ACROSS ANNUAL REPORT 2009

ACROSS
UTAS
RMIT UNIVERSITY
University of Western Sydney
Bringing knowledge to life

INSIDE THE REPORT

ACROSS research structure

	RESEARCH THEMES	OUTCOME AREAS
PRE-SEPARATION	Computer-assisted method development	Antarctic human impacts
	Preconcentration, selective extraction and derivatisation	Biogeochemistry
SEPARATION	Separation media	Biotechnology
	Multidimensional separations	Climate change
	Separation mechanisms and theory	National security
	Microfluidics and preparative scale	Education and training
POST-SEPARATION	Detection technologies	Environmental contaminants
	Data handling	Foods, flavours, fragrances
		Forensics
		Instrumentation
		Materials science
		Miniaturisation
		Nanotechnology
		Pharmaceuticals
		Software development

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 any 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 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 2009.

Staffing changes

2009 saw the appointment at UTAS of Dr Michael Breadmore as an ARC QEII Fellow, Dr Joe Hutchinson as an ARC Australian Postdoctoral Fellow (Industry) and Dr Gustavo Blanco Heras as a postdoctoral fellow in the national security area, while at RMIT Dr Zhongda Zeng has been appointed as a postdoctoral fellow. Visitors spending significant periods of time in ACROSS in 2009 included Professor Georges Guiochon (USA), Dr Chris Palmer (USA), A/Prof Massoud Kaykhaii (Iran), Dr Erwan Engel (France), A/Prof Z. Feng (China), Prof Yuanqi Lu (China), Dr Ekaterina Nesterenko (Ireland), and Prof Brett Paull (Ireland). In addition, there were several international PhD students who conducted part of their research projects in ACROSS (these are listed under "Visitors" later in this report.

Research outcomes

ACROSS has undertaken an extensive program of fundamental and applied research, with numerous individual research projects being undertaken in 2009. 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 Tumour 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 national security and counter-terrorism.

Funding

Funding for ACROSS in 2009 has totalled $3,862,021, with $2,507,712 (65%) coming in the form of 20 highly competitive grants from the Australian Research Council (ARC) [1 Federation Fellowship, 1 Future Fellowship, 1 QEII Fellowship, 1 APD(I), 2 APD, 7 Discovery Grants, 4 Linkage Grants, 3 Linkage Infrastructure and Facilities Grants]. Over $1.3m of additional financial support was provided by a range of government bodies and industries, with major contributors being Pfizer (through the Pfizer Analytical Research Centre, PARC) and the National Security, Science and Technology Branch (Australian Federal Government) for counter-terrorism research.

Achievements in 2009

ACROSS staff continue to feature prominently on the international separation science scene. Members of staff held three editorships of international journals in 2009 and also appeared on the editorial boards of 18 other journals of analytical chemistry or separation science. Speakers from ACROSS made presentations at most of the major international conferences and symposia on separation science, including the presentation of 42 invited lectures in 2009.

A number of other notable achievements by ACROSS staff occurred in 2009. Dr Emily Hilder was awarded an ARC Future Fellowship, she received the Royal Australian Chemical Institute Bob Cattrall Medal and was the recipient of the Tasmanian Young Tall Poppy Award.

Dr Rosanne Guijt and Dr Robert Shellie received University of Tasmania Rising Stars awards. Dr Rosanne Guijt was also promoted to Level C and received a Rod Rickards Fellowship and travel grant from the Australian Academy of Science. Professor Philip Marriott was appointed as a Distinguished Visiting Professor to the World Class Universities Program at the Chung-Ang University, Seoul, Korea. Finally, Professor Paul Haddad was awarded the title of Distinguished Professor at the University of Tasmania.

Summary

The overall performance of ACROSS is summarised in the Table below. This Table shows that the Centre has a sound critical mass of staff and research students, it has a well-developed funding base from both government and industry, and it has a strong level of publication output.

I thank all staff and students for their contributions to ACROSS in 2009 and wish them every success in the coming years.

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

Director

ACROSS performance at a glance

Node	Research staff	PhD, MSc students	BSc Hons students	Grants ($)	Publications	Conference presentations
UTAS	18	20	3	3,123,021	39	64
RMIT	1	19	1	394,000	13	27
UWS	2	7	0	345,000	3	2
ACROSS TOTAL	21	46	4	3,862,021	55	93

KEY PERSONNEL

Professor Paul Haddad

DSc, PhD, BSc(Hons),
DipMilStud, FAA,
FTSE, FRACI, FRSC, FFACS
ARC Federation Fellow,
Distinguished Professor
of Chemistry,
University of Tasmania

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 Separation Sciences,
RMIT University

Philip Marriott has degrees of BSc (Hons) and PhD from La Trobe University. He is currently Professor of Separation Science at RMIT 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

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 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 CO_2' 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 Greg Dicinoski

PhD, BAppSci(Hons),
FRACI CChem
Senior Lecturer,
University of Tasmania

Greg Dicinoski holds the degrees of BAppSci(Hons) and PhD from the University of Central Queensland. He is currently a Senior Lecturer and Deputy 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, and specialist applications for the separation of inorganic and organic ions using ion chromatography and capillary electrophoresis.

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

Dr Emily Hilder

PhD, BSc(Hons) MRACI CChem
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 an Editor of the *Journal of Separation Science* and is Assistant Dean of Graduate Research (generic skilling) at UTAS.

Dr Joe Hutchinson

PhD, BSc(Hons)
ARC Postdoctoral Research Fellow (Industry),
University of Tasmania

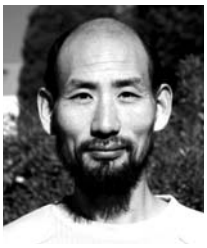
Joe Hutchinson completed his undergraduate and postgraduate studies at the University of Tasmania and was involved in pre-concentrating small ions using various stationary phases in capillary electrophoresis. After completing his PhD, he relocated to the University of Waterloo, Ontario, Canada to assume 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.



Dr Jianfeng Li

PhD, MSc, BEng(Hons)
ACROSS Postdoctoral
Research Fellow,
University of Tasmania

Jianfeng Li obtained his PhD in 1998 at the Shanghai Institute of Metallurgy, Chinese Academy of Sciences (CAS), Shanghai, China. After spending two years as a post-doc at Shanghai Institute of Organic Chemistry, CAS, Shanghai he moved to Paris where he worked at Institut de Topologie et de Dynamique des Systèmes, Université Paris 7. Since August 2002 he worked at University of New South Wales, Sydney before joining ACROSS in September 2007. His research interests include chemometrics, analytical and enviromental chemistry.

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 a member of the editorial boards of the *Analytica Chimica Acta* and *Encyclopedia 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 concentration 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)
ARC Australian Postdoctoral Fellow,
Part-time Lecturer,
University of Tasmania

Dr 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. He is an ARC Postdoctoral Fellow and part-time Lecturer of Chemistry. 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.

