 May 2014.

EF Hilder, RD Arrua, A Khodabandeh, CT Desire. Preparation and characterization of ordered porous polymer monoliths for chromatography. Invited keynote oral paper at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 11-15 May 2014.

EF Hilder, WB Hon, E Candish, RA Shellie, HJ Wirth, A Gooley. Polymeric monolithic materials for miniaturised and automated sample preparation. Invited plenary oral paper at *38th International symposium on capillary chromatography (ISCC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

EF Hilder, WB Hon, CT Desire, RD Arrua, E Candish, RA Shellie, A Gooley. Polymeric monolithic materials for miniaturised bioanalysis, Invited keynote oral paper at *3rd International Symposium on Hyphenated Techniques for Sample Preparation (HTSP-3)*, Bruges, Belgium, 28-31 January 2014.

EF Hilder, M Talebi, PR Haddad. Charge heterogeneity profiling of therapeutic monoclonal antibodies using monolithic columns and external pH gradient cation-exchange chromatography. Invited keynote oral paper at *30th International Symposium on Chromatography (ISC 2014)*, Salzburg, Austria, 14-18 September 2014.

M Macka. Low entry barriers microfluidics. Invited oral paper at *20th International Symposium on Separation Sciences (ISSS 2014)*, Prague, Czech Republic, 30 August-5 September 2014.

M Macka, N Nuchtavorn, L Yan, M Dvorak, PN Nesterenko, R Stanley. Miniaturized portable analysis and sample preparation: Synergies? Plenary oral paper at *1st Caparica Christmas Conference on Sample Treatment*, Lisbon, Portugal, 8-10 December 2014.

P Marriott. Aromas, flavours, perfumes: integrated GC, MDGC, GC×GC with FID, “O” And MS. Invited oral paper at *38th International symposium on capillary chromatography and 11th GC×GC symposium (ISCC 2014 & GCxGC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

P Marriott. Multidimensionality in gas chromatography: Revealing molecular information from complex samples. Plenary oral paper at *Petroleum Analysis Symposium*, London, UK, 14 November 2014.

PJ Marriott, S-T Chin. Essential oil analysis by using novel design of separation systems with olfactometry and MS/MS Detection - ‘TAAAS’. Invited oral paper at *Analytica China*, Shanghai, China, 24-25 September 2014.

P Marriott, S-T Chin. Innovative assessment tools for accurate assignment of food flavours. Invited oral paper at *47th Annual Australian Institute for Food Science and Technology Convention*, Melbourne, Australia, 22-25 June 2014.

P Marriott, S-T Chin, B Mitrevski, LS Kim. Pimp my GC. Invited keynote oral paper at *13th International Symposium on Hyphenated Techniques in Chromatography and Separation Technology (HTC-13)* Bruges, Belgium, 29-31 January 2014.

P Marriott, Z Zeng, C Kulsing, Y Nolvachai. Insights on orthogonality in GC×GC. Invited Keynote oral paper at *38th International symposium on capillary chromatography and 11th GC×GC symposium (ISCC 2014 & GCxGC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

PN Nesterenko. Current state of high-performance chelation ion chromatography. Plenary oral paper at *10th International conference on Ion Chromatography*, Zabrze, Poland, 9-10 April 2014.

PN Nesterenko, DP Mitev, B Paull, A Townsend. New approach to the analysis of elemental impurities in nanodiamonds and related progress in their purification. Invited oral paper at *2014 MRS Spring Meeting*, San Francisco, USA, 21-25 April 2014.

B Paull. Carbon on carbon composites: Properties, characterisation and applications. Invited oral paper at *9th Annual International Electromaterials Symposium*, Wollongong, Australia, 12-14 February 2014.

B Paull. The diverse application of nanoparticles in separation science. Invited oral paper at *Pure and Applied Chemistry International Conference (PAC-CON2014)*, Khon Kaen University, Khon Kaen, Thailand, 8-10 January 2014.

B Paull, T Kazarian, P Nesterenko. Combining mixed-mode and HILIC based chromatography in comprehensive pharmaceutical analysis. single column, sequential column and parallel column approaches. Invited keynote oral paper at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 11-15 May 2014.

RA Shalliker. Recent advances in column technology: Active flow technology. Invited oral paper at *Conference on Small Molecule Science (CoSMoS 2014)*, Williamsburg, USA, 10-13 August 2014.

R Shellie, L Tedone. You are what you eat: Using GCxGC to unravel the diet of the whale shark. Invited keynote oral paper at *13th International Symposium on Hyphenated Techniques in Chromatography and Separation Technology (HTC-13)* Bruges, Belgium, 29-31 January 2014.

AT Sutton, E Read, JD Marty, M Destarac, M Gaborieau, P Castignolles. Characterisation of block copolymers by capillary electrophoresis in the critical conditions. Invited oral paper (CRC for Polymer Prize) at *2014 RACI National Congress*, Adelaide, Australia, 7-10 December 2014.

M Talebi, EF Hilder, **PR Haddad**. Charge heterogeneity profiling of therapeutic monoclonal antibodies using monolithic columns and external pH gradient cation-exchange chromatography. Invited keynote oral paper at *NanoBio Australia 2014*, Brisbane, Australia, 6-10 July 2014.

Other Conference Papers and Presentations

D Arrua, A Khodabandeh, EF Hilder. Synthesis of nanoparticles by raft in miniemulsion polymerisation and their application as pseudostationary phases in electrokinetic chromatography. Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.

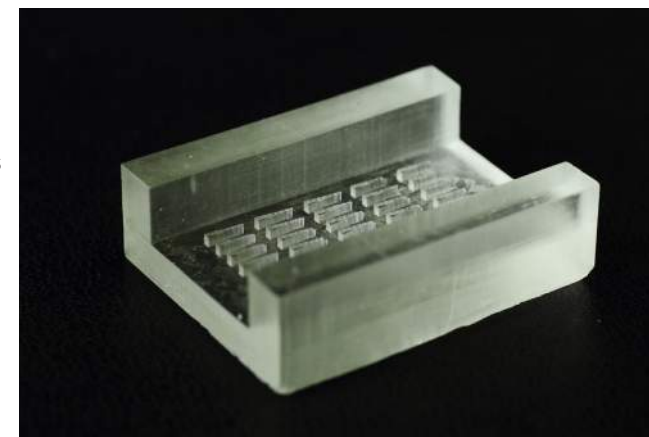
JM Cabot, E Fuguet, M Rosés, M Breadmore. Novel home-built CE system to ease pKa determination by the internal standard capillary electrophoresis method. Oral paper at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

E Candish, A Gooley, RA Shellie, EF Hilder. Rapid sample preparation using miniaturized solid phase extraction. Oral paper at *13th International Symposium on Hyphenated Techniques in Chromatography and Separation Technology (HTC-13)* Bruges, Belgium, 29-31 January 2014.

