

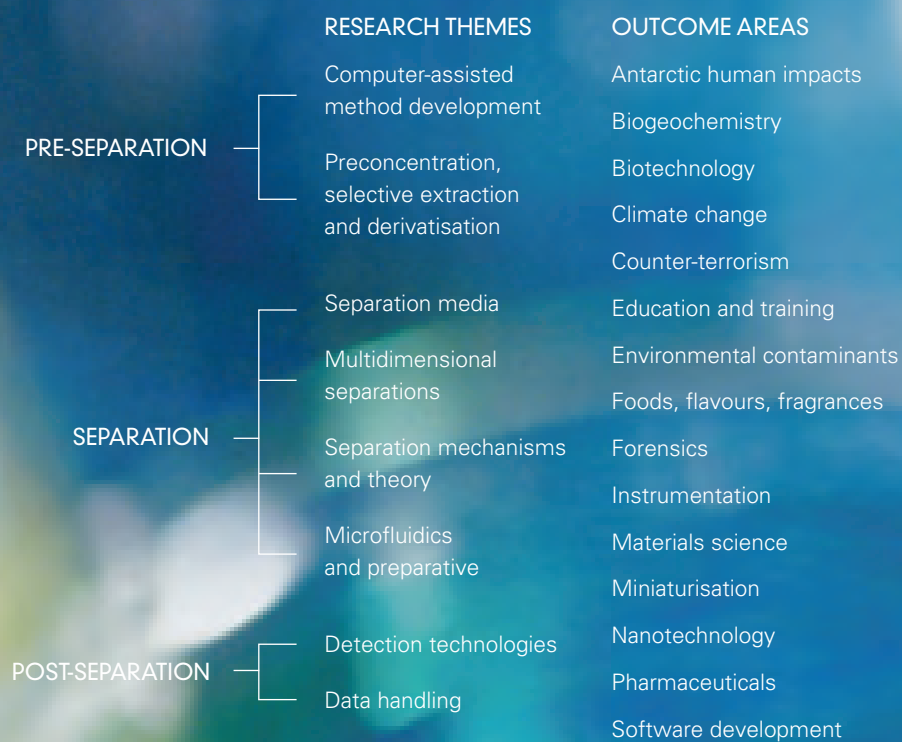
ACROSS ANNUAL REPORT 2010



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ACROSS RESEARCH STRUCTURE



INTRODUCTION TO ACROSS

Separation science involves the study of fundamental processes and materials for the separation and subsequent measurement of specific molecules, usually when these are present in very complex mixtures. It finds use in all of the chemical and biological sciences and in many areas of engineering.

Advances in separation science have provided the impetus for exciting new developments in the biological sciences (eg. genomics, proteomics and medicine), pharmaceutical sciences (eg. drug discovery and characterisation), environmental sciences (eg. ultra-trace residue analysis), forensic science (eg. illicit drugs, DNA fingerprinting, and explosives residues) and other areas. The discovery of new modes of separation science involving analysis, characterisation and purification will be essential to these fields. Separation science also bridges the nanoscale through to the macroscale, with common elements of theory and implementation. Advances in separation science will therefore be an important driver behind a very broad spectrum of Australian science, ranging from new developments in nanotechnology to novel biomaterials. 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) 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. This avoids duplication of effort, allows resources and expertise to be shared and value-added opportunities to be provided broadly to industry, academia and the Nation, and also establishes much needed national training facilities in separation science.

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

DIRECTOR'S REPORT

I am pleased to present this report on the activities of ACROSS in 2010.

Professor Paul Haddad is Director of the Australian Centre for Research on Separation Science (ACROSS) and a general overview of ACROSS appears below. Specific details of individual research projects can be found under the research entries of ACROSS collaborators which appear elsewhere in this section.

Staffing changes

2010 saw the appointment at UTAS of Professor Mirek Macka and Professor Pavel Nesterenko as New Stars Professors, Dr Dario Arrua as a postdoctoral fellow who is working on a monolith characterisation project funded by an ARC Discovery Grant and Dr Viktor Drgan as a postdoctoral fellow working on an ion chromatography optimisation project funded by an ARC Discovery Grant. Professor Philip Marriott moved from RMIT to Monash University. Visitors spending significant periods of time in ACROSS in 2010 included Professor Brett Paull and Dr Ekatarina Nesterenko (Ireland), and Hernan Cortes (USA). In addition, there were several international PhD students who conducted part of their research projects in ACROSS.

Research outcomes

ACROSS has undertaken an extensive program of fundamental and applied research, with numerous individual research projects being undertaken in 2010. These research topics can be found elsewhere in this report. Some notable features of this research are the continued strong emphasis on monolithic stationary phases, the development of new hyphenated and multidimensional separations, continued research into the search for biomarkers for the Tasmanian Devil Facial Tissue Disease, studies on stationary phase selectivity and capacity, retention modelling in ion chromatography using complex elution profiles, and an extensive program on the application of separation science as a tool for counter-terrorism.

Funding

Funding for ACROSS in 2010 has totalled \$3,488,747, with \$2,284,645 (66%) coming in the form of 14 highly competitive grants from the Australian Research Council (ARC) [1 Federation Fellowship, 2 Future Fellowships, 1 QEII Fellowship, 6 Discovery Grants, 2 Linkage Grants, 2 Linkage Infrastructure and Facilities Grants]. Two new ARC Fellowships were awarded in 2010 for commencement in 2011. Additional financial support was provided by a range of government bodies and industries, with major contributors being Pfizer (through the Pfizer Analytical Research Centre) and the National Security, Science and Technology Branch (Australian Federal Government) for counter-terrorism research.

Achievements in 2010

ACROSS staff continue to feature prominently on the international separation science scene. Members of staff held three editorships of international journals in 2010 and also appeared on the editorial boards of 18 other journals of analytical chemistry or separation science. Speakers from ACROSS made invited presentations at most of the major international conferences and symposia on separation science.

A number of other notable achievements by ACROSS staff occurred in 2010. Dr Robert Shellie was the recipient of a Tasmanian Young Tall Poppy Award. Dr Greg Dicoski, Dr Lito Quirino, Dr Emily Hilder and Dr Michael Breadmore were all promoted to Level D. Dr Emily Hilder and Dr Robert Shellie received UTAS Vice-Chancellor's Awards for Research Excellence. Dr Robert Shellie and Dr Rosanne Guijt received UTAS Rising Star Awards. Dr Robert Shellie received the RACI Analytical and Environmental Division Catrall Medal. The ACROSS - CE-Scan system for explosive detection was a finalist in the Tasmanian State Government C-Star Awards. Dr Greg Dicoski received the award for best oral presentation at the Australia and New Zealand Forensic Science Symposium. Dr Ashraf Ghanem received an Endeavour Award from the Australian Government. Finally, Professor Paul Haddad received the inaugural UTAS Vice-Chancellors' Medal for Research Excellence and he was also the recipient of the 2010 RACI Applied Research Award.

DIRECTOR'S REPORT

ACROSS performance at a glance

Node	Research staff	PhD, MSc students	BSc Hons students	Grants (\$)	Publications	Conference presentations
UTas	18	19	2	2,640,747	49	38
RMIT/Monash	2	13	0	503,000	22	18
UWS	3	10	1	345,000	21	9
ACROSS total	23	42	3	3,488,747	92	65

ACROSS staff continue to feature prominently on the international separation science scene.

Pfizer Analytical Research Centre (PARC)

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

The PARC multidisciplinary collaboration creates a centre of excellence for the development of novel pharmaceutical analytical methods by combining the expertise of ACROSS with that of world-leading pharmaceutical scientists from Pfizer. This multi-million dollar centre brings economic and financial gain to both the University of Tasmania and to the State of Tasmania. Pfizer, through a \$3.5m investment, has funded the appointment of research staff and students, purchase of equipment and the provision of running costs for the various projects. The University of Tasmania has contributed \$850k for the construction of the state-of-the-art, world-standard, purpose-built laboratory comprising 450 m² of instrumental bench and office space, in which PARC is housed. The Tasmanian State Government, through the Department of Economic Development and Tourism, has contributed \$267k for scholarships to facilitate the recruitment of international PhD students. This contribution has enabled ACROSS to recruit high calibre students from four different countries throughout the world.

In 2010 the centre comprised 11 staff and students, including scientists and technical employees. These personnel include a Director, Deputy Director, 3 post-doctoral fellows, 5 research higher degree (PhD) students, and a technical officer, with additional contributions from current ACROSS staff. Each Pfizer project involves close collaboration between ACROSS researchers and Pfizer scientists located in the UK or at various sites within the USA.

2010 projects within PARC are:

- Simulation of ion-exchange separations of pharmaceutical compounds
- Miniaturisation of the Bioanalytical Process
- High Performance ion-exchange Stationary Phases for Biomolecules
- Development of Immobilized Enzyme Monoliths for Sample Preparation and Analysis of Glycans
- Non-discriminatory, Universal and Sensitive Detection Technologies for Fluid based Separation Techniques in the Pharmaceutical Industry

I thank all staff and students for their contributions to ACROSS in 2010 and wish them every success in the coming years.