Technical and Administrative staff

Mr Marc Guijt

Administrative Officer
University of Tasmania

Mr Paul Morrison

Technical Research Officer
RMIT University

Dr Kim Shepherd

Administrative Assistant
RMIT University

Mr Anthony Malone

Computing Technical Officer
University of Tasmania

Ms Clodagh Moy

Technical Officer
University of Tasmania

VISITORS TO ACROSS IN 2009

Visitor	Country	Institution	Period of visit	Location
Mr James Armstrong	England	University of Warwick	2 months	UTAS
Dr Humberto Bizzo	Brazil	Brazil Agricultural Research Organisation EMBRAPA	5 weeks	RMIT
Ms Stella Brudin	Netherlands	University of Amsterdam	12 months	UTAS
Mr Lee Burton	England	University of Warwick	2 months	UTAS
Ms Chloë Dearden	England	University of Warwick	2 months	UTAS
Ms Madeleine Dell'Mour	Austria	BOKU, Vienna	2 months	UTAS
Mr Jailson Dias	Brazil	State University of Campinas	5 months	UTAS
Dr Erwan Engel	France	INRA	12 months	RMIT
Ms Olga Fedyanina	Russia	Lomonosov Moscow State University	2 months	UTAS
A/Prof Z. Feng	China	Foshan University	6 months	RMIT
Ms Grace Gao	China	China Scholarship Council	2 years	RMIT
Prof Georges Guiochon	USA	University of Tennessee and Oak Ridge National Laboratories	1 week 1 week	UTAS UWS
A/ Prof Massoud Kaykhaii	Iran	Sistan and Balouchistan University, Zahedan	3 months	UTAS
Mr Thijs Kruyen	The Netherlands	Radboud University, Nijmegen	8 months	UTAS
Ms Iris Lee	Australia	Edith Cowan University, Perth WA	1 week	UTAS
Prof Yuanqi Lu	China	Dezhou University	8 months	UTAS
Ms Michelle Meighan	USA	University of Arizona	3 months	UTAS
Mr Ben Müller	Australia	University of Wollongong	3 weeks	UTAS
Dr Ekaterina Nesterenko	Ireland	Dublin City University	2 months	UTAS
Prof Brett Paull	Ireland	Dublin City University	2 months	UTAS
Ms Kay Rigby	England	University of Warwick	2 months	UTAS
Mr Christian Ruehle	Germany	Technical University ,Berlin,	9 months	RMIT
Mr Stuart Vagg	England	University of Warwick	2 months	UTAS

RESEARCH FUNDING

UTAS NODE

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2009
Breadmore MC	Australian Research Council	Discovery Project	Integrated Microfluidic Device for the Direct Analysis of Drugs and Metabolites in Biological Fluids	$160,000
Breadmore MC	University of Tasmania	Conference Support Scheme	92nd Conference of the Canadian Society for Chemistry, Toronto, Canada	$3,031
Breadmore MC	University of Tasmania	Rising Stars		$24,800
Breadmore MC, Henderson, A, Guijt, RM, Carew, A	University of Tasmania	Teaching Development Grant	Enhancing student learning at the Chemistry-Engineering interplay	$5,000
Bowie AR	University of Tasmania	Conference Support Scheme	American Geophysical Union 2010 Ocean Sciences Meeting	$2,882
Butler ECV, Bowie AR, Keywood M		2008-09 Cape Grim Baseline Air Pollution Station Science Program	Continental aerosols as vectors of micronutrients to the oceans	$4,000
Canty AJ, Peterson GM, Nesterenko PN, Trull TW, Carter CG, Crawford C, Bowie AR, Townsend AT, Seen AJ	Australian Research Council	Linkage Infrastructure Grant	Purchase of a state of the art high resolution inductively coupled plasma mass spectrometer	$250,000
Dicinoski GW	University of Tasmania	Conference Support Scheme	The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pittcon 2010	$2,182
Dicinoski GW, Haddad PR, Battaglene SC	Australian Research Council	Linkage Project	Hatchery Production of Rock Lobster Seedstock for Aquaculture and Enhancement with Emphasis on Ozonation of Culture Water to Reduce Disease	$260,581
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	$225,797
Guijt RM	Australian Research Council	Discovery Project	Disposable microdevices for fast ion analysis	$47,250
Guijt RM	University of Tasmania Scheme	Conference Support	9th Asian-Pacific International Symposium on Microscale Separations and Analysis	$2,290
Guijt RM, Breadmore MC, Henderson AD	University of Tasmania	Cross-theme Grant	Fully-automated Direct-writing Lithography for Microchip Fabrication	$20,000
Haddad PR	Australian Research Council	Consultancy	Participation in the Excellence in Research for Australia initiative as a Member of the Physical, Chemical and Earth Sciences, Research Evaluation Committee	$15,197
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

UTAS NODE cont.

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2009
Haddad PR, Dicinoski GW, Breadmore MC, Guijt RM, Hilder EF, Shellie RA	Pfizer Pty Ltd	Collaborative Research Agreement	Collaboration on multiple research projects all related to separation science	$462,100
Haddad PR, Dicinoski GW, Hilder EF, Breadmore MC, Shellie RA	Australian Research Council	Linkage Project	Pre-blast screening of Improvised Explosives Devices - a National Counter-terrorism Initiative	$117,500
Haddad PR, Dicinoski 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	$237,137
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	$17,167
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	$150,000
Haddad PR, Marriot PJ, Shalliker RA, Nesterenko PN, Dicinoski GW, Hilder EF, Breadmore MC, Quirino JP, Shellie RA, Guijt RM	Australian Research Council	Linkage Infrastructure Grant	Multi-Purpose Mass Spectrometry Facility	$172,025
Haddad PR, Palmer AS, Seen AJ, Riddle M	Department of the Environment, Water, Heritage and the Arts	Grant	Development, Commissioning and Training in Analytical Methods for Soils and Sediments of an MIR/FTIR Methodology for Antarctic Soils and Sediments.	$41,441
Haddad PR, Shellie RA	Australian Research Council	Discovery Project	Enhanced peak capacity in ion chromatography through gradient elution and multidimensional separations	$186,000

RESEARCH FUNDING

UTAS NODE cont.