F Cecil, P Smejkal, N Nuchtavorn, MC Breadmore, A Henderson, A Cole, RM Guijt, M Macka. 3D printed on-capillary photometric detection/sensors. Poster presentation at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

E Duffy, S Krishnamurthy, X He, E Nesterenko, D Brabazon, P Nesterenko, B Paull. Preparation and properties of porous graphitic carbon monoliths embedded with nanodiamonds and other temperature-induced nanocarbons. Oral paper at *2014 Materials Research Society Spring Meeting*, San Francisco, USA, 21-25 April 2014.

M Dvorak, J Aufartová, LK Krčmová, Y Li, M Macka. Microfluidics meets portable LC. Oral paper at *5th Australia and New Zealand Nano- Microfluidics Symposium (ANZNMF) 2014*, Hobart, Australia, 14-16 April 2014.



M Dvorak, Y Li, J Aufartová, LK Krčmová, **M Macka**. Portable Medium Pressure Capillary LC designed as a modular system using off-the-shelf components. Poster presentation at *38th International symposium on capillary chromatography (ISCC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

M Dvorak, Y Li, N Nuchtavorn, P Nesterenko, R Stanley, **M Macka**. The potential of a portable modular medium pressure liquid chromatography system for in-field food analysis. Poster presentation at *14th International Nutrition & Diagnostics Conference (INDC 2014)*, Prague, Czech Republic, 2-5 September, 2014.

R Farrell, R Wilson, D Nichols, M Breadmore, R Shellie. Direct-infusion and paper spray ionisation mass spectrometry for high-throughput screening of rapid oak extracts. Poster presentation at *20th International Mass Spectrometry Conference (IMSC 2014)*, Geneva, Switzerland, 24-29 August 2014.

ON Fedyanina, PN Nesterenko. nanodiamond for high-performance liquid chromatography. Poster presentation at *XII International conference on Nanostructured Materials (NANO 2014)*, Moscow, Russia, 13-18 July, 2014.

O Fedyanina, PN Nesterenko. Cation-exchange properties of micro disperse sintered nanodiamonds. Poster presentation at *30th International Symposium on Chromatography (ISC 2014)*, Salzburg, Austria, 14-18 September 2014.

R Gras, J Luong, HJ Cortes, RA Shellie. Characterization of phenol and alkyl phenols in organic matrices with monoethylene glycol extraction and multidimensional gas chromatography/mass spectrometry. Oral paper at *38th International symposium on capillary chromatography and 11th GC×GC symposium (ISCC 2014 & GCxGC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

PR Haddad, G Dicinoski, E Hilder, M Breadmore, J Hutchinson, C Johns, P Nesterenko, M Macka, A Gaudry. A comparison of ion chromatography and capillary electrophoresis for the separation of inorganic anions and cations. Oral paper at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 10-15 May 2014.

PR Haddad, SH Park, M Taraji, RA Shellie, GW Dicinoski, G Schuster, M Talebi, R Szucs, CA Pohl, JW Dolan. Prediction of retention times in reversed-phase, HILIC and ion chromatography based on chemical structures of analytes. Oral paper at *Australia-Pacific Capillary Electrophoresis (APCE 2014)*, Osaka, Japan, 8-10 December 2014.

EF Hilder, RD Arrua, CT Desire, A Khodabandeh, R Wilson. Preparation and characterisation of ordered porous polymer monoliths. Oral paper at *248th American Chemical Society (ACS) National Meeting & Exposition*, San Francisco, USA, 10-14 August 2014.

EF Hilder, WB Hon, E Candish, RA Shellie, HJ Wirth, A Gooley. Polymeric monolithic materials for miniaturised and automated sample preparation. Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.

MIM Horgan, A Singh, DF Fania, R Wuhler, K Chan, P Castignolles, M Gaborieau, **V Naumovski**. Molecular characterisation of konjac glucomannan. Poster presentation at *29th International Horticultural Congress (IHC 2014)*, Brisbane, Australia, 17-22 August 2014.



MR Jacobs, M Edwards, T Gorecki, RA Shellie. GC×GC, GC×GC-MS and miniaturised GC×GC with single stage thermal modulation. Oral paper at *38th International symposium on capillary chromatography and 11th GC×GC symposium (ISCC 2014 & GCxGC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

MS Khan, M Rahman, ZI Sarker, PJ Marriott. Antioxidant activity of pereskia herb by infrared spectroscopy. Poster presentation at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

M Khandagale, PR Haddad, RA Shellie, EF Hilder. Eluent temperature and flow-rate programmed separation approaches to improve performance of aerosol based LC detectors. Poster presentation at *30th International Symposium on Chromatography (ISC 2014)*, Salzburg, Austria, 14-18 September 2014.

C Kukusamude, S Srijaranai, **JP Quirino**. Stacking and separation of neutral and charged analytes in interface-free two-dimensional heart-cutting capillary electrophoresis. Oral paper at *Australia-Pacific Capillary Electrophoresis (APCE 2014)*, Osaka, Japan, 8-10 December 2014.

I Lacík, M Buback, P Kilz, B Charleux, F D'Agosto, P Castignolles, RG Gilbert, C Barner-Kowollik. SEC analysis of poly(acrylic acid) and poly(methacrylic acid). Oral paper at *2014 IUPAC World Polymer Congress (MACRO 2014)*, Chiang Mai, Thailand, 6-11 July 2014.

Y Li, M Dvorak, L Krcmova, J Aufartova, N Nuchtavorn, PN Nesterenko, R Stanley, **M Macka**. Portable capillary LC: A modular medium pressure system designed with off-the-shelf components. Oral paper at *38th International symposium on capillary chromatography and 11th GC×GC symposium (ISCC 2014 & GCxGC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

Y Li, M Dvorak, N Nuchtavorn, P Nesterenko, R Stanley, **M Macka**. Portable medium pressure capillary liquid chromatography using off-the-shelf components based on a modular microfluidic system. Poster presentation at *20th International Symposium on Separation Sciences (ISSS 2014)*, Prague, Czech Republic, 30 August-5 September 2014.