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

Director

KEY PERSONNEL



Professor Paul Haddad
DSc, PhD, BSc(Hons), DipMilStud,
FAA, FTSE, FRACI, FRSC, FFACS

ARC Federation Fellow, Distinguished
Professor of Chemistry, UTAS
Director, ACROSS

Paul Haddad obtained the degrees of BSc, PhD and DSc in analytical chemistry from the University of New South Wales. He is currently Professor of Chemistry and ARC Federation Fellow at the University of Tasmania and is Director of ACROSS. His research interests lie predominantly in the field of 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 *Trends in Analytical Chemistry* and *Encyclopedia of Separation Science* and is a member of the editorial boards of 8 other separation science and analytical chemistry journals.



Professor Philip Marriott
PhD, FRACI, FFACS

Professor of Chemistry, Monash University;
Distinguished Visiting Professor,
Chung-Ang University, Korea.
Deputy Director, ACROSS

Philip Marriott has degrees of BSc (Hons) and PhD from La Trobe University. During this period he was Professor of Separation Science at RMIT University. He is currently Professor of Chemistry at Monash University and is Deputy Director of ACROSS. His research is primarily in the area of high resolution separation, in the fields of multidimensional gas chromatography and capillary electrophoresis, and the use of mass spectrometry detection in gas chromatography. He is a member of the editorial boards of the international journals *Journal of Chromatography A*, *Journal of Separation Science*, and *LCGC Asia Pacific*.



**Associate Professor
Andrew Shalliker**
PhD, BSc(Hons)

Associate Professor,
University of Western Sydney
Deputy Director, ACROSS

Andrew Shalliker has the degrees of BSc (Hons) and PhD from Deakin University. He is currently Associate Professor in the area of analytical chemistry within the School of Natural Sciences at the University of Western Sydney and he is 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 HPLC and fluid dynamics.



Dr Greg Dicinowski
PhD, BAppSci(Hons), FRACI CChem

Senior Lecturer,
University of Tasmania
Deputy Director, ACROSS
Head, School of Chemistry

Greg Dicinowski holds the degrees of BAppSci(Hons) and PhD from the University of Central Queensland. He is currently a Senior Lecturer and Head within the School of Chemistry at the University of Tasmania, and is 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.



Dr Gustavo Blanco Heras
PhD, BSc(Hons)

ACROSS Postdoctoral
Research Fellow,
University of Tasmania

Dr Blanco Heras joined ACROSS in July 2009, after completing his PhD at the University of A Coruña (Spain) where he worked on the application of capillary electrophoresis to atmospheric chemistry studies, particularly for the estimation of atmospheric particulate matter sources.

Gustavo's research interests lie in the development of analytical methods based on capillary electrophoresis for fast analysis of small inorganic ions and its application to environmental and counter-terrorism problems. Currently Gustavo is working on the development of a portable pre-blast screening system for improvised inorganic explosive devices.



Dr Andrew Bowie
PhD, MSc, BSc (Hons), MRSC

Senior Research Scientist, ACE CRC
and School of Chemistry,
University of Tasmania

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



Dr Michael Breadmore

PhD, BSc(Hons)

ARC QEII Fellow,
University of Tasmania

Michael Breadmore was awarded his PhD from the University of Tasmania, after which he held postdoctoral positions

at the Microchip Electrophoresis Laboratory at the University of Virginia (USA) and the Institute of Clinical Pharmacology, University of Bern (Switzerland). He has also been Project Leader in Microfluidics for DeltaDOT, an Imperial College London Biotechnology spin-out company. Dr Breadmore has extensive research interests in the development of miniaturised analytical separation technology with integrated sample preparation, with application in drug monitoring, forensics, medical diagnostics and environmental monitoring. He is a member of the Editorial Board of *Electrophoresis*.



Dr Gary Dennis

PhD, BSc (Hons)

Senior Lecturer,
University of Western Sydney

Gary Dennis has the degrees of BSc (Hons) and PhD from Sydney University. He is currently Senior Lecturer in the area

of physical chemistry within the School of Natural Sciences 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.



Dr Ashraf Ghanem

PhD, MSc, BSc (Hons) MRACI

Pfizer Postdoctoral Fellow,
Part-time Lecturer,
University of Tasmania

Ashraf Ghanem studied Chemistry at the University of Stuttgart, Germany where

he conducted his master degree research work with Prof. Franz Effenberger at the Institute of Organic Chemistry. He then joined the group of Prof. Rolf D. Schmid at the Institute for Technical Biochemistry, University of Stuttgart and Prof. Uwe Bornscheuer at the University of Greifswald, Germany. In 2002 he completed his PhD at the University of Tuebingen, Germany with Prof. Volker Schurig, before undertaking postdoctoral positions at the University of Geneva, Switzerland, and at King Faisal Research Centre, Riyadh, Saudi Arabia. His research interest lies in the field of miniaturization of biochemical analysis and enantioselective catalysis of pharmaceutical compounds.



Dr Rosanne Guijt

PhD, MSc MRACI

ARC Australian Postdoctoral Fellow,
Part-time 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 (Neuchâtel, 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.



Dr Emily Hilder

PhD, BSc(Hons) MRACI

Senior Lecturer,
University of Tasmania

Emily Hilder is a graduate of the University of Tasmania where she obtained the degrees of BSc(Hons) and PhD. She

has held postdoctoral positions at Johannes Kepler University (Austria) and the E.O. Lawrence Berkeley National Laboratory (USA) and was an ARC Postdoctoral Fellow in ACROSS from 2004-2007. Her research interests lie in the general area of separation science, in particular in 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 a member of the Editorial Advisory Board of the *Journal of Separation Science* and is UTAS Theme Area Coordinator for Frontier Technologies.



Dr Joe Hutchinson

PhD, BSc(Hons)

ARC Postdoctoral Research Fellow
(Industry), University of Tasmania

Joe Hutchinson completed his undergraduate and postgraduate studies at the University of Tasmania and was involved

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

KEY PERSONNEL



Dr Cameron Johns

PhD, BSc(Hons)

ACROSS Postdoctoral Research Fellow,
University of Tasmania

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



Prof Mirek Macka

PhD, RNDr, MRACI, MRSC, CChem

New Stars Professor,
University of Tasmania

Mirek Macka holds the degree of RNDr equivalent to MSc+BSc in analytical chemistry from the Masaryk University, Brno, Czech Republic, and PhD from the University of Tasmania. He started his career as research scientist in pharmaceutical industry in Europe, and with his move to Australia in 1994 switched to academic career. Prof Macka's research interest 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 three Editorial Boards, including two A-journals (*Electrophoresis* and *Analytica Chimica Acta*).



Dr Blagoj Mitrevski

PhD, BSc(Hons)

Postdoctoral Research Fellow,
Monash University

Dr Blagoj Mitrevski is a graduate of RMIT University, completing his PhD award in 2010. He commenced his Postdoctoral research appointment at Monash University with the move of the research group of Professor Marriott to Monash. He formerly was a forensic scientist in the Macedonian police forensic laboratory, and his research at RMIT was application of advanced GC and GCxGC methods to drugs analysis, supported by mass spectrometry.



Professor Pavel Nesterenko

MSc, PhD, DSc

Quantum Leaps Professor,
University of Tasmania

Pavel Nesterenko obtained degrees of MSc in petrochemistry and organic catalysis, PhD and DSc in analytical chemistry from the Lomonosov Moscow State University. He is currently Professor of Separation Science 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 the different separation techniques including high-performance liquid chromatography, ion chromatography, chiral phase chromatography, ligand-exchange and others. He is Editor-in-Chief of *Journal of Analytical Chemistry Research* and a member of the editorial boards of the *Analytica Chimica Acta*, *Encyclopedia of Analytical Chemistry*, *Open Journal of Analytical Chemistry* and *International Journal of Analytical Chemistry*.



Dr Anna Nordborg

PhD, MSc

Pfizer Postdoctoral Fellow,
University of Tasmania

Anna Nordborg is a graduate of Umeå University, Sweden. She obtained her MSc in Chemistry with the thesis work performed at a pulp and paper research institute, STFI-Packforsk AB (Stockholm, Sweden) where she also worked as a research engineer after completion of her MSc. In 2008 she obtained her PhD from Umeå University on the synthesis and surface modification of materials for use in separation science. Part of her PhD studies work was conducted at University of Berkeley and E.O Lawrence Berkeley National Laboratory (Berkeley, California, USA). Her current research aims include the development of tools to aid in the characterization of biopharmaceuticals. This includes the development and characterization of stationary phases, mainly monoliths, for analytical applications.



Dr Anne Palmer

PhD, BSc, BAntSt(Hons)

ACROSS Postdoctoral Research Fellow,
University of Tasmania

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



Dr. Joselito P. Quirino

PhD, MSc, BSc

Quantum Leaps Senior Lecturer,
University of Tasmania

Joselito P. Quirino holds a BSc in Industrial Pharmacy (1992) from the University of the Philippines and a MSc (1998) and PhD (1999) in Material Science from the Himeji Institute of Technology (HIT) Japan. He was a postdoctorate at HIT (1999-2000) and Stanford University (2000-2001) and has 5 years experience in the USA working as an analytical development scientist in the biotechnology/pharmaceutical industry. He is currently employed as Senior Lecturer under the Quantum Leaps Program of the University of Tasmania. His research interest are on the fundamentals and applications of on-line sample preconcentration in capillary zone electrophoresis, electrokinetic chromatography, and electrochromatography, as well as the applications of separation science to drug discovery and development.



Dr Robert Shellie

PhD, BAppSc(Hons)

Senior Lecturer,
University of Tasmania

Dr Robert Shellie undertook 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, metabolomics, and modelling of chromatographic retention behaviour.