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2009
Hilder EF	Australian Research Council	Future Fellowship	High-performance chromatography based on nanostructured monolithic polymers	$85,800
Hilder EF	University of Tasmania	Rising Stars		$24,889
Hilder EF	Australian Academy of Science	Scientific Visits to Europe Grant	Polymer nanoparticles and their assembled supracolloidal monolithic structures for applications in separation science	$8,900
Jacobson GA, Geragthy DP, Narkowicz CK, Hilder EF	University of Tasmania	Cross-theme Grant	Drug discovery, biotechnology and bridging the gap using an intermediary: Pilot application to novel flavonoids woth potential to reduce cardiovascular disease risk	$19,799
Macka M, Paull B, Breadmore MC	Science Foundation Ireland	Frontiers Program	Electrohydrodynamic focusing in 2-dimensional planar microfluidic devices for preconcentration of low abundance bioanalytes	$42,000
Nesterenko PN	University of Tasmania	Conference Support Scheme	21st International Ion Chromatography Symposium	$900
Quirino JP	University of Tasmania	Institutional Research Grant Scheme	Analyte focusing by micelle collapse: A new dimension for sample control in capillary electrophoresis	$9,500
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	$40,000
Shellie RA	Australian Research Council	Discovery Project	New separation technologies for profiling metabolites in biological samples	$30,000
Shellie RA	CASS Foundation (Contributing to Australian Scholarship and Science)	Post Doctoral Travel Grant	33rd International Symposium on Capillary Chromatography and Electrophoresis and 6th International GCxGC Symposium	$2,500
Shellie RA, Frysinger GS, Harvey PM, Palmer AS	Department of Environment, Water, Heritage and the Arts	Australian Antarctic Science Grant	Development and application of multidimensional gas chromatography for quantitative monitoring of Antarctic and sub-Antarctic fuel spills	$23,000
Trull TW, Bowie AR, Lannuzel D, Mancuso-Nichols C, Meiners K, Van Der Merwe P	Department of the Environment, Water, Heritage and the Arts	Australian Antarctic Science Grant	The role of iron as a micro-nutrient to the Antarctic sea-ice zone algal community	$24,000
Tyrrell EC	University of Tasmania	Conference Support Scheme	21st International Ion Chromatography Symposium	$2,076
Woods GM, Kreiss A, Tovar C, Shellie RA, Hilder EF, Breadmore MC	University of Tasmania Foundation Inc	Donation – Dr Eric Guiler Tasmanian Devil Research	Establishment of a mouse model to study the biology of Devil Facial Tumour Disease (DFTD)	$20,255
			Total	**$3,123,021**

RMIT NODE

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2009
Marriott PJ	Firmenich SA Geneva	Model Project	Development and implementation of routine fast comprehensive 2D-GC for quality control of essential oil and perfume products	$15,000
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)	$80,000
Tong J, Ng KC, Marriott PJ	Singapore Tote Board	Model Project	Characterisation of essential oils using GC hyphenated with FTIR and MS	$60,000
Marriott PJ, Small DM	Masterfoods	Model Project	Development of Methods for Herb and Spice Analysis	$3,000
Marriott PJ	Bureau of Meterology	Model Project	Separation and MS analysis based on 2D GC, MS and other emerging techniques for assessment of atmospheric trace organics	$6,000
Marriott PJ, Pang E	Horticulture Australia	Model Project	Environmental effects on flavour development in Australian varieties of strawberry	$57,000
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	$65,000
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
			Total	**$394,000**

UWS NODE

Applicant(s)	Funding scheme	Type of grant	Title	Funding for 2009
Shalliker RA	UWS	ACROSS Initiative	N/A	$50,000
Kannangara 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**

RESEARCH ACTIVITIES

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.

DRUGS IN SPORT (RMIT)

Development of multidimensional chromatographic methods for illicit drugs and anabolic adrenergic steroids in doping control

In association with international collaborators at Cornell University, the Thai doping control laboratory at Mahidol University, and the Forensic Science Unit, Ministry of Internal Affairs, Macedonia with support from the National Drug Law Enforcement Fund, methods developed at RMIT ACROSS laboratory have been applied to a variety of profiling applications directed to drugs of abuse and steroids relevant to doping in sports.

Our methodologies have continued to be developed with a consistent drive towards providing analysts with directions on how to improve identification of individual compounds, and in some cases to demonstrate approaches for absolute conformation of structures of compounds. Two basic approaches have been followed. The first focuses on comprehensive two-dimensional chromatography (GC×GC) with its improved separation power that resolves individual compounds in complex samples. This then permits improved mass spectrometry confirmation of compound identity. This is the approach we have taken with the illicit and doping control drugs.

The second approach is to use a high resolution multidimensional capillary chromatography system, with a switching device to direct individual compounds to a collection zone. By repeat collection, we have shown that sufficient material can be collected to permit a wide array of spectroscopic tools to be used for absolute identification of the compound, including NMR and recently, X-ray crystallography.

For our drugs work, time-of-flight mass spectrometry (TOFMS) with GCxGC has allowed us to address the limitations of current methods for steroid detection in doping control samples. Using our approach, we can detect and analyse steroids in urine matrices at the levels required of the World Anti-Doping Authority (WADA) of 2 ng/mL or less, but with acquisition of full mass spectral data. This gives considerably improved identification, especially with the purpose-built mass spectral library data of pure compounds. Since Time-of-flight (TOF) MS data are different to regular MS data, use of our in-house library is important. The National Institute of Standards and Technology (NIST, USA) has obtained our data to add to the NIST Mass Spectrometry database. This approach will allow novel retro-searching of analysed samples in future, should any evidence of new designer drugs be identified in the sports arena. An application for funding made to WADA in 2009 was successful, and will apply the new technologies developed at RMIT to all classes of volatile doping drugs relevant to sports.

In a similar manner, illicit drugs (ecstasy, cocaine and heroin) have been profiled by GC×GC using a validated sampling method based on solid-phase microextraction to rapidly process samples of street-captured drugs. The 2D GC×GC plots allow much improved separation power, with completely resolved major and minor components which can be selected for chemometric analysis. Eventually, we expect to be able to identify the geographical source of drugs, different manufacturing or synthesis processes, and other sample-specific information to provide improved forensic intelligence for seized samples.

LAB ON A CHIP
(UTAS)

The Lab on a Chip research group is a unique entity of ACROSS as the research is not restricted to separation science but stretches from the design and fabrication of microfluidic devices to their use in life sciences.

One of the main research topics is the development of novel and often quirky microfabrication techniques. Researchers Rosanne Guijt and Michael Breadmore have developed a system for direct writing lithography using UV Light Emitting Diodes (LEDs).[1] The initial experimental set-up consisted of a UV LED, a microscope objective and the plunger of a syringe pump as a moving stage. The output of the LED was collected using the microscope objective and focused onto a photoresist-coated substrate that was positioned on the moving stage. The negative photoresist SU8 polymerised upon exposure to the UV light, making these areas insoluble in the developer. During development, the non-exposed areas washed off, resulting in 3D structures in the exposed areas. This work was further developed in conjunction with Dr Alan Henderson, School of Engineering. Using a motorised stage, relationships were shown between the width of the patterned lines, the diameter of the pinhole and the velocity of the stage. Features with a width down to 17 µm could be created, significantly improving the resolution of budget lithographic techniques using high resolution transparency masks.

More recently, a similar set-up was used for patterning of a conducting polymer. Conducting polyaniline nanofibres (PANI) were known to be fused into a non-conducting polymer by flash-welding using a broad spectrum camera flash [2]. Rowan Henderson (PhD student) has applied this flash welding technology to pattern electrodes in the PANI film. These PANI electrodes were used to supply the high voltages to the microchip for the electrophoretic separation of fluorescently-labelled sugars, illustrating the potential of these non-metallic electrodes.[3]. Rowan has also demonstrated that only the light with a wavelength above 600 nm is responsible for this welding process. Following this finding, he has successfully patterned PANI film using the direct writing set-up in combination with a red laser diode as light source.