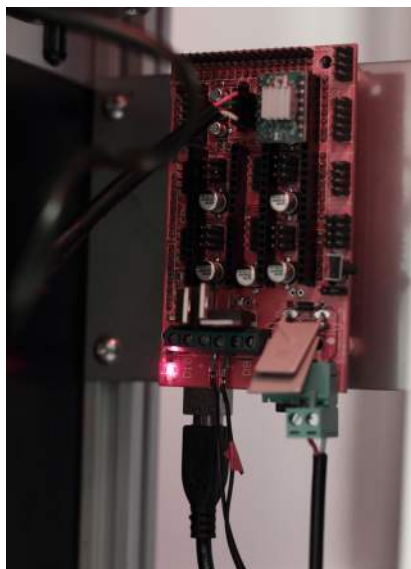
M Macka, M Dvorak, J Aufartová, LK Krčmová, Y Li. Portable Capillary LC: A modular medium pressure system designed with off-the-shelf components. Oral paper at *38th International symposium on capillary chromatography (ISCC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

P Mahbub. Impact of climate change induced rainfall characteristics on water quality from road runoff: A case study for traffic generated volatile compounds in Gold Coast Australia. Oral paper at *Engineers Australia Convention 2014*, Melbourne, Australia, 25-27 November 2014.

G Mangiante, P Alcouffe, B Burdin, M Gaborieau, E Zeno, M Petit-Conil, J Bernard, **A Charlot**, E Fleury. Non-degrading modifications of cellulose fibers to generate tailor-made biohybrids. Oral paper at *2014 IUPAC Word Polymer Congress (MACRO2014)*, Chiang Mai, Thailand, 6-11 July 2014.

AR Maniego, AT Sutton, CM Fellows, Y Guillaneuf, M Destarac, M Gaborieau, P Castignolles. Branching topology and heterogeneity in hydrophilic poly-acrylates. Poster presentation at *RACI NSW Polymer Workshop on Polymer Nanoparticles, Self-Assembly and Colloids*, Kensington, Australia, 14 November 2014.

AR Maniego, AT Sutton, Y Guillaneuf, C Lefay, M Destarac, CM Fellows, P Castignolles, **M Gaborieau**. Poly(acrylic acid) is branched! NMR and capillary electrophoresis characterisation. Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.



AR Maniego, **EG Whitty**, A Coronel Palacios, D Le, JR Aldrich-Wright, Y Guillaneuf, J Nicolas, M Gaborieau, P Castignolles. Binding cisplatin and fluorescent probes to poly(acrylic acid). Poster presentation at *RACI NSW Polymer Workshop on Polymer Nanoparticles, Self-Assembly and Colloids*, Kensington, Australia, 14 November 2014.

AR Maniego, EG Whitty, DJ Keddie, CM Fellows, Y Guillaneuf, M Gaborieau, **P Castignolles**. Smart poly(acrylic acid) for anticancer drug delivery. Oral paper at *3rd biennial conference of the Combined Australian Materials Societies (CAMS2014)*, Sydney, Australia, 26-28 November 2014.

PN Nesterenko, S Sandron, AR Cardona, N Davies, R Wilson, B Kelleher, R Shellie, P Haddad, B Paull. Single and multi-dimensional chromatographic approaches for the fractionation of dissolved organic matter (DOM). Poster presentation at *30th International Symposium on Chromatography (ISC 2014)*, Salzburg, Austria, 14-18 September 2014.

N Nuchtavorn, M Macka. New detection options for microfluidic chip platforms. Oral paper at *5th Australia and New Zealand Nano- Microfluidics Symposium (ANZNMf) 2014*, Hobart, Australia, 14-16 April 2014.

N Nuchtavorn, M Macka. Technical drawing pens as a novel highly flexible, simple, rapid and low-cost fabrication tool for paper based microfluidic devices (µPADs). Poster presentation at *20th International Symposium on Separation Sciences (ISSS 2014)*, Prague, Czech Republic, 30 August-5 September 2014.

N Nuchtavorn, M Macka. Technical drawing pens as a fabrication method of paper-based microfluidic devices for antioxidant activity evaluation. Poster presentation at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

JD Oliver, M Gaborieau, **P Castignolles**. Carbohydrates and ethanol determination in complex media with capillary electrophoresis. Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.

JD Oliver, **AT Sutton**, M Gaborieau, EF Hilder, P Castignolles. Pathway to the online monitoring of fermentations by capillary electrophoresis: optimizing analysis of substrates and products in a living system. Poster presentation at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

SH Park, RA Shellie, GW Dicinoski, M Talebi, C Jones, PR Haddad, R Szucs, JW Dolan, CA Pohl. Updating methodology for “porting” ion chromatography retention data. Poster presentation at *4th AsiaPacific-Korea Conference on Science and Technology (AKC2014)*, Sydney, Australia, 20-22 November 2014.

B Paull, D Collins, EP Nesterenko, B Heery, PN Nesterenko, S Sandron, A Peristyy, M Talebi, V Gupta, S Beirne, F Thompson, G Wallace. The development and application of 3D printed metal. Capillary Chromatography Columns. Poster presentation at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 11-15 May 2014.

B Paull, D Collins, EP Nesterenko, PN Nesterenko, S Sandron, M Talebi, S Beirne, F Thompson, G Wallace. The development and application of 3D printed metal capillary chromatography columns. Oral paper at *38th International symposium on capillary chromatography and 11th GC×GC symposium (ISCC 2014 & GCxGC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

B Paull, T Kazarian, P Nesterenko. Combining mixed-mode and HILIC based chromatography in comprehensive pharmaceutical analysis. Single column, sequential column and parallel column approaches. Oral paper at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 11-15 May 2014.

A Peristyy, P Nesterenko, B Paull. Synthetic diamond microparticles as a stationary phase for elevated temperature and ultra-high pressure liquid chromatography. Oral paper at *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 11-15 May 2014.



P Prapatpong, MC Breadmore, RM Guijt, **M Macka**. In-capillary derivatisation in CE studied for anti-alzheimer drug Memantine and amines. Poster presentation at *38th International symposium on capillary chromatography (ISCC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

P Prapatpong, AA Keyon, MC Breadmore, R Guijt, N Nuchtavorn, L Suntornsuk, M Macka. In-capillary derivatisation for automated sensitive analysis of Memantine in plasma by capillary electrophoresis with photometric detections. Oral paper at *5th Australia and New Zealand Nano- Microfluidics Symposium (ANZNMf) 2014*, Hobart, Australia, 14-16 April 2014.