Dr Eadaoin Tyrrell

PhD, BSc(Hons)

ACROSS Postdoctoral
Research Fellow,
University of Tasmania

Eadaoin Tyrrell is a graduate of Dublin City University, Ireland where she obtained her PhD in Analytical Chemistry. Prior to joining ACROSS in 2006, she spent a year as an Assistant Lecturer in Chemistry at Dublin City University. She is particularly interested in the area of separation science, where current work includes the development of an ion chromatography system for the pre-blast screening of inorganic improvised explosive devices. Other areas of interest include the design and fabrication of microfluidic-based devices for environmental monitoring.



Dr Philip Zakaria

PhD, BSc(Hons)

Pfizer Postdoctoral Fellow,
University of Tasmania

Dr Philip Zakaria is a graduate of the University of Tasmania and completed his subsequent postgraduate training in ACROSS in 2003. Upon completion of his PhD he spent 1½ years as a Postdoctoral Fellow within ACROSS. Prior to returning as a Pfizer Postdoctoral Fellow in 2007 he worked in a commercial wine laboratory as well working outside of the chemistry field. His research interests include pharmaceutical separations using ion chromatography and the possibility of modelling the observed chromatographic retention behavior. Other interests include development of more universal detection schemes for chromatographic pharmaceutical separations.

Dr Zhong-Da Zeng

PhD, BSc

Postdoctoral Research Fellow,
RMIT University

Dr Zeng came to RMIT on an ARC Discovery Grant appointment, and brings to this group a wealth of experience in chemometrics. He trained with Professor Y Z Liang (an editor of Chemometrics and Intelligent Lab Systems), at Central South University, Changsha, China. His prior research appointment was as a postdoctoral researcher at the Hong Kong Polytechnic University. His key interests are in separation methods, and mass spectrometry applications, with chemometric interpretation of complex datasets. He has developed many useful data handling packages and automated programs for research and industry.

Technical and Administrative staff

Mr Marc Guijt

Administrative Officer
University of Tasmania

Mr Anthony Malone

Computing Technical Officer
University of Tasmania

Mr Paul Morrison

Technical Research Officer
RMIT University

Ms Clodagh Moy

Technical Officer
University of Tasmania

Dr Kim Shepherd

Administrative Assistant
RMIT University

VISITORS TO ACROSS IN 2010

Visitor	Country	Institution	Period of visit	Location
Ms Kara-Lea Angoy	England	Kings College London	3 months	UTAS
Mr James Armstrong	England	University of Warwick	2 months	UTAS
Dr Erwan Engel	France	INRA	2 months	RMIT
Ms Olga Fedyanina	Russia	Lomonosov Moscow State University	3 months	UTAS
Ms Grace Gao	China	China Scholarship Council	1 year	RMIT
Mr Thijs Kruyen	The Netherlands	Radboud University, Nijmegen	3 months	UTAS
Dr Ekaterina Nesterenko	Ireland	Dublin City University	2 months	UTAS
Prof Brett Paull	Ireland	Dublin City University	1 month	UTAS
Mr Christian Ruehle	Germany	Technical University ,Berlin,	9 months	RMIT
Dr Jin-Young Kim	Korea	Supreme Prosecutor's Office, Seoul	2 months	Monash
Mike Sahl	Germany	Johannes Gutenberg University, Mainz	3 months	UWS

VISITORS TO ACROSS

RESEARCH FUNDING

UTAS NODE

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2010
Breadmore MC	Australian Research Council	Discovery Project	Integrated Microfluidic Device for the Direct Analysis of Drugs and Metabolites in Biological Fluids	\$135,000
Breadmore MC	University of Tasmania	Rising Stars	Chemistry	\$24,404
Breadmore MC, Manefield M, Powell S	Department of Sustainability, Environment, Water, Population and Communities	Australian Antarctic Science	A New Method for Characterisation of Antarctic Microbial Communities	\$24,914
Bowie AR	Australian Research Council	Discovery Project	Novel technologies to resolve the role of organic matter on iron chemistry and bioavailability in the Southern Pacific Ocean	\$100,000
Dicinoski GW, Haddad PR, Hilder EF, Breadmore MC, Hutchinson JP, Guijt RM, Nesterenko PN, Quirino JP, Johns CA	Australian Federal Government Department of Prime Minister & Cabinet	National Security Science and Technology Unit Counter Terrorism Grant	Portable multiplexed electrophoretic and chromatographic systems for the detection and identification of explosives	\$528,207
Guijt RM	University of Tasmania	Rising Stars	Chemistry	\$24,918
Guijt RM	Australian Academy of Science	Scientific visits to Europe	Evaluation of a new but simple manufacturing method to improve sensitivity in contactless conductivity detection	\$9,500
Haddad PR, Danyushevsky LV, Hilder EF, Large RR, Kamenetsky VS, Canty AJ, Shabala SN, Laybourn-Parry J	Australian Research Council	Linkage Infrastructure	Purchase of a multi-purpose Schottky field emission gun scanning electron microscope	\$400,000
Haddad PR	Australian Research Council	Discovery Projects	Simulation and Optimisation of Retention in Ion Chromatography with Multi-step Elution Profiles	\$210,000
Haddad PR, Dicinoski GW, Breadmore MC, Guijt RM, Hilder EF, Shellie RA	Pfizer Inc	Agreement – Sponsored Research	Collaboration on multiple research projects all related to separation science	\$60,000
Haddad PR	Australian Research Council	Consultancy	Participation in the Excellence in Research for Australia initiative as Chair of the Physical, Chemical and Earth Sciences, Research Evaluation Committee	\$28,560
Haddad PR	Australian Research Council	Federation Fellowship	Separation Science Based on Nanoparticle-coated Monolithic Scaffold Stationary Phases	\$316,222
Haddad PR, Dicinoski GW	Tasmanian Department of Economic Development	Grant	Support for 4 international PhD students assisting in PARC	\$66,800
Haddad PR, Palmer AS, Seen AJ, Riddle M	Department of Sustainability, Environment, Water, Pollution and Communities	Grant	Engagement of UTAS Professional Services to Support the AAD Human Impacts Research Program	\$28,000

RESEARCH FUNDING

UTAS NODE cont.

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2010
Haddad PR, Dicoski GW, Hutchinson JP, Szucs R	Australian Research Council	Linkage Project	Non-discriminatory, universal and sensitive detection technologies for fluid based separation techniques in the pharmaceutical industry	\$115,139
Haddad PR, Guijt RM, Breadmore MC, Hilder EF, Lewis TW	Department of Innovation, Industry, Science and Research	ISL Australia-China Fund	Revolutionising Lab-on-a-Chip by Integrating Polymer Electrodes	\$7,000
Haddad PR, Hilder EF, Shalliker RA	Australian Research Council	Discovery Project	Synthesis, Characterisation and Evaluation of Novel Ion-exchange Polymer Monolithic Stationary Phases for Separation Science	\$135,000
Hilder EF	Australian Research Council	Future Fellowship	High-performance chromatography based on nanostructured monolithic polymers	\$171,600
Hilder EF	University of Tasmania	Rising Stars	Chemistry	\$24,754
Macka M	University of Tasmania	Conference Support Scheme	International Nutrition & Diagnostics Conference & Euroanalysis – Czech Republic and Serbia, 2011	\$ 2,725
Nesterenko PN	University of Tasmania	Institutional Research Grant Scheme	Adsorption Properties and Chromatographic Performance of Microdisperse Sintered Nanodiamond	\$25,000
Quirino JP	Australian Research Council	Future Fellowship	Green sample preparation technologies for analytical chemistry	\$88,124
Shabala SN, Guijt RM	Australian Research Council	Discovery Project	Novel Approach to Study Mechanisms of Na ⁺ Transport in Plants Using Lab on a Chip Technology	\$90,000
Shellie RA	University of Tasmania	Rising Stars	Chemistry	\$24,980

Total \$2,640,747

RESEARCH FUNDING

RMIT/MONASH NODE

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2010
Marriott PJ, Choi HK	Korean Science and Engineering Foundation	World Class Universities Program	Collaborative Research on Multidimensional and comprehensive GC	\$100,000
Marriott PJ, Huegel H	Australian Research Council	Discovery	Simulation, Modelling, Prediction and Two-Dimensional Retention Database Development in Comprehensive Two-Dimensional Gas Chromatography(GC×GC)	\$70,000
Marriott PJ, Pang E	Horticulture Australia	Model Project	Environmental effects on flavour development in Australian varieties of strawberry	\$55,000
Marriott PJ, Adams MJ, Wynne PM, Winniford WL	Australian Research Council	Linkage Project	Advanced Separation technologies and chemometric data processing for macromolecular materials and metabolite profiling	\$30,000
Marriott PJ	National Drug Law Enforcement Research Fund	Funding Agreement	Innovative solutions for enhanced illicit drugs profiling using comprehensive two dimensional gas chromatography and mass spectrometry technologies	\$8,000
Marriott PJ	Australian Research Council	Discovery	Integrated Multidimensional Gas Chromatography – Spectroscopic Detection Methodology for Chemical Marker Discovery	\$100,000
Marriott PJ	School of Chemistry, Monash	Start-up Grant	-	\$50,000
Marriott PJ	Faculty of Science, Monash	Commencement Facility Grant	-	\$25,000
Marriott PJ	Agilent Foundation	Equipment Grant	-	\$65,000
Total				\$503,000

UWS NODE

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2010
Shalliker RA	UWS	ACROSS Initiative	N/A	\$50,000
Kannagara GS, Milev AS, Bartlett J, Williams PA, Price WS, Tran NH, Dennis GR, Shalliker RA, Porter G, Cairney JW, Anderson IC, He Y, Kennedy EM, George SC, Moran GM, Scott JA, McNevin DB, Chen Y, Wilson MA	Australian Research Council	LIEF Grant	Hybrid Fourier Transform Dispersive Raman Micro-Spectrometer	\$295,000
Total				\$345,000

Preparative-scale Capillary Multidimensional Gas Chromatography for Absolute Identification of Volatile Compounds

The RMIT/Monash group has successfully demonstrated use of a preparative scale multi-dimensional capillary GC system for precise fraction collection of single GC peaks from complex matrices, to support improved chemical characterisation of compounds. The single biggest problem arising from the use of capillary GC resides with uncertainty of identification of separated compounds. This has been largely addressed in the past by the advent of mass spectrometry methods for detection of resolved peaks. However, there is still considerable residual uncertainty in identification and allocation of structural formulae due to imprecision of library spectral matching and interpretation. This is recognised in a number of important areas. For instance, essential oil components have many mass spectral ions in common across the terpene structures, so MS features for minor components leads to uncertainty in MS assignments. This is also commonly found for isomers of many other compounds.