In 2008, Guijt and Breadmore introduced a high intensity LED array as an alternative exposure source for the fabrication of microfluidic devices [4]. This array has replaced other lithographic exposure sources in ACROSS and forms the basis of all microchips produced in ACROSS. The UV LED array has been used in combination with dry film photoresist to create a $2,500 microfabrication suite comprising scissors, an office laminator, a hotplate a drill and the UV LED array [5-6]. Using this budget suite, high quality microfluidic devices were made, as demonstrated by the highly competitive high resolution separations. This process was slightly modified to create devices with integrated electrodes based on printed circuit boards. The innovative idea of backfilling of the etched metal on the board with photoresist to create an even surface for mounting the microfluidic network has been protected by a provisional patent. Devices for CE with integrated conductivity detectors were tested by Guijt during her research visit to Prof Peter Hauser's research group at the University of Basel and were demonstrated to have improved sensitivity.

One of the application-driven Lab on a Chip research projects in ACROSS is the microreactor project where flow-through microreactors have been developed for heterogenous catalysis using a polymer monolith as solid support [7-8]. UV-initiated polymerisation was selected for the *in-situ* synthesis of the poly(glycidyl methacrylate-*co*-ethylene dimethacrylate)(GMA-co-EDMA) monolith. In 2009, the research focused on the development of a photoinitiation system based on the UV LED array. Following the selection of a suitable type I photoinitiator, bis(2, 4, 6-trimethylbenzoyl)-phenylphosphineoxide (BAPO), polymer monoliths were prepared in glass and COC microchips and used as flow-through microreactors with >90% conversion in the Suzuki Miyaura reaction.

Other applications of the microchip research can be found in national security research, where a commercially available glass chip with integrated electrodes for contactless conductivity detection (C^4D) will be used to increase the speed of analysis. CE-C^4D is also the platform for a Lab on a Chip system for monitoring ion fluxes in plant cells in collaboration with A/Prof Shabala, School of Agricultural Sciences.

2D–HPLC (UWS)

The highlight for UWS in 2009 was the completion of three PhD programs of study.

Coleen Milroy completed a thesis on the efficiency of targeted isolations from complex samples using two-dimensional preparative HPLC. Her work detailed the complexity of the separation problem, illustrating the impossibility of isolating the target species using one-dimensional HPLC. She investigated the interplay between recovery, yield and purity and the ramifications of maximising these with respect to production rate. In the end, purity was the minor concern since recovering a target species from a complex sample almost always resulted in carry-over impurities, but, as the complexity of the sample matrix was reduced to only a few components, these impurities could be easily removed using one-dimensional HPLC.

Paul Stevenson completed a thesis on the factors influencing the design of stationary phases. His thesis focused on phenyl stationary phases and he studied how selectivity and sample loading was affected by the length of the alkyl spacer chain that bonded the phenyl ring to the silica. Models indicated that the orientation of the phenyl ring depended on whether there was an even or odd number of carbon atoms in the chain and while differences in selectivity were apparent, the most significant finding was with respect to the saturation capacity, which depended on whether the alkyl spacer had an even or an odd number of carbon atoms. Even-numbered alkyl chain lengths had a greater saturation capacity than the odd alkyl chain lengths. A data analysis package was designed to analyse chromatographic data derived from two-dimensional HPLC and this was able to plot the data graphically, search for peaks, define their retention times and the degree of solute crowding within the separation plane.

The software could automatically perform a statistical analysis of the two-dimensional separation using Information theory, factor analysis and the Bin theory, providing a measure of the separation performance. Signal to noise ratios were improved by factors of greater than 50000 times.

Mariam Mnatsakanyan's studies involved the search for antioxidants in complex foods. High resolution screening techniques, coupled with selectivity in detection were of paramount importance. For that reason she used two-dimensional HPLC for high peak capacity separations and a variety of detection processes. She studied café espresso, red wine and apple skin extracts, and has submitted for publication the first example of 2DHPLC with chemiluminescence detection. These studies were undertaken in conjunction with Professor Neil Barnett's group at Deakin University. This project has shown that searching for antioxidants in foods is greatly facilitated by selectivity in detection and some information on the mode of action of the antioxidant can be derived from the response to different detectors. She also investigated the process of optimising the separation performance in 2D HPLC for these types of complex samples and highlighted the importance of undertaking selectivity studies using standard compounds that very closely resemble the sample matrix.

Studies at UWS in 2010 continue with new projects on the design of software for 2D HPLC and the enhancement of signal-to-noise responses. We have expanded the area of study on the analysis of foods for antioxidants, and we are applying this knowledge to defining the limits of reliability of chemical signatures derived from 2D HPLC. After the completion of Mariam's coffee project we are now much more comfortable with our coffee habits.

RESEARCH STUDENTS

Name	Degree	Commenced	Thesis Title	Supervisors
Tamana Arya*	Honours	2009	Flavonoids Analysis by Multidimensional Methods	P.J. Marriott
Tim Causon	PhD	2009	High temperature liquid chromatography using organic polymer monoliths	E.F. Hilder, R.A. Shellie
Esme Candish*	Honours	2009	Potential of porous polymer monoliths as a medium for dried blood spots	E.F. Hilder, P.N. Nesterenko, P.R. Haddad, G.W. Dicinoski
Sung Tong Chin	PhD	2009	Multidimensional GC and MS approaches for odourants in wine and related products	P.J. Marriott, G. Eyres
Brad Clarke*	PhD	2005	Methods and status for environmental toxicant analysis	P.J. Marriott, N. Porter
Mohamed Dawod*	PhD	2005	Environmental chemical analysis related to pharmaceuticals	R.M. Guijt, P.R. Haddad, M.C. Breadmore
Jeremy Deverell	PhD	2006	Microreactors for organic synthesis	R.M. Guijt, A.J. Canty, T. Rodemann
Michael Dunn	PhD	2005	Targeted multidimensional GC methods of analysis	P.J. Marriott, R.A. Shellie
Rodney Hau Cheung Fung*	PhD	2006	Vitamin fortification and encapsulation in foods	D. Small, P.J. Marriott
Grace Gao	PhD (Int.)	2009	Serum Pharmacochemistry and Pharmacokinetic Studies of Zuojin Pill	P.J. Marriott, X.W. Yang
Jessica Gathercole	PhD	2007	Development of a pre-clinical diagnostic test for devil facial tumour disease	M.C. Breadmore, E.F. Hilder, R.A. Shellie
Paul Harvey	PhD	2006	Development and application of multidimensional gas chromatography for quantitative monitoring of Antarctic and sub-Antarctic fuel spills	P.R. Haddad, R.A. Shellie, I. Snape
Rowan Henderson	PhD	2007	Revolutionising lab-on-a-chip using polymer electrodes	R.M. Guijt, M.C. Breadmore, E.F. Hilder, P.R. Haddad, T.W. Lewis
Roy Hibbert	MSc	2008	Assessment of Orthogonality of stationary phases in GC	P.J. Marriott, P. Wynne
Naama Karu	PhD	2008	High performance ion-exchange chromatography for separation of organic ions	P.R. Haddad, G.W. Dicinoski
Nicha Kawila	PhD	2009	GCxGC Analysis of the Formation of the toxin acrylamide during processing of cereal grain foods	D. Small, P.J. Marriott
Artaches (Tom) Kazarian	PhD	2006	Investigation of new strategies for labelling of biomolecules	E.F. Hilder, M.C. Breadmore
Weeraya Khuemmeng*	PhD	2004	Environmental pollutant analysis by using GCxGC	P.J. Marriott, C. Trenerry
Elsuida Kondo	PhD	2008	High resolution GC and MS methods for metabolite profiling	P.J. Marriott, M. Adams, W. Winniford
Con Kouremenos	PhD	2006	Metabolite profiling using GCxGC	P.J. Marriott
Tsz Kwan Kwok	PhD	2009	Remediation of surfactants in wastewater	M. Othman, P.J. Marriott
Russell McGifford	PhD	2006	Spatial and selective colorimetric detection of polluting metal ions using the Diffusive Gradients in Thin-films (DGT) technique	A.J. Seen, P.R. Haddad, A.S. Palmer
Bussayarat Maikhunthod	PhD	2008	Herb and spice profiling by using GCxGC and MDGC methods	P.J. Marriott D. Small
Elijah Marshall	PhD	2004	Development of MIEX gold selective resins for thiosulfate leach solutions	G.W. Dicinoski, P.R. Haddad