L Ranjbar, MC Breadmore, RA Shellie. Comprehensive two-dimensional ion chromatography-capillary electrophoresis for separation of disinfection byproducts. Oral paper at *21st International Symposium on Electro- and Liquid Phase-Separation Techniques & 20th Latin-American Symposium on Biotechnology, Biomedical, Biopharmaceutical, and Industrial Applications of Capillary Electrophoresis (ITP&LACE 2014)*, Natal, Brazil, 4-8 October 2014.

L Ranjbar, MC Breadmore, RA Shellie. Two-dimensional ion chromatography-capillary electrophoresis. Oral paper at *5th Australia and New Zealand Nano- Microfluidics Symposium (ANZNMf) 2014*, Hobart, Australia, 14-16 April 2014.

L Ranjbar, MC Breadmore, RA Shellie. Two-dimensional ion chromatography-capillary electrophoresis. Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.

M Romero, RD Arrua, CIA Igarzabal, **EF Hilder**. Synthesis and characterisation of pH responsive hydrogels: Application as flow control valve in microfluidic systems. Poster presentation at *Biosensors 2014*, Melbourne, Australia, 27-30 May 2014.

M Romero, RD Arrua, CIA Igarzabal, **EF Hilder**. Synthesis and characterisation of pH-responsive hydrogels: Application as flow control valve in microfluidic systems. Oral paper at *5th Australia and New Zealand Nano- Microfluidics Symposium (ANZNMf) 2014*, Hobart, Australia, 14-16 April 2014.

B Savareear, **RA Shellie**. Multi-multi-dimensional gas chromatography. Oral paper at *38th International symposium on capillary chromatography and 11th GC×GC symposium (ISCC 2014 & GCxGC 2014)*, Riva del Garda, Italy, 18-23 May 2014.

HH See. Electric field driven extraction across a polymer inclusion membrane. Oral paper at *Australia-Pacific Capillary Electrophoresis (APCE 2014)*, Osaka, Japan, 8-10 December 2014.

AI Shallan, RM Guijt, MC Breadmore. Electrokinetic traps for integrated biological sample analysis. Poster presentation at *The 16th International Conference on Miniaturized Systems for Chemistry and Life Sciences (µTAS 2014)*, San Antonio, USA, 26-30 October 2014.

AI Shallan, RM Guijt, MC Breadmore. 3D printed microchips. Oral paper at *5th Australia and New Zealand Nano- Microfluidics Symposium (ANZNMf) 2014*, Hobart, Australia, 14-16 April 2014.

RA Shalliker, D Kocic. Optimising analytical performance using active flow technology chromatography columns: speed, efficiency and sensitivity. *41st International Symposium on High Performance Liquid Phase Separations and Related Techniques (HPLC 2014)*, New Orleans, USA, 11-15 May 2014.

RA Shellie, B Savareear. Multi-multi-dimensional gas chromatography. Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.

AT Sutton, AR Maniego, CM Fellows, M Destarac, JD Marty, Y Guillaneuf, P Castignolles, M Gaborieau. Capillary electrophoresis and NMR spectroscopy of smart polymers. Poster presentation at *Molecular Medicine Research Group Annual Meeting*, Campbelltown, Australia, 25 November 2014.

AT Sutton, JD Marty, M Destarac, M Gaborieau, P Castignolles. Assessing copolymer purity by capillary electrophoresis. Oral paper at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

AT Sutton, E Read, AR Maniego, JJ Thevarajah, JD Marty, M Destarac, M Gaborieau, P Castignolles. Quantification of homopolymers in block copolymers by capillary electrophoresis in the critical conditions (CE-CC). Poster presentation at *RACI NSW Polymer Workshop on Polymer Nanoparticles, Self-Assembly and Colloids*, Kensington, Australia, 14 November 2014.

AT Sutton, E Read, AR Maniego, JJ Thevarajah, JD Marty, M Destarac, M Gaborieau, P Castignolles. Quantification of homopolymers in block copolymers by capillary electrophoresis in the critical conditions. Poster presentation at *2014 IUPAC Word Polymer Congress (MACRO2014)*, Chiang Mai, Thailand, 6-11 July 2014.

M Taraji, M Talebi, G Schuster, GW Dicinowski, RA Shellie, PR Haddad, R Szucs, JW Dolan, CA Pohl. The role of similarity in QSRR Studies. Poster presentation at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

JJ Thevarajah, MD O'Connor, P Castignolles, **M Gaborieau**. Molecular characterisation of polysaccharides for applications in cell culture and nutrition. Oral paper at *Molecular Medicine Research Group Annual Meeting*, Campbelltown, Australia, 25 November 2014.

JJ Thevarajah, DL Taylor, DK Narayan, C Lefay, MD O'Connor, M Gaborieau, **P Castignolles**. Enabling chitosan for biomedical applications: looking closer at dissolution and grafting and ... getting surprised! Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.

JJ Thevarajah, DL Taylor, MD O'Connor, R Wuhner, P Castignolles, **M Gaborieau**. Chitosan: A smart polymer for (bio) materials. Oral paper at *3rd biennial conference of the Combined Australian Materials Societies (CAMS2014)*, Sydney, Australia, 26-28 November 2014.

MR Toutounji, M Van Leeuwen, JD Oliver, M Gaborieau, A Shrestha, P Castignolles. Breakfast cereal: How much glucose does it release in our digestive system? Poster presentation at *Food - The Final Frontier - 47th Annual Australian Institute for Food Science and Technology Convention*, Melbourne, Australia, 22-25 June 2014.

MR Toutounji, MP Van Leeuwen, JD Oliver, AK Shrestha, P Castignolles, M Gaborieau. A new method for sugar quantification in starchy food - breakfast cereals. Poster presentation at *Molecular Medicine Research Group Annual Meeting*, Campbelltown, Australia, 25 November 2014.

MR Toutounji, MP Van Leeuwen, JD Oliver, AK Shrestha, P Castignolles, M Gaborieau. A new method for sugar quantification in starchy food - breakfast cereals. Poster presentation at *RACI NSW Polymer Workshop on Polymer Nanoparticles, Self-Assembly and Colloids*, Kensington, Australia, 14 November 2014.

M Van Leeuwen, M Toutounji, J Mata, E Gilbert, L Pallas, R Ward, A Shrestha, P Castignolles, M Gaborieau. Characterisation of starch by IR spectroscopy and X-ray diffraction. Poster presentation at *Molecular Medicine Research Group Annual Meeting*, Campbelltown, Australia, 25 November 2014.