In order to address this general limitation, we first recognised that MS is a bottleneck to adequate characterisation. There are many solutions to molecular characterisation, usually requiring alternative spectroscopic methods, but these are often not readily hyphenated with GC. Second, if we want to provide a spectroscopic solution, then we need to isolate the compound from the matrix (spectroscopy works best on pure compounds), collect it, and then perform different methods of analysis. Fortunately, once a compound is isolated, then many different methods can be used to characterise the component. Finally, we need to accomplish the complete isolation of the compound, and for this we want to address potentially very complex mixtures. Multidimensional capillary gas chromatography (MDGC) is the most appropriate

technology for this. To scale-up the preparative process, it is necessary to inject multiple quantities of sample, and to also collect the single compound many times. We developed a fully automated method for unattended operation of the trapping system, capable of collecting in the order of 100 μg quantities of compound, which is sufficient for ^1H NMR and 2D NMR. This allows us to add NMR to the MS results of the isolated compounds. Indeed, collection of much smaller amounts can also allow satisfactory identification, depending on spectral complexity and sensitivity of the spectroscopic method.

Our studies first applied the method to geraniol in a complex essential oil sample, and then to characterisation of methyl naphthalene isomers in a crude oil sample. The comparative NMR result for a simple organic – 1,4-dimethoxybenzene – demonstrated that this could be a good internal standard for our approach. It is possible to use a small variant of the method to collect multiple isolated compounds from a complex sample, and thereby create new multiple-component mixtures from natural materials. Flow-switching capabilities that support such processes are readily implemented. Finally, it has been demonstrated that not only can NMR be used to characterise the materials from a catalyst product that was difficult to separate by classical liquid chromatography means, but suitable collection and careful crystallisation allows the minute quantities of collected pure components to be absolutely characterised by use of X-ray crystallography. Such a capability has been rarely reported in the literature, and the scope for discovery of new information based in this approach is our next task.

A New Design in Chromatography Columns

Continuing from work initiated in 2008 with ThermoFisher Scientific as research partner, the design of a new concept chromatography column has been taken to the point of 'Proof of Principle' in 2010 by the UWS group. The birth of the 'active flow management' column was realised. In the 'active flow management' project two new types of chromatography columns were designed, both of which could be employed at the preparative and analytical scales.

The first new design in the chromatography column was the parallel segmented flow column. The second new design was the curtain flow column, which also incorporated aspects of parallel segmented flow. In both designs a special fitting and frit are attached to the column outlet. This allows for the solvent and sample to be selectively isolated from the bulk flow of mobile phase at the column outlet. In the curtain flow design, a special inlet header is attached to the column, which also contains a specially designed inlet frit. This frit and header allows the sample to be introduced to the column in the central region of the bed, and a curtain flow of mobile phase isolates the sample from the wall region of the column. The parallel segmented outlet fitting ensures that as the sample is detected elution maintains the advantages of the 'infinite diameter' column since the parallel segmented flow end fittings effectively mimic the performance of an end column detector, rather than a traditional bulk detector. While there have been numerous attempts to build the 'infinite diameter'

column over the years this is the first column of its kind to be designed that can be used with a regular auto injector and employ a regular bulk detector. Using these new columns the efficiency, as measured by the number of theoretical plates, increased by as much as 50%, and detection sensitivity increased by 150% at the preparative scale and more than 50% at the analytical scale.

Perhaps the most significant advantage of the columns is that the volume of an eluting sample band can be controlled, with experimentation showing that an 85% reduction in peak volume may be feasible for the same level of detection as a regular column. This is important because it may mean that very high throughput separations can be achieved using hyphenated techniques, where the detector is sensitive to the volume load, such as in LC-MS. These columns should therefore experience widespread application in all facets of column liquid chromatography especially in LC-MS.

In 2010 two new PhD students joined the group at UWS: Michelle Camenzuli, who has been involved in the study on the design of the new concept HPLC column, and Mark Trudgett, who is studying advanced aspects of multidimensional HPLC. His project specifically studies separations in the time and frequency domains, paving the way for very fast separations of complex samples.

RESEARCH STUDENTS

Name	Degree	Commenced	Thesis Title	Supervisors
Bernadette Ahling*	Honours	2010	Analysis of enzymatically degraded chitosan films using size exclusion chromatography and diffusion nuclear magnetic resonance	A Lauto, P Castignolles, M Gaborieau
Michelle Camenzuli	PhD	2010	Advances in HPLC column technology	RA Shalliker/GR Dennis
Esme Candish*	Honours	2009	Potential of porous polymer monoliths as a medium for dried blood spots	EF Hilder, PN Nesterenko, PR Haddad, GW Dicoski
Tim Causon	PhD	2009	High temperature liquid chromatography using organic polymer monoliths	EF Hilder, RA Shellie
Sung Tong Chin	PhD	2009	Multidimensional GC and MS approaches for odourants in wine and related products	PJ Marriott, G Eyres
Jeremy Deverell	PhD	2006	Microreactors for organic synthesis	RM Guijt, A. Canty, T Rodemann
Michael Dunn	PhD	2005	Targeted multidimensional GC methods of analysis	PJ Marriott, RA Shellie
Grace Gao	PhD	2009	Serum Pharmacochemistry and Pharmacokinetic Studies of Zuojin Pill	PJ Marriott, XW Yang
Jessica Gathercole	PhD	2007	Development of a pre-clinical diagnostic test for devil facial tumour disease	MC Breadmore, EF Hilder, RA Shellie
Paul Harvey	PhD	2006	Development and application of multidimensional gas chromatography for quantitative monitoring of Antarctic and sub-Antarctic fuel spills	PR Haddad, RA Shellie, I Snape
Rowan Henderson	PhD	2007	Revolutionising lab-on-a-chip using polymer electrodes	RM Guijt, MC Breadmore, EF Hilder, PR Haddad, TW Lewis
Roy Hibbert	MSc	2008	Assessment of Orthogonality of stationary phases in GC	PJ Marriott, P. Wynne
Wei Boon (Jason) Hon	PhD	2007	Miniaturisation of the bioanalytical process	EF Hilder, PR Haddad
Lucy Huang	PhD	2009	The Chemical Analysis and Anti-oxidant Activity of Volatile Compounds of Australian Native Plants	PJ Marriott, H Huegel
Hwaida Issa	Masters by coursework	2010	Capillary electrophoresis and size exclusion chromatography of chitosan	P Castignolles, M Gaborieau
Naama Karu	PhD	2008	High performance ion-exchange chromatography for separation of organic ions	PR Haddad, GW Dicoski
Nicha Kawila	PhD	2008	GCxGC Analysis of the Formation of the toxin acrylamide during processing of cereal grain foods	D Small, PJ Marriott
Artaches (Tom) Kazarian*	PhD	2006	Investigation of new strategies for labelling of biomolecules	EF Hilder, MC Breadmore
Manish Khandagale	PhD	2010	Non-discriminatory, universal and sensitive detection technologies for fluid based separation techniques in the pharmaceutical industry	GW Dicoski, Hutchinson JP, PR Haddad
Danijela Kocic	PhD	2010	Ultra-high resolution separations of complex samples derived from biological matrices	RA Shalliker, GR Dennis, EF Hilder
Elsuida Kondo	PhD	2008	High resolution GC and MS methods for metabolite profiling	P.J. Marriott, M. Adams, W Winniford
Mitra Nouri Koupaei	MSc	2010	Towards a Better Understanding of Uraemic Molecules	EF Hilder, RA Shellie M Jose