Students who completed their project during 2009 are marked with an asterisk.

Name	Degree	Commenced	Thesis Title	Supervisors
Kirsty Mayfield	PhD	2008	High Capacity Multidimensional HPLC for Studies in Metabolomics	R.A. Shalliker, G.R. Dennis, G.A. Guiochon
Coleen Milroy*	PhD	2006	Preparative scale 2DHPLC for the isolation of components in complex mixtures	R.A Shalliker, G.R. Dennis
Blagoj Mitrevski	PhD	2007	Profiling of illicit substances by using GCxGC MS	P.J. Marriott, P. Wynne
Mariam Mnatsakanyan*	PhD	2007	Isolation and Identification of Antioxidants in Australian Native Plants	R.A. Shalliker, K. Kailaspathy
Boon King Ng	PhD	2007	Ion chromatography in silico	G.W. Dicinoski, R.A. Shellie, P.R. Haddad
William Percey	PhD	2009	Development of a Lab on a Chip for ion flux monitoring in plants	R.M. Guijt, S. Shabala
Oscar Potter	PhD	2006	New materials and techniques for integrated microscale bioanalytical devices	E.F. Hilder, M.C. Breadmore
Samuel Poynter	PhD	2007	New separation technologies for profiling metabolites in biological samples	P.R. Haddad, R.A. Shellie
Kavitha Samykanno*	PhD	2008	Aroma Profiling of Strawberries Using Gas Chromatography-Olfactometry and Comprehensive Two-Dimensional Gas Chromatography	P.J. Marriott, E. Pang
Tomas Remenyi	PhD	2008	Quantifying dust deposition into the Southern Ocean using dissolved aluminium concentrations as a tracer	A.R. Bowie, P.R. Haddad, P.N. Nesterenko, E.C.V. Butler
David Schaller	PhD	2005	Design and synthesis of monolithic and nanostructured stationary phases for chromatography	E.F. Hilder, P.R. Haddad
David Shock	PhD	2008	Multidimensional HPLC for complex separations	R.A. Shalliker, G.R. Dennis
Isabel Silva	PhD (Int.)	2007	GCxGC and GC-MS of Organic Impurities in Salt	I. Rochas, P.J. Marriott
Arianne Soliven	PhD	2008	Design and Performance of Monolith Separation Media	R.A. Shalliker, G.R. Dennis, E.F. Hilder, G. Guiochon
Patterson de Souza*	PhD (Int.)	2006	Process monitoring and quality assurance of manufacture of Cachaça	Z. Cardeal, P.J. Marriott
Paul Stevenson*	PhD	2007	Separation and Selectivity of Phenyl-type Stationary Phases	R.A. Shalliker, G.R. Dennis
Boon Kim Tan	MSc	2008	Profiling of the Danshen Herb by using LC/MS, LC-NMR and GCxGC/MS methods	P.J. Marriott, E. Pang C.G. Li, S. Urban
Jonathan Thabano*	PhD	2005	Multidimensional electroseparation systems for the analysis of complex biological samples	M.C. Breadmore, P.R. Haddad
Tin Cao Tran*	PhD	2005	Oil Seeps and atmospheric organics analysis	P.J. Marriott, D. Ryan, G. Logan
Juliette Tria*	PhD	2004	Ultratrace determination of aluminium in seawater and complex samples	A.R. Bowie, P.R. Haddad, P.N. Nesterenko, E.C.V. Butler
Bronwyn Wake*	PhD	2003	Selenium as a micronutrient in the Southern Ocean	A.R. Bowie, P.R. Haddad, E.C.V. Butler
Grace Wu	PhD	2009	Multidimensional LC of Surfactants	P. J. Marriott, M. Othman
Yiing Chiing Yap	MAppSci	2009	Dry film photoresist devices for bioanalysis	MC Breadmore, R.M. Guijt

COLLABORATIONS AND INDUSTRY LINKS IN 2009

Collaborator	Institution/company
Prof M. Adams, Dr S. Urban, A/Prof H. Hügel, Dr E. Pang, Dr C.G. Li	RMIT University
Dr Y. Liu, Mr C.A. Pohl, Dr K. Flook, Mr D. Moore, Dr J. Schibler, Dr P. Jackson, Dr J. Madden, Dr K. Srinivasan, Dr X. Liu	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'Océanologie de Marseille, France
A/Prof S. Bon	University of Warwick, UK
Dr M. Boyce	Edith Cowan University
Dr P. Boyd	National Institute of Water and Atmospheric research, New Zealand
Prof J.T. Brenna	Cornell University, N.Y. USA
Dr E.C.V. Butler	CSIRO Marine & Atmospheric Research
Prof A.J. Canty, Dr T.W. Lewis, Dr A.J. Seen, Dr J.A. Smith	School of Chemistry, University of Tasmania
Prof Z. Cardeal	UFMG, Brazil
Dr A. Carew	Centre, Advancement of Learning and Teaching, University of Tasmania
Dr P. Castignolles	University of Mainz, Germany
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
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
Ms S. Dixon, Dr N. Speers	National Science, Security and Technology Unit of Prime Minister and Cabinet
Dr T. Dickson, Dr A. King	Menzies Research Institute, University of Tasmania
Dr M. Ellwood	Australian National University, Australia
Prof A. Felinger	University of Pecs, Hungry
Dr G. Frysinger	U.S. Coast Guard Academy
Dr M. Gaborieau	Max Planck Institute for Polymers, Mainz, Germany
Dr A. Goldstein	University of California, Berkeley