M Van Leeuwen, M Toutounji, J Mata, E Gilbert, L Pallas, R Ward, A Shrestha, P Castignolles, M Gaborieau. Characterisation of starch by IR spectroscopy and X-ray diffraction. Poster presentation at *RACI NSW Polymer Workshop on Polymer Nanoparticles, Self-Assembly and Colloids*, Kensington, Australia, 14 November 2014.



M Vázquez, E Duffy, X He, R Padovani, E Vereshchagina, R Gorkin, EP Nesterenko, J Ducreé, PN Nesterenko, B Paull, D Brabazon. Centrifugal microfluidic discs for solid-phase micro-extraction applications. Oral paper at *1st Caparica Christmas Conference on Sample Treatment*, Lisbon, Portugal, 8-10 December 2014.

R Webster, P Marriott. Multidimensional gas chromatography of alkylidihydrofurones in thermally stressed jet fuels. Oral paper at *2014 RACI National Congress*, Adelaide, Australia, 7-12 December 2014.

R Webster, P Marriott. Investigating the oxidation of synthetic jet fuels with two-dimensional gas chromatography. Poster presentation at *All-Energy Australia 2015*, Melbourne, Australia, 15-16 October 2014.

EG Whitty, AR Maniego, SA Bentwitch, Y Guillaneuf, MR Jones, P Castignolles, M Gaborieau. Cellular response to branched poly(sodium acrylate). Oral paper at *Molecular Medicine Research Group Annual Meeting*, Campbelltown, Australia, 25 November 2014.

EG Whitty, AR Maniego, SA Bentwitch, Y Guillaneuf, MR Jones, P Castignolles, M Gaborieau. Cellular responses to branched poly(acrylic acid). Poster presentation at *RACI NSW Polymer Workshop on Polymer Nanoparticles, Self-Assembly and Colloids*, Kensington, Australia, 14 November 2014.

EG Whitty, AR Maniego, P Castignolles, M Jones, M Gaborieau. Cellular response to poly(acrylic acid) obtained by nitroxide-mediated polymerisation. Poster presentation at *2014 IUPAC Word Polymer Congress (MACRO2014)*, Chiang Mai, Thailand, 6-11 July 2014.

A Wuethrich, PR Haddad, JP Quirino. Purely aqueous electrophoretic concentration of anions using a glass micropipette and hydrogel. Oral paper at *Australia-Pacific Capillary Electrophoresis (APCE 2014)*, Osaka, Japan, 8-10 December 2014.

YC Yap, TC Dickson, AE King, MC Breadmore, RM Guijt. Microfluidic model for mild traumatic brain injury. Poster presentation at *The 16th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS 2014)*, San Antonio, USA, 26-30 October 2014.

YC Yap, RM Guijt, TC Dickson, AE King, MC Breadmore. Stainless steel pinholes for fast fabrication of microfluidic devices by CO₂ laser ablation. Oral paper at *5th Australia and New Zealand Nano-Microfluidics Symposium (ANZNMF) 2014*, Hobart, Australia, 14-16 April 2014.

YC Yap, AE King, MC Breadmore, RM Guijt, TC Dickson. Microfluidic culture platform for studying neuronal response to axonal stretch injury. Poster presentation at *34th Annual Meeting of the Australasian Neuroscience Society*, Adelaide, Australia, 28-31 January 2014.

YC Yap, AE King, MC Breadmore, RM Guijt, TC Dickson. Novel in vitro model of repetitive very mild axonal stretch injury. Oral paper at *5th Australian Neurotrauma Symposium*, Adelaide, Australia, 16-18 October 2014.

Seminars to Universities and Companies

RD Arrua. Synthesis and characterisation of ordered monolithic structures. Invited seminar at Kyoto University, Kyoto, Japan, 14 July, 2014.

P Castignolles. Characterization of complex (co)polymers by free solution capillary electrophoresis (and SEC/GPC and (solid-state) NMR). Invited seminar at Paul Sabatier University, Toulouse, France, 13 January 2014.

P Castignolles. Separation of smart polymers by electrophoretic methods. Invited lecture at Federation de Chimie, Aix-Marseille University, Marseilles, France, 17 January 2014.

P Castignolles, M Gaborieau. Characterization of polymeric biomaterials by free solution capillary electrophoresis (and SEC/GPC and (solid-state) NMR). Invited lecture at Universite Paris Sud, Chatenay-Malabry, France, 24 January 2014.

EF Hilder. Polymeric monolithic materials for miniaturized sampling and sample preparation. Invited seminar at Department of Chemistry and Biochemistry, University of Texas, Arlington, USA, 9 May 2014.

EF Hilder. Polymeric monolithic materials for miniaturized sampling and sample preparation. Invited seminar at School of Life and Environmental Sciences, Deakin University, Waurm Ponds, Australia, 4 July 2014.

M Macka. Miniaturised analysis: Where to now? Invited lecture at Faculty of Natural Sciences, Charles University, Prague, Czech Republic, 16 June 2014.

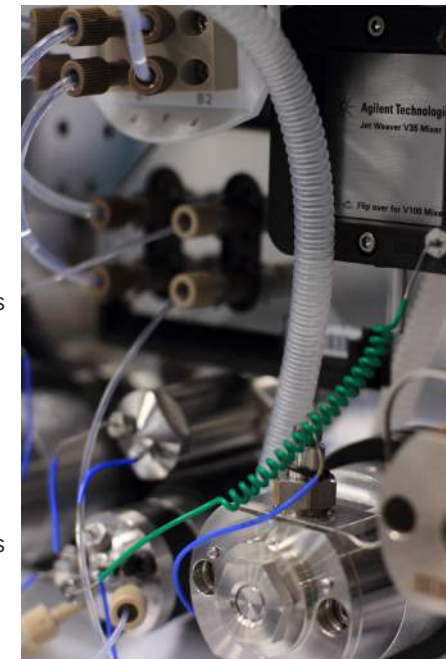
M Macka. Miniaturised and portable analysis in a Concept of Low-Barrier Science. Invited seminar at Institute of Analytical Chemistry, The Czech Academy of Sciences (AV ČR, v.v.i.), Brno, Czech Republic, 30 May 2014.

M Macka. Miniaturised and portable analysis: Synergies with Engineering and Technology in a Concept of Low-Barrier Science. Invited seminar at Brno University of Technology, Brno, Czech Republic, 25 June 2014.