Name	Degree	Commenced	Thesis Title	Supervisors
Con Kouremenos*	PhD	2006	Metabolite profiling using GCxGC	PJ Marriott
Tsz Kwan Kwok	PhD	2009	Remediation of surfactants in wastewater	M Othman, PJ Marriott
Russell McGifford	PhD	2006	Spatial and selective colorimetric detection of polluting metal ions using the Diffusive Gradients in Thin-films (DGT) technique	AJ Seen, PR Haddad, AS Palmer
Bussayarat Maikhunthod	PhD	2008	Herb and spice profiling by using GCxGC and MDGC methods	PJ Marriott, D Small
Lea Mauko	PhD	2008	Glycosylation analysis of therapeutic monoclonal antibodies	EF Hilder, PR Haddad
Kirsty Mayfield	PhD	2008	High Capacity Multidimensional HPLC for Studies in Metabolomics	RA Shalliker, GR Dennis, GA Guiochon
Coleen Milroy*	PhD	2006	Targeted Isolations in Preparative scale 2DHPLC	RA Shalliker, GR Dennis
Blagoj Mitrevski*	PhD	2007	Profiling of illicit substances by using GCxGC MS	PJ Marriott, P Wynne
Mariam Mnatsakanyan*	PhD	2007	Natural Antioxidants and High Performance Liquid Chromatography Hyphenated Screening Techniques	RA Shalliker
Boon King Ng	PhD	2007	Ion chromatography in silico	GW Dicoski, RA Shellie, PR Haddad
Oscar Potter	PhD	2006	New materials and techniques for integrated microscale bioanalytical devices	EF Hilder, MC Breadmore
Samuel Poynter	PhD	2007	New separation technologies for profiling metabolites in biological samples	PR Haddad, RA Shellie
Tomas Remenyi	PhD	2008	Quantifying dust deposition into the Southern Ocean using dissolved aluminium concentrations as a tracer	AR Bowie, PR Haddad, PN Nesterenko, ECV Butler
Kavitha Samykanno	PhD	2008	Aroma Profiling of Strawberries Using Gas Chromatography-Olfactometry and Comprehensive Two-Dimensional Gas Chromatography	PJ Marriott, E Pang
Benjamin Savareear	MSc	2010	Characterisation of plant extracts using high resolution gas chromatography	RA Shellie EF Hilder
David Schaller	PhD	2005	Design and synthesis of monolithic and nanostructured stationary phases for chromatography	EF Hilder, PR Haddad, CJ Evenhuis
David Shock	PhD	2008 (P/T)	Selectivity in Separations	RA Shalliker, GR Dennis
Arianne Soliven	PhD	2008	In-situ Modification of Monolithic Columns Towards Improved Selectivity & Faster Separations	RA Shalliker, GR Dennis, EF Hilder, G Guiochon
Paul Stevenson*	PhD	2007	Exploring the Retention Characteristics of Stationary Phases	RA Shalliker, GR Dennis
Mohammad Talebi	PhD	2009	High Performance Ion-Exchange Stationary Phases for Biomolecules	EF Hilder, PRHaddad
Boon Kim Tan	PhD	2008	Profiling of the Danshen Herb by using LC/MS, LC-NMR and GCxGC/MS methods	PJ Marriott, E Pang CG Li, S Urban
Mark Thomas	BSc (Hons)	2010	Synthesis of polymer nanoparticles by RAFT in miniemulsion	EF Hilder, R Jones
Mark Trudgett	PhD	2010	Advanced Aspects of Multidimensional HPLC	RA Shalliker, G Guiochon
Grace Wu	PhD	2008	Multidimensional LC of Surfactants	PJ Marriott, M Othman

COLLABORATIONS & INDUSTRY LINKS IN 2010

Collaborator	Institution/company
Prof M Adams, Dr S Urban, A/Prof H Hugel, Dr E Pang, Dr CG Li	RMIT University
Dr N Avdalovic, Dr Y Liu, Mr CA Pohl, Dr K Flook, Mr D Moore, Dr J Schibler, Dr P Jackson, Dr K Srinivasan, Dr C Cowie	Dionex Corporation
Prof N Barnett, Dr X Conlan, Dr P Francis	Deakin University
Mr T Beaufort	Grinders P/L, Melbourne
Dr S Bieri	Food Authority, Geneva, Switzerland
Dr H Bizzo	EMBRAPA, Brazil
Prof S Blain	Centre d'Ocanologie de Marseille, France
Mr GA Blanco-Heras, Prof P Lopez-Mahia	University of A Corua, Spain
Dr M Boyce	Edith Cowan University
Dr P Boyd	National Institute of Water and Atmospheric research, New Zealand
Prof JT Brenna	Cornell University, N.Y. USA
Dr ECV Butler	CSIRO Marine & Atmospheric Research
Prof AJ Canty, Dr TW Lewis, Dr AJ Seen, Dr JA Smith	School of Chemistry, University of Tasmania
Prof Z Cardeal	UFMG, Brazil
Dr GS Catchpole	Max-Planck Institute of Molecular Plant Physiology
Dr A Chaintreau, Dr F Begnaud, Dr E Delort	Firmenich (Switzerland)
Prof D Chen	University of British Columbia
Prof H-K Choi	Chung-Ang University, Korea
Dr J Cochran, Dr F Dorman, Ms C Vargo	Restek Corporation, USA
Dr O Colombani	Le Mans University, France
Insp J Cooper	Tasmanian Police
Prof J Cooper-White	Australian Institute for Bioengineering and Nanotechnology University of Queensland
Dr F Dehairs	Vrije Universiteit Brussel, Belgium
Dr D De Tata	Chemistry Centre Western Australia
Dr M Ellwood	Australian National University, Australia
Ms V Goodall	National Science, Security and Technology Unit of Prime Minister and Cabinet
Prof A Felinger	University of Pecs, Hungary
Dr R Fieldhouse	UniQuest
Prof T Fornstedt	Karlstad University, Sweden
Dr G Frysinger	U.S. Coast Guard Academy
Dr M Gaborieau, Dr A Lauto	NANO group, University of Western Sydney
Prof RG Gilbert, Dr P Castignolles, Dr M. Gaborieau	Centre for Nutrition and Food Science, University of Queensland

Collaborator	Institution/company
Dr A Goldstein	University of California, Berkeley
Dr F Gritti and Prof G Guiochon	University of Tennessee, USA
Dr Y Guillaneuf, Dr C Lefay, Dr D Gigmes, Prof D Bertin	University of Provence, Marseilles, France
Prof G Guiochon	University of Tennessee, Knoxville, USA
Mr J Harcourt, Ms G de Plater, Mr M Smith	Grey Innovation
Dr J Harynuk	University of Alberta
Prof P Hauser, Dr P Kuban	University of Basel, Switzerland
Dr C Hassler, Dr C Mancuso-Nichols	CSIRO Marine & Atmospheric Research
Prof S Haswell	Hull University, UK
Mr R Hayes, Mr J Pearson, Mr J Kelleher	Victorian Police
Dr GA Jacobson, Dr C Narkowicz	School of Pharmacy, University of Tasmania
Mr B Jones, Mr C Frost	Australian Customs Service
Dr M Jones	School of Zoology, University of Tasmania
Dr T Junkers, Prof C Barner-Kowollik	Karlsruhe Institute of Technology, Germany
Dr I Kempson	University of South Australia
Dr P Kirkbride	Australian Federal Police
Dr. S Koster	TNO, the Netherlands
A/Prof M Koudelka-Hep, Dr P Van der Wal	Institute for Microtechnology, University of Neuchâtel, Switzerland
A/Prof A Koutoulis, Dr S Whittock,	School of Plant Science, University of Tasmania
Dr P Lam	Woods Hole Oceanographic Institute, USA
Dr W Landing	Florida State University, USA
Dr D Lannuzel, Dr K Meiners, Dr M Mongin	Antarctic Climate and Ecosystems CRC, Australia
Prof C Lennard	University of Canberra
Prof BC Lin, Prof GW Xu	Dalian Institute for Chemistry Physics, China
Prof JM Lin	Tsinghua University, China
Dr G Logan, Dr E Grosjean	Geoscience Australia
Dr M Lohan	University of Plymouth, UK
Dr M Macka, A/Prof B Paul	Dublin City University, Ireland
Dr R Szucs, Mr K Saunders, Dr M Hanna-Brown, Dr E Groeber, Dr R Bemish, Dr W Farrell, Dr R Robins, Dr P Ferguson, Dr N Lacher, Dr B Zhang, Dr J Wang, Mr O Drap	Pfizer
Dr M Manefield	Environmental Biotechnology Cooperative Research Centre, University of New South Wales
Prof G Meira	CONICET and Universidad Nac. del Litoral, Argentina
Mr R Minett, Mr M Klee, DR C Milner	Agilent Technologies/Baseline Separation Technologies

COLLABORATIONS & INDUSTRY LINKS IN 2010

Collaborator	Institution/company
Prof L Mondello, Prof P Dugo, Prof G Dugo, Dr P Tranchida	University of Messina, Italy
Dr KC Ng, Ms J Tong	Singapore Polytechnic, Singapore
Dr A Nikitin	Institute of Lasers, Shatura, Russia
Mr M Pedler	Office of Transport Security
Dr P Pigou, Dr M Cook	Forensic Science Services South Australia
Dr S Pyecroft	Department of Primary Industries, and Water(DPIW)
Dr S Rintoul	CSIRO Marine & Atmospheric Research
Dr A Ritar, A/Prof S Battaglene	TAFI, University of Tasmania
Dr H Ritchie	ThermoScientific, UK
Dr T Rodemann, Dr A Townsend	Central Science Laboratories, University of Tasmania
Dr A Ross	National Institute for Forensic Science
Prof M Schmidt	Johannes Gutenberg University, Mainz, Germany
Dr V Schoemann	Université Libre de Bruxelles. Belgium
Dr P Sedwick	Bermuda Institute of Ocean Sciences
A/Prof S Shabala	School of Agricultural Science, University of Tasmania
Dr S Smith	Waters Corp, UK
Dr I Snape, Dr M Riddle, Dr S Ferguson, Dr S Powell	Australian Antarctic Division
Prof M Gomes da Silva	New University of Lisbon, Portugal
Dr Y Sohrin	Kyoto University, Japan
Prof F Svec	Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley (USA)
Dr A Tagliabue	Laboratoire des Sciences du Climat et de l'Environnement, France
Prof M Tanaka	Kyoto University of Technology, Japan
Prof. W Thormann	University of Bern, Switzerland
A/Prof T Trull	CSIRO Marine & Atmospheric Research
Dr T Wagener	Laboratoire d'Océanographie de Villefranche, France
Prof P Wilairat	Mahidol University, Thailand
Dr W Winniford	Dow Chemical Company
A/Prof G Woods	Menzies Research Institute, University of Tasmania
Prof S Wongpornchai	Chang Mai University, Thailand
Prof P Worsfold, Dr S Ussher	University of Plymouth (UK)
Dr P Wynne, Dr P Dawes	SGE International
Prof Feng Zhu	Foshan University
Prof C Zini	UFRGS, Brazil

PUBLICATIONS

Books and book chapters

PN Nesterenko, B Paull, P Jones. *High performance chelation ion chromatography*. RSC Chromatography Monographs Series (UK). Ed. Smith R.M. 2010. 283p.