Collaborator	Institution/company
Dr F. Gritti and Prof G. Guiochon	University of Tennessee, USA
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
Mr R. Hayes, Mr J. Pearson, Mr J. Kelleher	Victorian Police
Dr A. Henderson	School of Engineering, University of Tasmania
Dr G.A. Jacobson, Dr C. Narkowicz	School of Pharmacy, University of Tasmania
Mr B. Jones	Australian Customs Service
Dr M. Jones	School of Zoology, University of Tasmania
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 B.C. Lin, Prof G.W. Xu	Dalian Institute for Chemistry Physics, China
Prof J.M. Lin	Tsinghua University, China
Dr G. Logan, Dr E Grosjean	Geoscience Australia
Dr M. Lohan	University of Plymouth, UK
Prof P. Lopez-Mahia	University of A Coruña, Spain
Dr M. Macka, A/Prof B. Paull	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	Pfizer
Dr M. Manefield	Environmental Biotechnology Cooperative Research Centre, University of New South Wales
Mr R. Minett, Mr M. Klee	Agilent Technologies
Prof L. Mondello, Prof P. Dugo, Prof G. Dugo, Dr P. Tranchida	University of Messina, Italy
Dr C. von Muehlen	Feevale University, Brazil
Dr K.C. Ng, Ms J. Tong	Singapore Polytechnic, Singapore
Mr M. Pedler	Department of Infrastrucutre (DOTARS)

COLLABORATIONS AND INDUSTRY LINKS IN 2009

Collaborator	Institution/company
Dr P. Pigou	Forensic Science Services South Australia
Dr S. Powell, A/Prof S. Shabala	School of Agricultural Science, University of Tasmania
Dr S. Pyecroft	Department of Primary Industries, and Water(DPIW)
Dr S. Rintoul	CSIRO Marine & Atmospheric Research
Dr A. Ritar	TAFI, University of Tasmania
Dr T. Rodemann, Dr A. Townsend	Central Science Laboratories, University of Tasmania
Dr A. Ross	National Institute for Forensic Science
Dr V. Schoemann	Université Libre de Bruxelles. Belgium
Dr P. Sedwick	Bermuda Institute of Ocean Sciences
Dr S. Smith	Waters Corp, UK
Dr I. Snape, Dr M. Riddle, Dr S. Ferguson	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
Dr D. Xiao	Sichuan University, China
Prof F. Zhu	Foshan University
Prof C. Zini	UFRGS, Brazil


Counter-Terrorism

PUBLICATIONS

Books and book chapters

A.R. Bowie and M.C. Lohan. Chapter 12: Analysis of Iron in Seawater in *Practical Guidelines for the Analysis of Seawater*, Wurl O. (ed.), Taylor and Francis, Boca Raton (USA), 2009, 235-257.

R.A, Shellie. Chapter 9: Volatile Components of Plants, Essential Oils, and Fragrances in Wilson and Wilson's *Comprehensive Analytical Chemistry, Vol.55*, L. Ramos (ed.), Elsevier, Amsterdam, 2009, 189-213.

Refereed journal articles

J.L. Adcock, M. Adams, B.S. Mitrevski and P.J. Marriott. Peak modeling approach to accurate assignment of first-dimension retention times in comprehensive two-dimensional chromatography. *Anal. Chem.* 81 (2009) 6797-6804.

A.T. Aranas, A.M. Guidote Jr. and J.P. Quirino. Sweeping and new on-line sample preconcentration techniques in capillary electrophoresis. *Anal. Bioanal. Chem.* 394 (2009) 175-185.

F. Begnaud, C. Debonneville, J.P. Probst, A. Chaintreau, P.D. Morrison, J.L. Adcock and P.J. Marriott. Effects of variation in modulator temperature during cryogenic modulation in comprehensive two-dimensional gas chromatography. *J. Sep. Sci.* 32 (2009) 3144 – 3151.

A.R. Bowie, D. Lannuzel, T.A. Remenyi, T. Wagener, P.J. Lam, P.W. Boyd, C. Guieu, A.T. Townsend and T.W. Trull. Biogeochemical iron budgets of the Southern Ocean south of Australia: Decoupling of iron and nutrient cycles in the subantarctic zone by the summertime supply. *Global Biogeochemical Cycles* 23 (2009).

M.C. Breadmore. Electrokinetic and hydrodynamic injection: making the right choice for capillary electrophoresis. Bioanalysis 1 (2009) 889-894.

M.C. Breadmore, J.P. Quirino and W. Thormann. High-resolution computer simulations of EKC. *Electrophoresis* 30 (2009) 570-578.

M.C. Breadmore, J.R.E. Thabano, M.D.Z. Dawod, A.A. Kazarian, J.P. Quirino and R.M. Guijt. Recent advances in enhancing the sensitivity of electrophoresis and electrochromatography in capillaries and microchips (2006-2008). *Electrophoresis* 30 (2009) 230-248.

Z.L. Cardeal and P.J. Marriott. Comprehensive two-dimensional gas chromatography- mass spectrometry analysis and comparison of volatile organic compounds in Brazilian cachaca and selected spirits. *Food Chem.* 112 (2009) 747-755.

T.J. Causon, R.A. Shellie and E.F. Hilder. High temperature liquid chromatography with monolithic capillary columns and pure water eluent. *Analyst* 134 (2009) 440-442.

R.H.F. Cheung, J.G. Hughes, P.J. Marriott and D.M. Small. Investigation of folic acid stability in fortified instant Asian noodles by use of capillary electrophoresis. *Food Chem.* 112 (2009) 507-514.

M.D.Z. Dawod, M.C. Breadmore, R.M. Guijt and P.R. Haddad. Counter-flow electrokinetic supercharging for the determination of non-steroidal anti-inflammatory drugs in water samples. *J. Chromatogr. A* 1216 (2009) 3380-3386.

C.J. Evenhuis and P.R. Haddad. Joule heating effects and the experimental determination of temperature during CE. *Electrophoresis* 30 (2009) 897-909.

A. Ghanem, M.N. Aboul-Enein, A. El-Azzouny and M.F. El-Behairy. Solvent versatility of immobilized amylase and cellulose-based chiral stationary phases in enantioselective LC separation and monitoring of bio-catalyzed resolutions of acidic drugs in non-standard organic solvents. *Chromatographia* 70 (2009) 349-363.

E. Gillespie, D. Connolly, P.N. Nesterenko and B. Paull. On-column titration and investigation of metal complex formation for aminopolycarboxylate functionalised monoliths using scanning contactless conductivity detection. *J. Sep. Sci.* 32 (2009) 2659-2667.

A. Gömann, J.A. Deverell, K.F. Munting, R.C. Jones, T. Rodemann, A.J. Canty, J.A. Smith and R.M. Guijt. Palladium-mediated organic synthesis using porous polymer monolith formed in situ as a continuous catalyst support structure for application in microfluidic devices. *Tetrahedron* 65 (2009) 1450-1454.

R.M. Guijt, E. Candish and M.C. Breadmore. Dry film microchips for miniaturised separations. *Electrophoresis* 30 (2009) 4219-4224.

V. Hruska, C.J. Evenhuis, R.M. Guijt, M. Macka, B. Gas, P.J. Marriott and P.R. Haddad. Determination of the surface heat-transfer coefficient in CE. *Electrophoresis* 30 (2009) 910-920.

C.A. Johns, M.C. Breadmore, M. Macka, M. Ryvolová and P.R. Haddad. Recent significant developments in detection and method development for the determination of inorganic ions by CE. *Electrophoresis* 30 (2009) S53-S67.

C.A. Johns, R.A. Shellie, C.A. Pohl and P.R. Haddad. Two-dimensional ion chromatography using tandem ion-exchange columns with gradient-pulse column switching. *J. Chromatogr. A* 1216 (2009) 6931-6937.