M Macka. Miniaturised and portable formats in bioanalysis in a concept of low-barrier science. Invited lecture at University of Veterinary and Pharmaceutical Sciences, Brno, Czech Republic, 10 June 2014.

M Macka. Miniaturised and portable bioanalysis. Invited seminar at Mendel University, Brno, Czech Republic, 28 May 2014.

M Macka. Portable LC. Invited seminar at Griffith University (Gold Coast Campus), Southport, Australia, 21 November 2014.



PJ Marriott. Advanced gas chromatographic analysis based on multidimensionality in GC with mass spectrometry: GC×GC-MS and MDGC-MS. Invited seminar at Centres for Disease Control & Prevention (CDCP), Nanjing, China, 29 September 2014.

PJ Marriott. Aromas, Flavours, perfumes: Methods for analysis and assessment. Invited seminar at Milan Polytechnic, Milan, Italy, 16 May 2014.

PJ Marriott. High resolution GC with mass spectrometry: expanding the information available for industrial and environmental analysis. Invited seminar at BASF, Ludwigshafen, Germany, 4 February 2014.

PJ Marriott. Incorporating ionic liquid phases into GC and GC×GC methods. Invited seminar at Sigma-Aldrich/Supelco, 38th International Symposium on Capillary Chromatography / 11th GC×GC Symposium (ISCC/GC×GC 2014), Riva del Garda, Italy, 20 May 2014.

PJ Marriott. Multidimensional methods based on MDGC, GC×GC, MS, and olfactometry for assessing aromas and flavours. Invited seminar at Duisburg-Essen University, Essen, Germany, 3 February 2014.

PJ Marriott. Multidimensionality in GC: Revealing molecular information from complex samples. Invited seminar at Universiti Teknologi Petronas, Perak, Malaysia, 22 December 2014.

PJ Marriott. Separation multidimensionality in GC, mass spectrometry, new separation materials, and complex sample analysis. Invited seminar at Agilent Technologies Shanghai, Shanghai, China, 23 August 2014.

PJ Marriott. Separation multidimensionality, new separation materials, and applications in life and biological sciences. Invited seminar at Faculty of Pharmacy, Xi'an Jiaotong University, China, 19 September 2014.

PJ Marriott, S-T Chin, G Eyres. Emerging methods for analysis and assessment of aromas and flavours. Invited seminar at Fraunhofer Institute - IVV Freising, Freising, Germany, 6 February 2014.

PJ Marriott, Y Nolvachai, C Kulsing. Separation multidimensionality and new ionic liquid and metal organic framework (coordination polymer) materials. Invited seminar at La Trobe University School of Molecular Sciences, Melbourne, Australia, 13 May 2014.

PN Nesterenko. Advanced inorganic and carbon materials in chromatography. Invited seminar at East China University of Science and Technology, Shanghai, China, 9 July 2014.

PN Nesterenko. Application of diamond based materials in chromatography. Invited seminar at Zhejiang University, Hangzhou, China, 7 July 2014.

Workshops

MC Breadmore, RM Guijt. Microfabrication via 3D printing. Invited Workshop at *The 16th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS 2014)*, San Antonio, USA, 26-30 October 2014.

M Macka. Miniaturised, microfluidic and portable separations and analysis. International Workshop "Trends in sample pre-treatment" at Faculty of Pharmacy, Charles University, Hradec Králové, Czech Republic, 17-19 June 2014.

AWARDS

Student Awards

JM Cabot. Awarded the "Highly Commended" oral paper award for "JM Cabot, E Fuguet, M Rosés, MC Breadmore. Novel home-built CE system to ease pKa determination by the internal standard capillary electrophoresis method." at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

E Candish. Endeavour Research Fellowship, Australian Government, Department of Education and Training, 2014.

E Duffy. UTAS graduate research conference and travel fund scholarship to attend and present at *2014 Materials Research Society Spring Meeting* (San Francisco, USA, 21-25 April 2014), University of Tasmania, 2014.

R Farrell. Endeavour Research Fellowship, Australian Government, Department of Education and Training, 2014.

R Farrell. Travel Award to attend *20th International Mass Spectrometry Conference (IMSC 2014)* (Geneva, Switzerland, 24-29 August 2014), International Mass Spectrometry Foundation, 2014.

BK Gaskell. Awarded the "Highly Commended" poster presentation award for "BK Gaskell, RA Shellie, EF Hilder. Porous polymer matrix for ambient ionization mass spectrometry." at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

AR Maniego. Endeavour Research Fellowship, Australian Government, Department of Education and Training, 2014.

AR Maniego. Student Travel Award for *International Polymer Meeting*, Royal Australian Chemical Institute (RACI) Polymer Division, 2014.

AR Maniego. Young Scientist Award to give a lecture at the *Seventh International Symposium on the Separation and Characterization of Natural and Synthetic Macromolecules (SCM-7)* (Amsterdam, Netherlands, February 2015), 2014.

N Nuchtavorn. Awarded the "Highly Commended" poster presentation award for "N Nuchtavorn, M Macka. Technical drawing pens as a fabrication method of paper-based microfluidic devices for antioxidant activity evaluation." at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

AT Sutton. Awarded the 2013 CRC for Polymers Prize for best Honours Thesis in Polymer Science in Australia, The Cooperative Research Centre for Polymers, 2014.

AT Sutton. Awarded the 2nd best oral paper award for "AT Sutton, E Read, AR Maniego, JJ Thevarajah, J-D Marty, M Destarac, M Gaborieau, P Castignolles. Assessing copolymer purity by capillary electrophoresis." at *22nd Annual RACI Environmental and Analytical Division R&D Topics Conference*, Adelaide, Australia, 13-15 December 2014.