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TJ Causon, EF Hilder, RA Shellie, PR Haddad. Probing the kinetic performance limits for ion chromatography. II. Gradient conditions for small ions. *J. Chromatogr. A.* 1217 (2010) 5063-5068.

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BO Clarke, NA Porter, RK Symons, PJ Marriott, GJ Stevenson, JR Blackbeard. Investigating the distribution of polybrominated diphenyl ethers through an Australian wastewater treatment plant. *Science Total Envir.*, 408 (2010) 1604-1611.

B Clarke, N Porter, J Blackbeard, P Marriott. Investigating the levels and trends of organochlorine pesticides and polychlorinated biphenyl in sewage sludge. *Environment International*, 36 (2010) 323-329.

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PK Dasgupta, Y Chen, CA Serrano, G Guiochon, H.Liu, JN Fairchild, RA Shalliker. Black box linearization for greater linear dynamic range: The effect of power transforms on the representation of data. *Anal. Chem.*, 82 (2010) 24, 10143-10150.

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MDZ Dawod, MC Breadmore, RM Guijt, PR Haddad. Electrokinetic supercharging-electrospray ionisation-mass spectrometry for separation and on-line preconcentration of hypolipidaemic drugs in water samples. *Electrophoresis.* 31 (2010) 1184-1193.

M Dell'mour, G Koellensperger, JP Quirino, PR Haddad, C Stanetty, E Oburger, M Puschenreiter, S Hann. Complexation of metals by phytosiderophores revealed by CE-ESI-MS and CE-ICP-MS. *Electrophoresis.* 31 (2010) 1201-1207.

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AH Eltmimi, L Barron, A Rafferty, JP Hanrahan, ON Fedyanina, EP Nesterenko, PN Nesterenko, B Paull. Preparation, characterisation and modification of carbon-based monolithic rods for chromatographic applications. *J. Sep. Sci.* 33 (2010) 1231-1243.

ON Fedyanina, PN Nesterenko. Regularities of chromatographic retention of phenol on microdispersed sintered detonation nanodiamond in aqueous-organic solvents. *Russian J Phys. Chem. A.* 84 (2010) 476-480.

M Gaborieau, S 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.

M Gaborieau, T Causon, Y Guillaneuf, EF Hilder, P Castignolles. Molecular weight and tacticity of oligoacrylates by capillary electrophoresis - mass spectrometry. *Aust. J. Chem.*, 63 (2010) 1219-1226.

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X Gao, O Woodman, S Williams, PJ Marriott. Gas chromatographic separation, retention indices and mass spectra of trimethylsilyl derivatives of flavonoids and their precursor chalcones. *J. Chromatogr. A.* 1217 (2010) 8317-8326.

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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.

AM Guidote Jr., JP Quirino. On-line sample concentration of organic anions in capillary zone electrophoresis by micelle to solvent stacking. *J. Chromatogr. A.* 1217 (2010) 6290-6295.

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PMcA. Harvey, RA Shellie, PR Haddad. Design considerations for pulsed-flow comprehensive two-dimensional GC: Dynamic flow model approach. *J. Chromatogr. Sci.* 48 (2010) 245-250.

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T Junkers, M Schneider-Baumann, S Koo, P Castignolles, C Barner-Kowollik. Determination of Propagation Rate Coefficients for Methyl and 2-Ethylhexyl Acrylate via High Frequency PLP-SEC under Consideration of the Impact of Chain Branching. *Macromolecules,* 43 (2010) 10427-10434.

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X Gao, X Yang, PJ Marriott. Simultaneous analysis of seven alkaloids in coptis-evodia herb couple and zuojin pill by UPLC with accelerated solvent extraction. *J. Sep. Sci.* 33 (2010) 2714-2722.

AA Kazarian, EF Hilder, MC Breadmore. Capillary electrophoretic separation of mono- and di-saccharides with dynamic pH junction and implementation in microchips. *Analyst.* 135 (2010) 1970-1978.

AA Kazarian, JA Smith, EF Hilder, MC Breadmore, JP Quirino, J Suttill. Development of a novel fluorescent tag O-2-[aminoethyl]fluorescein for the electrophoretic separation of oligosaccharides. *Anal. Chim. Acta.* 662 (2010) 206-213.

KA Kouremenos, J Pitt, PJ Marriott. Metabolic profiling of infant urine using comprehensive two-dimensional gas chromatography: application to the diagnosis of organic acidurias and biomarker discovery. *J. Chromatogr. A.* 1217 (2010) 104-111.

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Other publications

Plenary, keynote and invited conference presentations

G Blanco-Heras, E Tyrrell, RM Guijt, YH Nai, EF Hilder, RA Shellie, JP Hutchinson, C Johns, GW Dicoski, PR Haddad, MC Breadmore. Sub-minute screening of improvised explosives by electrophoresis, Plenary, *10th Asia-Pacific International Symposium on Microscale Separations and Analysis 2010*, 10-13 December, Hong Kong.

G Blanco-Heras, E Tyrrell, RM Guijt, YH Nai, EF Hilder, RA Shellie, JP Hutchinson, C Johns, GW Dicoski, PR Haddad, MC Breadmore. Sub-minute screening of improvised explosives by electrophoresis, Plenary, *10th Asia-Pacific International Symposium on Microscale Separations and Analysis 2010*, 10-13 December, Hong Kong, Hong Kong.

MC Breadmore, JP Quirino, W Thormann. *Computer-aided design of on-line enrichment strategies for electrophoresis*, Oral, 25th *International symposium on microscale bioseparations MSB 2010*, 21-25 March 2010, Prague, Czech Republic

MC Breadmore, M Dawod, R Guijt, PR Haddad. On-line concentration of acidic drugs in environmental waters by CE and CE-MS, Invited lecture, *The International Chemical Congress of Pacific Basin Societies*, 15-20 December, Honolulu, USA.

M Dawod, MC Breadmore, RM Guijt, PR Haddad. Analysis of pharmaceuticals in environmental waters by CE and CE-MS. Invited lecture at *Separation Science Singapore 2010*, Singapore 26-27 Jul 2010.

PR Haddad, M Dawod, MC Breadmore, RM Guijt. Analysis of pharmaceuticals in environmental waters by CE and CE-MS. Invited lecture at *Pittcon 2010*, Orlando, USA 1-4 March 2010

PR Haddad, PJ Zakaria, N Karu, GW Dicoski, M Hanna-Brown. Expanding the role of Ion Chromatography in Pharmaceutical analysis. Invited plenary lecture at *International Symposium on Capillary Chromatography*, Riva del Garda, Italy, 1-4 June 2010.

PR Haddad. Separation of inorganic ions by ion chromatography and capillary electrophoresis. Which is best? Invited lecture at *Dutch Chemical Society Lunteren Meeting*, Lunteren, The Netherlands, 1-2 Nov 2010.

PR Haddad, GW Dicoski, MC Breadmore, RA Shellie, RM Guijt, JP Hutchinson, CA Johns, E Tyrrel, EF Hilder. Separation of inorganic ions by ion chromatography and capillary electrophoresis. Which is best? Invited lecture at *HPLC 2010*, Boston, USA 21-25 Jun 2010.

PR Haddad. Smarter, faster, more powerful: New developments in ion chromatography. Keynote lecture at *5th International Conference on Ion Exchange ICIE 2010*, Melbourne, 18-21 Jul 2010.

PR Haddad, EF Hilder, E Candish, WB Hon, K Saunders, J Thabano, MC Breadmore, G Clark. Polymeric monoliths for sample preparation in bioanalysis. *Symposium on Sample Preparation*, Runcorn, UK 27 Oct 2010.

RD Henderson, RM Guijt, OS Hutter, AD Henderson, PR Haddad, EF Hilder, TW Lewis, MC Breadmore. Lithographically patterned conducting polymer electrodes for microfluidics, Oral, *Chemeca*, 26-29 September 2010, Adelaide, Australia

RD Henderson, OS Hutter, RM Guijt, TW Lewis, EF Hilder, PR Haddad, MC Breadmore. Laser welded polyaniline circuits, Poster, *The Proceedings of The 14th International Conference on Miniaturized Systems for Chemistry and Life Sciences - μ TAS 2010*, 3-7 October, Groningen, The Netherlands.