K.F. Johns, M.C. Breadmore, R. Bruno and P.R. Haddad. Evaluation of Peakmaster for computer-aided multivariate optimisation of a CE separation of 17 antipsychotic drugs using minimal experimental data. *Electrophoresis* 30 (2009) 839-847.

R.C. Jones, A.J. Canty, J.A. Deverell, M.G. Gardiner, R.M. Guijt, T. Rodemann, J.A. Smith and V.A. Tolhurst. Supported palladium catalysis using a heteroleptic 2-methylthiomethylpyridine–N,S–donor motif for Mizoroki–Heck and Suzuki–Miyaura coupling, including continuous organic monolith in capillary microscale flow-through mode. *Tetrahedron* 65 (2009) 7474-7481.

W. Khummueng and P.J. Marriott. The nomenclature of comprehensive two-dimensional gas chromatography: Defining the modulation ratio (M-R). *LC-GC Europe* 22(2009) 38-43.

S.S. Kubyshev, T.I. Tikhomirova, D.O. Varlamova, A.V. Ivanov and P.N. Nesterenko. Sorbent based on alumina modified with pyrocatechol violet. *Moscow University Chemistry Bulletin* 64 (2009) 83-86.

C.G. Li, S.J. Sheng, E.C.K. Pang, P.J. Marriott, B. May, S. Zhou, D. Story and C.C.L. Xue. Cultivar Variations of Australian-Grown Danshen (Salvia miltiorrhiza): Bioactive Markers and Root Yields. *Chemistry and Biodiversity* 6 (2009) 170-181.

P.J. Marriott, G.T. Eyres and J.P. Dufour. Emerging Opportunities for Flavor Analysis through Hyphenated Gas Chromatography. *Journal of Agricultural and Food Chemistry* 57 (2009) 9962-9971.

P.J. Marriott, G.T. Eyres, S. Urban and C. Rühle. Microfluidic valve geometries and possibilities for flow switching in gas chromatography. Proceedings, Biomedical Applications of Micro- and Nanoengineering IV and Complex Systems; Melbourne, VIC. D.V. Nicolau, G. Metcalf (eds.), 9-12 Dec 2008. Proceedings of SPIE Vol 7270, pp 72700G-1 – 72700G-11 ISSN: 16057422; ISBN: 978-081947522-0. DOI: 10.1117/12.814896.

P. van der Merwe, D. Lannuzel, C.A. Mancuso Nichols, K. Meiners, P. Heil, L. Norman, D. Thomas and A.R. Bowie. Biogeochemical observations during the winter-spring transition in East Antarctic sea ice: evidence of iron and exopolysaccharide controls. *Marine Chemistry* 115 (2009) 163-175.

B. Mitrevski, K. Kouremenos and P.J. Marriott. Accelerating analysis for metabolomics, drugs and their metabolites in biological samples using multidimensional methods in gas chromatography. *Bioanalysis* 1 (2009) 367-391.

E.P. Nesterenko, P.N. Nesterenko and B. Paull. Zwitterionic ion-exchangers in ion chromatography: A review of recent developments. *Anal. Chim. Acta* 652 (2009) 3-21.

A.M. Nguyen, A. Nordborg, A. Shchukarev and K. Irgum. Thermally induced dissolution/precipitation – A simple approach for the preparation of macroporous monoliths from linear aliphatic polyamides. *J. Sep. Sci.* 32 (2009) 2619-2628.

A.M.M. Nordborg, B. Zhang, X.Z. He, E.F. Hilder and P.R. Haddad. Characterization of monoclonal antibodies using polymeric cation exchange monoliths in combination with salt and pH gradients. *J. Sep. Sci.* 32 (2009) 2668-2673.

A.M.M. Nordborg and E.F. Hilder. Recent advances in polymer monoliths for ion-exchange chromatography. *Anal. Bioanal. Chem.* 394 (2009) 71-84.

M. O'Toole, L. Barron, R. Shepherd, B. Paull, P.N. Nesterenko and D. Diamond. Paired emitter-detector diode detection with dual wavelength monitoring for enhanced sensitivity to transition metals in ion chromatography with post-column reaction. *Analyst* 134 (2009) 124-130.

C.P. Palmer. Recent progress in the use of ionic polymers as pseudostationary phases for electrokinetic chromatography. *Electrophoresis* 30 (2009) 163-168.

G. Palmeri, G.M. Turchini, P.J. Marriott, P.D. Morrison, S.S. De Silva. Biometric, nutritional and sensory characteristic modifications in farmed Murray cod (*Maccullochella peelii peelii*) during the purging process. *Aquaculture* 287 (2009) 354-360.

J.P. Quirino and P.R. Haddad. Neutral analyte focusing by micelle collapse in partial-filling MEKC with UV and ESI-MS detection. *Electrophoresis* 30 (2009) 1670-1674.

J.P. Quirino. Analyte focusing by micelle collapse in CZE: Nanopreparation of neutrals. *Electrophoresis* 30 (2009) 875-882.

J.P. Quirino. Micelle to solvent stacking of organic cations in capillary zone electrophoresis with electrospray ionization mass spectrometry. *J. Chromatogr. A* 1216 (2009) 294-299.

C. Ruehle, G.T. Eyres, S. Urban, J.P. Dufour, P.D. Morrison, and P.J. Marriott. Multiple component isolation in preparative multidimensional gas chromatography with characterisation by mass spectrometry and nuclear magnetic resonance spectroscopy. *J. Chromatogr. A* 1216 (2009) 5740-5747.

K.C. Saunders, A. Ghanem, W.B. Hon, E.F. Hilder and P.R. Haddad. Separation and sample pre-treatment in bioanalysis using monolithic phases: A review. *Anal. Chim. Acta* 652 (2009) 22-31.

R.A. Shalliker. Two-dimensional HPLC analysis of oligostyrenes: Comprehensive and online heart-cutting techniques. *J. Sep. Sci.* 32 (2009) 2903-2911.

R.A. Shalliker and G. Guiochon. Understanding the importance of the viscosity contrast between the sample solvent plug and the mobile phase and its potential consequence in two-dimensional high-performance liquid chromatography. *J. Chromatogr. A* 1216 (2009) 787-793.

R.A. Shellie, S.D.H. Poynter, J. Li, J.L. Gathercole, S.P. Whittock and A. Koutoulis. Varietal characterization of hop (*Humulus lupulus* L.) by GC-MS analysis of hop cone extracts. *J. Sep. Sci.* 32 (2009) 3720-3725.

P.P. de Souza, Z. De L. Cardeal, R. Augusti, P.D. Morrison and P.J. Marriott. Determination of volatile compounds in Brazilian distilled cachaca by using comprehensive two-dimensional gas chromatography and effects of production pathways. *J. Chromatogr. A* 1216 (2009) 2881-2890.

PUBLICATIONS

P.G. Stevenson, A. Soliven, G.R. Dennis and R.A. Shalliker. Phenyl-type and C1 stationary phases for environmentally friendlier chromatography. *J. Sep. Sci.* 32 (2009) 3880-3889.