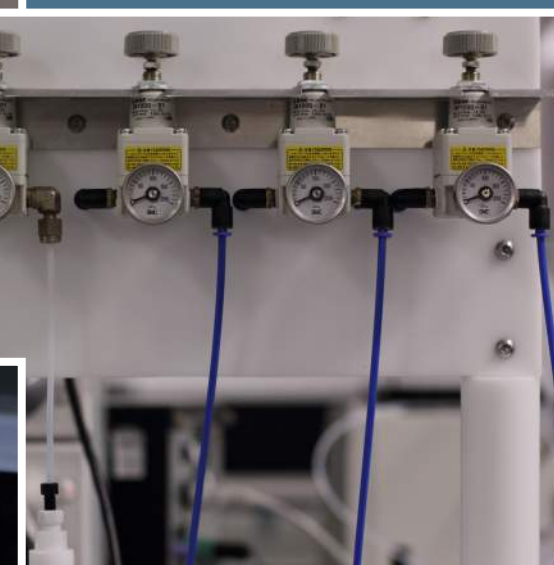
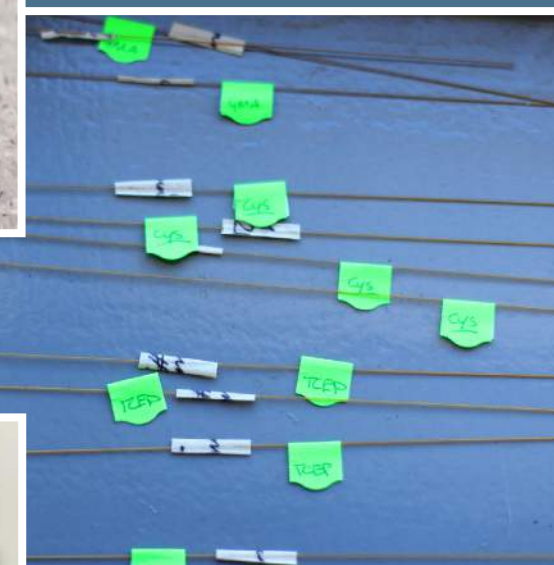
AT Sutton. Winner of the "3 Minute Thesis" competition, School of Science and Health, University of Western Sydney, 2014.

JJ Thevarajah. Endeavour Research Fellowship, Australian Government, Department of Education and Training, 2014.

JJ Thevarajah. Student Travel Award for *International Polymer Meeting*, Royal Australian Chemical Institute (RACI) Polymer Division, 2014.