EF Hilder, OG Potter, ME Thomas, MC Breadmore. Photochemical eluent generation for chromatography, *34th International Symposium on Capillary Chromatography*, Riva del Garda, Italy, 30th May - 4th June 2010.

EF Hilder. Nanostructured monolithic columns for high performance chromatography: from inorganic ions to biopolymers, *Royal Australian Chemical Institute National Convention - RACI2010*, Melbourne, Australia, 4-8 July 2010.

EF Hilder, E Candish, A Nordborg, PR Haddad, PN Nesterenko, GW Dicoski, GT Clark. Porous polymer monoliths as a new medium for dried blood spot sampling, *Separation Science Singapore*, Singapore, August 5th -6th 2010.

EF Hilder. Getting your work published: strategies and tactics, *RACI Research and Development Topics in Analytical & Environmental Chemistry*, Hobart, Australia, 5th-8th December 2010.

PJ Marriott. Hyphenated GC detection: What has been done? Where can we get to? *HTC-11 Conference*, Belgium, 27 - 29 January 2010.

P Marriott, C Ruehle, PD Morrison, M.Adams. Developments in Preparative Capillary Multidimensional Gas Chromatography with Spectroscopic Detection – “Prep-Cap MDGC-Spec”. *34th ISCC*, Riva del Garda, Italy, 1 - 4 June 2010.

P Marriott, B Maikhunthod, PD Morrison. Development of a Switchable Comprehensive Gas Chromatography/Multidimensional Gas Chromatography Analysis System as an Advanced Separation Technique. *7th GCxGC Symposium*, Riva del Garda, Italy, 1 - 4 June 2010.

P Marriott. Developments in Preparative Capillary Multidimensional Gas Chromatography with Spectroscopic Detection – “Prep-Cap MDGC-Spec”. *SIMCRO 2010 (4th Brazilian Symposium on Chromatography and Related Techniques)*, Campos do Jordao, Brazil, 14 - 16 September 2010.

P Marriott. Advances in Pesticides and Drug Analysis using Comprehensive Two-Dimensional Gas Chromatography. *2nd Separation Science Symposium*, Singapore, 5 - 6 August 2010.

P Marriott. Micro-scale isolation and detection in gas chromatographic methodologies using microfluidics devices. *APCE 10 – Asia Pacific Capillary Electrophoresis meeting*, University of Hong Kong, 10 – 12 December 2010.

P Marriott. Advances in Microscale Preparative Gas Chromatography for Volatile Chemical Analysis: Capabilities and Prospects. *Symposium on “Advancement of Microscale Separations and Analysis in the Past Decade”*, University of Hong Kong, 10 December 2010.

P Marriott, ST Chin, B Maikhunthod, C Rühle. Strategies for comprehensive 2-D gas chromatography analysis of essential oils. Comprehensive Multidimensional Separations (Symposium #191). *Pacificchem 2010*, Hawaii, 15 - 20 December 2010.

P Marriott, HK Choi, S-O Yang, H-S Kim, Y-J Kim, S-H Kim. Comprehensive 2D GC and multidimensional GC with quadrupole MS detection. Comprehensive Multidimensional Separations (Symposium #191). *Pacificchem 2010*, Hawaii, 15 - 20 December 2010.

P Marriott, W Khummueng, ST Chin, E Engel. Advanced gas chromatographic analysis of pesticide residues. Rapid, Multi-Component Environmental Analysis (Symposium #253), *Pacificchem 2010*, Hawaii, 15 - 20 December 2010.

RA Mosher, MC Breadmore, W Thormann. High-resolution electrophoretic simulations: Performance characteristics of one-dimensional simulators, Poster, *25th International symposium on microscale bioseparations MSB 2010*, Prague, Czech Republic, 21-25 March 2010.

PN Nesterenko. Micro-disperse sintered nano-diamonds – prospective type of adsorbents for high performance liquid chromatography. *7th Diamond & Related Films jointly with 2nd International Workshop on Science and Applications of Nanoscale Diamond Materials*, Zakopane, Poland, 28 June – 2 July 2010.

PN Nesterenko, P Jones, B Paull. Recent Advances in High Performance Chelation Ion Chromatography. *5th International Conference on Ion Exchange, ICIE 2010*, Melbourne, Australia, 18 - 21 July 2010.

PN Nesterenko. Micro-disperse sintered nano-diamonds: a new versatile stationary phase for HPLC. *28th International Symposium on Chromatography, ISC 2010*, Valencia, Spain, 12 – 16 September 2010.

RA Shalliker, PG Stevenson, M Mnatsakanyan. The Assessment of Selectivity and Separation Performance for the Analysis of Samples Derived from Natural Origin using 2DHPLC. *HPLC2010*, Boston, MA, USA, 19 – 24 June 2010.

RA Shellie. Extending the flexibility of pulsed-flow modulation to permit new applications of GCxGC and GCxGC-QPMS, *11th International Symposium on Hyphenated Techniques in Chromatography and Chromatographic Analyzers*, 25 - 29 January 2010, Bruges, Belgium.

Other conference presentations

P Castignolles, M Gaborieau. Transfer to polymer and branching in the radical polymerization of acrylates. *MACRO10*, Glasgow, Scotland, UK, July 2010.

P Castignolles, RS Roi, T Kiefer, C Skworzow, S Fluegel, M Schmidt. Capillary electrophoresis of polyelectrolytes and polysaccharides copolymers. *International Chemical Congress of Pacific Basin Societies (Pacificchem)*, Hawaii, USA, December 2010.

P Castignolles, S Koo, A Nikitin, T Junkers, C Barner-Kowollik, M Gaborieau. Transfer to polymer and branching in the radical polymerization of acrylates. *International Chemical Congress of Pacific Basin Societies (Pacificchem)*, Hawaii, USA, December 2010.

C Chifuntwe, H Huegel and P Marriott. Synthesis of New Ionic Liquids as Potential Stationary Phase Chiral Selectors. *RACI National Convention*, Melbourne, VIC, Australia, 4-8 July 2010.

ST Chin, PJ Marriott, GT Eyres. Exploring comprehensive two-dimensional gas chromatography approach for identification of potent odorants in wine and coffee beverage. *12th Scientific Meeting of the Australasian Association for ChemoSensory Science*, Yarra Valley, Victoria, Australia, 2 - 4 December 2010.

AL Choy, PD Morrison, JG Hughes, PJ Marriott, DM Small. Evaluation of the flavanoid properties in instant noodles enriched with common buckwheat. *Australian Grain Science Association 2010*, 19-22 September 2010.

C Gartner, P Castignolles, R Graf, HW Spiess, MJ Gidley, M. Gaborieau. Characterizing polysaccharides solutions, local motions and films with (solid-state) NMR. *International Chemical Congress of Pacific Basin Societies (Pacificchem)*, Hawaii, USA, December 2010.

Y Guillaneuf, P Castignolles. Using Apparent Molecular Weight from SEC in Controlled/ Living Polymerization and Kinetics of Polymerization. *International Chemical Congress of Pacific Basin Societies (Pacificchem)*, Hawaii, USA, December 2010.

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X He, PN Nesterenko, B Paull. Preparation and characterisation of C-60 fullerene-modified graphitised-carbon monoliths for chromatographic applications. *28th International Symposium on Chromatography, ISC2010*, Valencia, Spain, 12 - 16 September 2010.

EF Hilder, RA Shellie, J Li, CJ Desire, MA Jose, E Candish JL Gathercole, MC Breadmore. Small molecule markers for disease diagnosis, *Eleventh International Symposium on Hyphenated Techniques in Chromatography (HTC-11)*, Bruges, Belgium, 27 - 29 January 2010.

EF Hilder, E Candish, A Nordborg, PR Haddad, PN Nesterenko, GW Dicoski, GT Clark. Porous polymer monoliths as a new medium for dried blood spot sampling, *35th International Symposium on High Performance Liquid Phase Separations and Related Techniques*, 19 - 24 June 2010.

N McGillicuddy, E Nesterenko, B Paull, PN Nesterenko. Two-dimensional ion chromatography of cations. *28th International Symposium on Chromatography, ISC2010*, Valencia, Spain, 12 - 16 September 2010.

N Mc Gillicuddy, E Nesterenko, P Nesterenko, B Paull. High-Performance Chelation Ion Chromatography of Lanthanides Using ProPac IMAC Column. *22nd International Ion Chromatography Symposium, IICS-2010*, Cincinnati, OH, USA. 19 - 22 September 2010.

PJ Marriott, ST Chin, B Maikhunthod, C Ruehle, R Prasad. Strategies for Comprehensive Two-Dimensional Gas Chromatography of Essential Oils. *RACI National Convention*, Melbourne, VIC, Australia, 4 - 8 July 2010.

PJ Marriott, E Engel, G Rose, P Morrison. Advanced Gas Chromatographic Analysis of Pesticide Residues. RACI National Convention, *RACI National Convention*, Melbourne, VIC, Australia, 4 - 8 July 2010.

PJ Marriott. Advances in CE and GC Technology for Characterisation of Complex Samples – Green Analytical Chemistry. *Centre for Green Chemistry Monash University Annual Symposium: "Looking Ahead: 2011 & Beyond"*, Wheelers Hill, Australia, 18 - 19 November 2010.