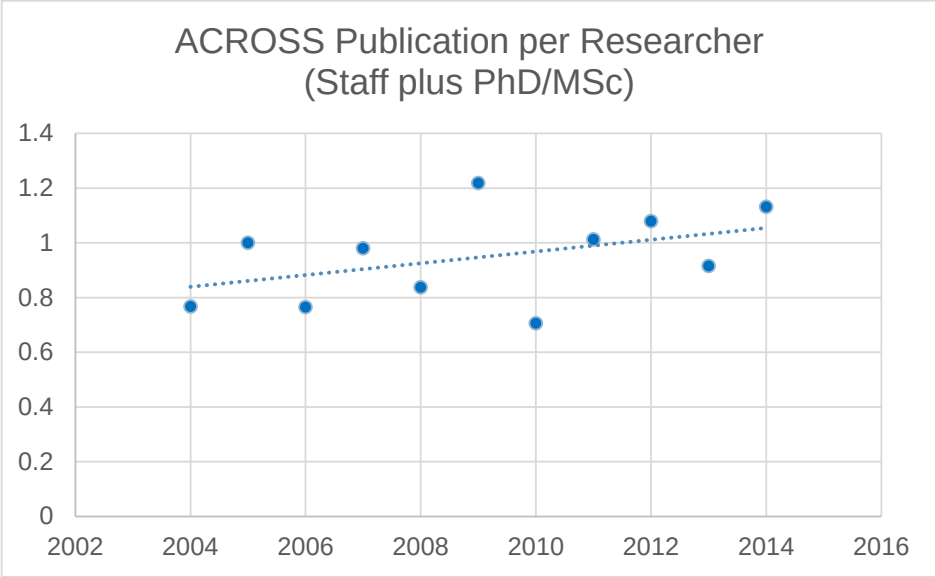
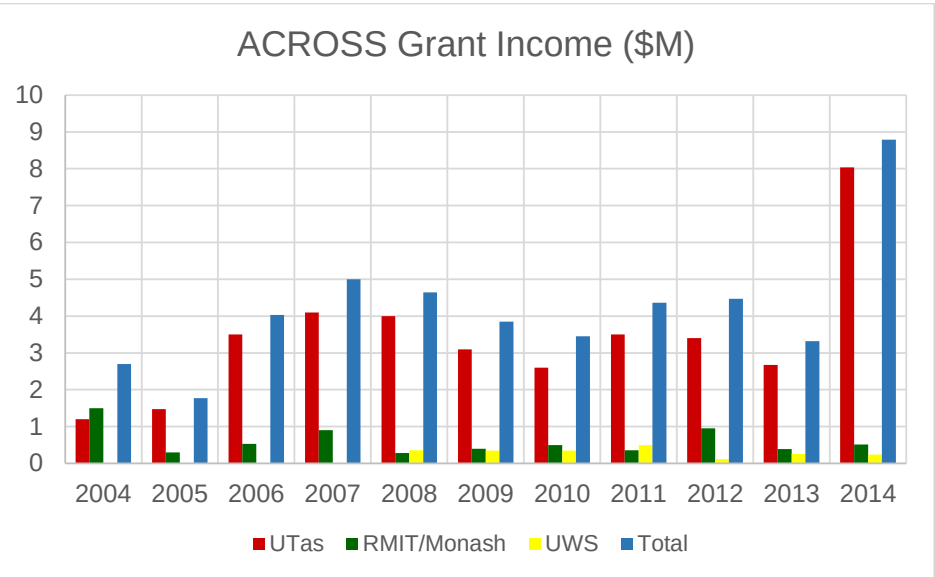
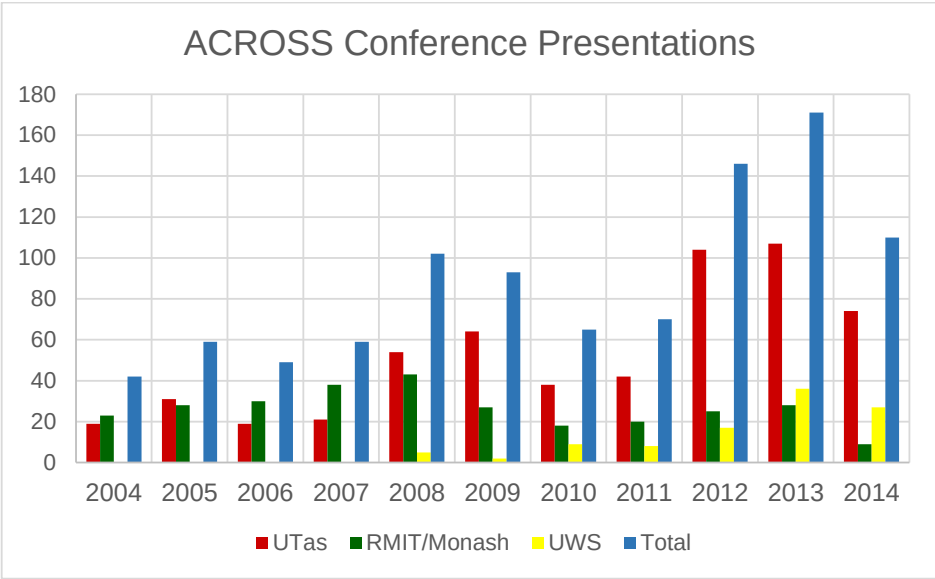
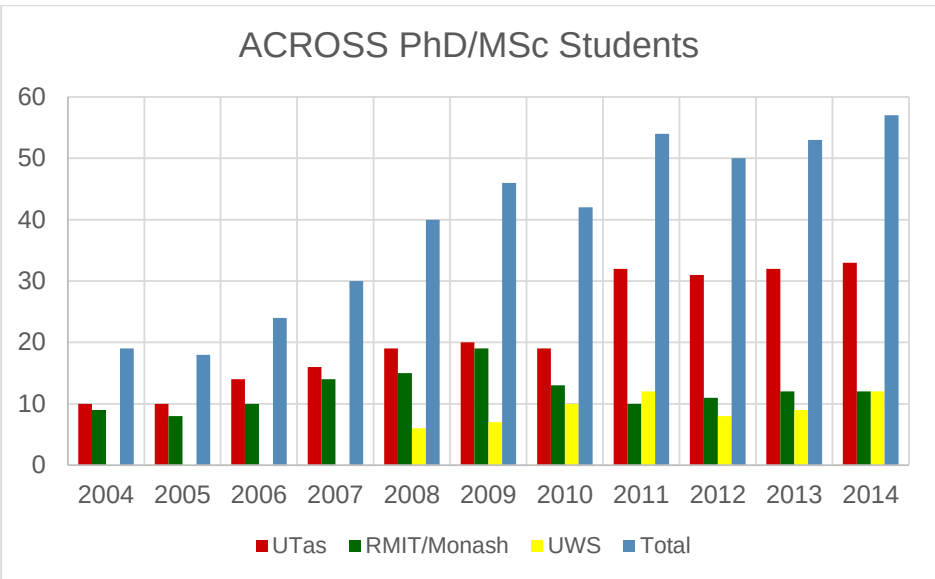
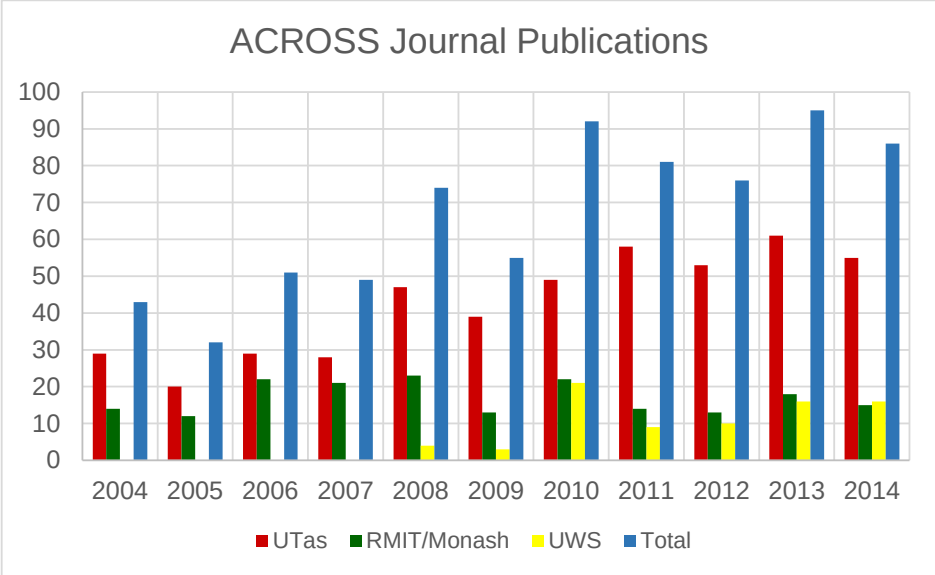
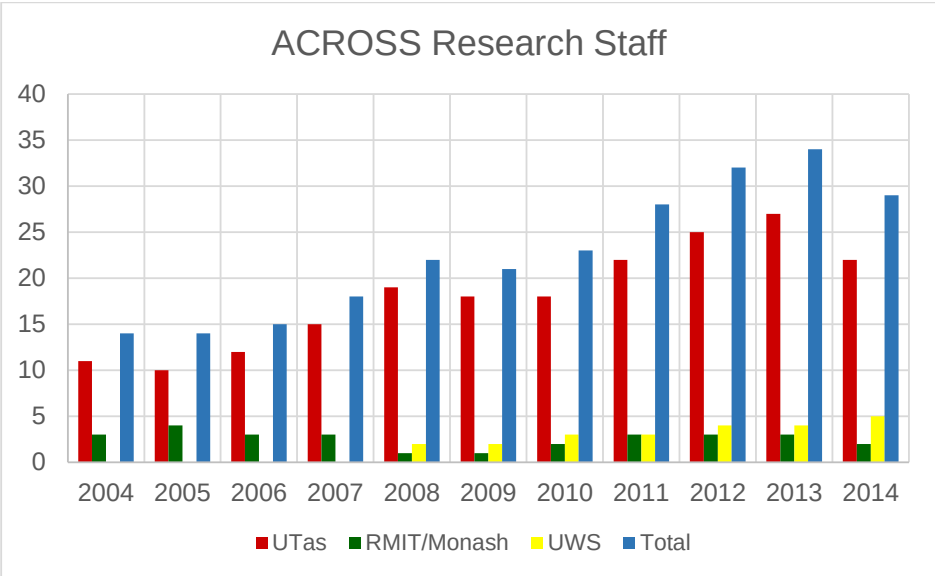
MR Toutounji. Runner-up at the "3 Minute Thesis" competition, School of Science and Health, University of Western Sydney, 2014.

EG Whitty. Awarded 'Best Oral Presentation Prize' at *Molecular Medicine Research Group Annual Meeting*, Molecular Medicine Research Group, University of Western Sydney, 2014.



Photography:
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Appendix



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