L Mauko, A Nordborg, N Lacher, EF Hilder, PR Haddad. Glycan profiling of monoclonal antibodies: comparison of CCAD, fluorescent and ESI-MS detection, coupled with hydrophilic interaction chromatography. *International symposium on the separation of proteins, peptides and polynucleotides (ISPPP)*, Bologna, Italy 2010.

L Mauko, A Nordborg, N Lacher, EF Hilder, PR Haddad. Glycan profiling of monoclonal antibodies: comparison of CCAD, fluorescent and ESI-MS detection, coupled with graphitised carbon and hydrophilic interaction chromatography. *18th RACI R&D Topics*, University of Tasmania, Hobart, TAS, Australia, 2010.

GR Meira, JR Vega, P Castignolles. Quantification of Long Chain-Branched Homopolymers by Multidetector Size Exclusion Chromatography: A Critical Assessment, *16th Int. Symp. On Separation Sciences*, Rome, Italy, September 2010.

B Mitrevski, P Marriott. Application of GCxGC-TOFMS in performance enhancing and illicit drug profiling. *34th ISCC and 7th GCxGC Symposium*, Riva del Garda, Italy, 1-4 June 2010.

PD Morrison, ST Chin, PJ Marriott. Analysis of Sulfur and Phosphorus Compounds by Using GCxGC Coupled to Specific FPD-P and FPD-S Detection. *34th ISCC and 7th GCxGC Symposium*, Riva del Garda, Italy, 1-4 June 2010.

PN Nesterenko. Micro-disperse sintered nano-diamonds: a new class of versatile adsorbent. *The Royal Australian Chemical Institute's National Convention*, Melbourne, VIC, Australia. 4 - 8 July 2010.

EP Nesterenko, F Lacroix, PN Nesterenko, D Connolly, B Paull. Micro-bore Titanium Housed Polymer Monoliths for High Temperature and High Pressure Reversed Phase Liquid Chromatography. *35th International Symposium on High performance Liquid Phase Separations and Related Techniques, HPLC-2010*, Boston, MA, USA, 19 - 24 June 2010.

PN Nesterenko, ON Fedyanina. Ion-Exchange Properties and Chromatographic Performance of Microdisperse Sintered Nanodiamonds. *5th International Conference on Ion Exchange, ICIE2010*, Melbourne, VIC, Australia, 18-21 July 2010.

A Nordborg, M Talebi, J Wang, Q Wang, EF Hilder, PR Haddad. Separation and Purity Profiling of Biopharmaceuticals using Polymeric Monolithic Ion-exchange Stationary Phases. *International symposium on the separation of proteins, peptides and polynucleotides (ISPPP)*, Bologna, Italy 2010.

RA Shellie. GCxGC with pneumatic modulation for fuel spills analysis, Presented at *Separation Science Singapore*, 5 - 6 August 2010, Singapore.

RA Shellie. Enhanced peak capacity in ion chromatography using gradient elution and multidimensional separations, Presented at *34th International Symposium on Capillary Chromatography*, 30 May - 4 June 2010, Riva del Garda, Italy.

RA Shellie. GCxGC with pneumatic modulation for fuel spills analysis, Presented at *7th GCxGC Symposium*, 30 May - 4 June 2010, Riva del Garda, Italy.

M Talebi, A Nordborg, EF Hilder, PR Haddad, N Lacher, Q Wang. Polymeric Monolithic Ion-Exchange Stationary Phases in Combination with pH Gradient for the Separation and Purity Profiling of Monoclonal Antibodies. *Drug Analysis 2010, International Symposium on Drug Analysis*, Antwerp, Belgium, 21 - 24 September 2010.

M Talebi, A Nordborg, EF Hilder, PR Haddad, N Lacher, Q Wang. Polymeric Monolithic Ion-Exchange Stationary Phases in Combination with pH Gradients for the Separation and Purity Profiling of Monoclonal Antibodies. *18th RACI R&D Topics*, University of Tasmania, Hobart, TAS, Australia, December 2010.

M Van Der Sterren, G Dennis, J Chuck, A Rahman. Rainwater tank water quality testing in Western Sydney Australia. *World Environmental and Water Resources Congress 2010*, pp 4048-4058.

C Gartner Vargas, P Castignolles, R Graf, HW Spiess, MJ Gidley, M Gaborieau. Polysaccharides and (solid-state) NMR: characterizing solutions, local motions and films. *MACRO10*, Glasgow, Scotland, UK, July 2010.

Lectures to Universities and Companies

P Castignolles. Separation and characterization of complex polymers: Branched and/or hydrophilic polymers. Dr Christopher Fellows, University of New England, Armidale, NSW, Australia, April 2010.

P Castignolles. Separation and characterization of branched polymers and polysaccharides. Pr Marc in Het Panhuis, University of Wollongong, NSW, Australia, November 2010

EF Hilder. Polymeric monolithic stationary phases based on photografting or nanoparticle coatings, Irish Separation Science Cluster, Dublin City University, 5 February 2010

EF Hilder. Nanostructured polymeric materials for applications in separation science, Flinders University, South Australia, 16 August 2010

N Karu. Conductivity signal enhancement of weak ions; Suppression for normalization of ionic gradient. Dionex Corporation headquarters, R&D and Marketing, Sunnyvale, CA, USA, June 2010.

N Karu. Expanding the Role of Ion Chromatography in Pharmaceutical analysis: Suppressed Universal Detection of Non-Chromophoric Compounds. Pfizer Inc. R&D centre, Groton, CT, USA, June 2010.

P Marriott. World Class Universities Program, Distinguished Visiting Professor, Korea Research Foundation, KOSEF; Korean Organisation for Science and Education 2010. 2 month attachment to Chung-Ang University, Seoul; workshops and visiting lectures.

P Marriott. Comprehensive and Multidimensional GC - Mass Spectrometry: Some Atmospheric Analysis Applications. University of California, Berkeley, CA, USA, 26 January 2010.

P Marriott. Comprehensive and Multidimensional GC - Mass Spectrometry for Natural Product Analysis, with Innovative Approaches to MDGC-NMR Spectroscopy. University of Nice, France, 7 June 2010.

P Marriott. GC & HPLC Studies in the ACROSS Lab, RMIT University. National Academy of Agricultural Science, "Agricultural Applications", Suwon, Korea, 28 July 2010.

PJ Marriott. Advanced Multidimensional and Comprehensive Gas Chromatography Technologies for Pesticides and Illicit Drugs Analysis. Supreme Prosecutor's Office, Forensic Division, Korea, 12 August 2010.

PJ Marriott. Advances in Spectroscopic Chemical Characterisation in GC: Experiences with Prep-GC and MS, NMR & X-ray Crystallography. College of Pharmacy, Chung-Ang University, Seoul, Korea, 2 September 2010.

PJ Marriott. Food / Volatile Component Analysis using Multidimensional Chromatographic Methods. Korean Food Research Institute, Seoul, Korea, 26 August 2010.

P Marriott. Discovery through Resolution: A Guide to Technological / Knowledge Innovation. Schools Lecture, Seoul, Korea, 20 July 2010.

P Marriott. Developments in Preparative Capillary Multidimensional Gas Chromatography with Spectroscopic Detection – "Prep-Cap MDGC-Spec". Federal University of Rio De Janeiro, Brazil, 13 September 2010.

P Marriott. Multidimensional and Comprehensive Gas Chromatography Technologies for Pesticides and Illicit Drugs Analysis. Feevale University, Brazil, 17 September 2010.

P Marriott. Multidimensional and Comprehensive GC with Mass Spectrometry: Innovative Approaches to NMR Spectroscopy for Improved Chemical Analysis. Federal University of Rio Grande do Sul, Brazil, 21 September 2010.

P Marriott. Recent studies in gas chromatography for aroma analysis. School of Food Science & Technology, University of New South Wales, Sydney, NSW, Australia, 30 November 2010.

A Nordborg, L Mauko, N Lacher, EF Hilder, PR Haddad. Glycan profiling of monoclonal antibodies: comparison of CCAD, fluorescent and ESI-MS detection, coupled with graphitised carbon and hydrophilic interaction chromatography. Merck-SeQuant, Umeå, Sweden, 16 September, 2010.

A Nordborg, M Talebi, J Wang, Q Wang, EF Hilder, PR Haddad. Separation and Purity Profiling of Biopharmaceuticals using Polymeric Monolithic Ion-exchange Stationary Phases. University of Amsterdam, Amsterdam, The Netherlands, 22 September, 2010.

RA Shalliker. Honours program in Advanced Separations (series of 10 lectures), Deakin University, Victoria, Australia, June 2010.

Workshops

GW Dicoski. Introduction to modern ion chromatography – Short course. *IICS 2010 – 22nd International Ion Chromatography Symposium*, Cincinnati, USA, 21-24 September 2010.

P Castignolles, M Gaborieau. Polymeric materials and polysaccharides. *UWS and RACI NSW polymer group one day workshop* (65 participants), Parramatta, NSW, Australia, 5 November 2010.

P Marriott. *GCxGC Workshop* (1 day). 34th ISCC and 7th GCxGC, Riva del Garda, Italy, 1 - 4 June 2010.

P Marriott. *GCxGC Workshop* (1 day). Feevale University, Brazil, 18 September 2010.

P Marriott. *Scientific-Training Workshop: MDGC, GCxGC & MS Technology for advanced chemical analysis*. College of Pharmacy, Chung-Ang University, Seoul, Korea, 21 Aug 2010.



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