J.R.E. Thabano, M.C. Breadmore, J.P. Hutchinson, C.A. Johns and P.R. Haddad. Silica nanoparticle-templated methacrylic acid monoliths for in-line solid-phase extraction–capillary electrophoresis of basic analytes. *J. Chromatogr. A* 1216 (2009) 4933-4940.

W. Thormann, J. Caslavska, M.C. Breadmore and R.A. Mosher. Dynamic computer simulations of electrophoresis: Three decades of active research. *Electrophoresis* 30 (2009) S16-S26.

T.I. Tikhomirova, S.S. Kubyshev, A.V. Ivanov and P.N. Nesterenko. Sorbent based on aluminum oxide modified with Tiron. Russ. *J. Phys. Chem. A.* 83 (2009) 1208-1211.

A.T. Townsend, I. Snape, A.S. Palmer and A.J. Seen. Lead isotopic signatures in Antarctic marine sediment cores: A comparison between 1 M HCl partial extraction and HF total digestion pre-treatments for discerning anthropogenic inputs. *Science of the Total Environment* 408 (2009) 382-389.

É. Tyrrell, R.A. Shellie, E.F. Hilder, C.A. Pohl and P.R. Haddad. Fast ion chromatography using short anion exchange columns. *J. Chromatogr. A* 1216 (2009) 8512-8517.

P. Zakaria, G.W. Dicinoski, B.K. Ng, R.A. Shellie, M. Hanna-Brown and P.R. Haddad. Application of retention modelling to the simulation of separation of organic anions in suppressed ion chromatography. *J. Chromatogr. A* 1216 (2009) 6600-6610.

Other publications

M.C. Breadmore, E. Candish and R.M. Guijt. Dry film photoresist. Saving time and money without compromising on performance. Refereed conference paper presented at *μTAS 2009 - 13th International Conference on Miniaturized Systems for Chemistry and Life Sciences*, Jeju, Korea, 1-5 November 2009, 1593-1595.

B.O. Clarke, N.A. Porter, R.K. Symons, P.J. Marriott, P.K. Ades, G.J. Stevenson and J.R. Blackbeard. Response to "Provisional human health risk assessment of PBDEs in sewage sludge used for agricultural purposes" by Marek Banasik et al. *Chemosphere* 77 (2009) 702-703.

A. Henderson, M. Guijt, M.C. Breadmore, A. Carew and R.M. Guijt. Honour thesis assessment: the role of guidelines in achieving inter-rater agreement. Refereed conference paper presented at *AAEE2009 - 20th Australasian Association for Engineering Education Conferenc*e, University of Adelaide, 6-9 December 2009, 185-192.

C. Johns, J.P Hutchinson, M.C. Breadmore, R.M. Guijt, E.F Hilder, G.W. Dicinoski, P.R. Haddad, Profiling the chemical composition of explosives, *Chem. in Aust.* 76 (2009) 30-34.

Plenary, keynote and invited conference presentations

A.R. Bowie. The Australian SAZ-Sense study of the sensitivity of the Sub-Antarctic Zone to climate change: the importance of biogeochemical iron budgets. *Inaugural Australian National Network in Marine Science Conference (ANNiMS)*, Hobart, Australia, 1-2 December 2009.

M.C. Breadmore, M.D.Z. Dawod, R.M. Guijt and P.R. Haddad, From 0 to 100,000 in 20 min: Improving sensitivity through Isotachophoretic stacking with a counter-flow. *92nd Canadian Chemistry Conference and Exhibition*, Hamilton, Ontario, Canada, 30 May – 3 June 2009.

M.D.Z. Dawod, M.C. Breadmore, R.M. Guijt and P.R. Haddad. Electrophoretic separation and on-line concentration of hypolipidaemic drugs by CE-MS and CE. *9th Asian-Pacific International Symposium on Microscale Separations and Analysis (APCE 2009) and 1st Asian-Pacific International Symposium on Lab on Chip (APLOC 2009)*, Shanghai, China, 28-31 October 2009.

G.W. Dicinoski, P.R. Haddad, E.F. Hilder, M.C. Breadmore, R.A. Shellie, R.M. Guijt, J.P. Hutchinson, C.A. Johns, E.C. Tyrrell, R.A. Shalliker. How do we identify the chemical composition of improvised explosives? *2nd International Conference and workshops on basic and applied sciences & regional annual fundamental science seminar 2009*, Johor Bahru, Malaysia, 2-4 June 2009.

G.W. Dicinoski, E.F. Hilder, M.C. Breadmore, R.A. Shellie, R.M. Guijt, J.P. Hutchinson, C.A. Johns, E.C. Tyrrell and P.R. Haddad. Ion chromatography and capillary electrophoresis for identification of improvised inorganic explosives used in terrorist attacks. A comparison of two techniques. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

G.W. Dicinoski, M. Kaykhaii, R. Smedley and P.R. Haddad. Solid-phase micro-extraction – ion chromatography (SPME-IC) for the trace analysis of environmental anions. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

R.M. Guijt, E. Candish, J. Armstrong, W.J. Percey, Y. Chiing and M.C. Breadmore. Making high-resolution devices on a small budget. *9th Asian-Pacific International Symposium on Microscale Separations and Analysis (APCE 2009) and 1st Asian-Pacific International Symposium on Lab on Chip (APLOC 2009)*, Shanghai, China, 28-31 October 2009.

R.M. Guijt. Lab on a chip, applications and budget strategies. *APSA 2009 – Australasian Pharmaceutical Science Association Annual Conference & Aus-CRS Symposium*, Hobart, Australia, 9-11 December 2009.

P.R. Haddad, E.F. Hilder, A. Ghanem, W.B. Hon, L. Mauko, A. Nordborg, N. Lacher and K. Saunders. Polymeric monolithic stationary phases for separation and solid-phase extraction in pharmaceutical analysis. ISOPS 2009 – *9th International Symposium on Pharmaceutical Sciences*, Ankara, Turkey, 23-26 June 2009.

P.R. Haddad, G.W. Dicinoski, E.F. Hilder, M.C. Breadmore, R.A. Shellie, R.M. Guijt, J.P. Hutchinson, C.A. Johns and E.C. Tyrrell. Pre- and post-blast identification of improvised inorganic explosives by capillary electrophoresis and ion chromatography. HPLC 2009 – *34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

P.R. Haddad, G.W. Dicinoski, E.F. Hilder, M.C. Breadmore, R.A. Shellie, R.M. Guijt, J.P. Hutchinson, C.A. Johns and E.C. Tyrrell. Development of portable separation methods for the identification of terrorist explosives by analysis of inorganic residues. *Separation Science Singapore*, Singapore, 26-28 August 2009.

P.R. Haddad, E.F. Hilder, D. Schaller, C. Pohl, C.J. Evenhuis, A. Ghanem, W.B. Hon and K. Saunders. Synthesis and applications for polymer monoliths for ion-exchange and mixed-mode separations of small molecules. *8th Balaton Symposium on High-Performance Separation Methods and 15th International Symposium on Separation Sciences*, Siófok, Hungary, 2-4 September 2009.

P.R. Haddad. The Pfizer Analytical Research Centre: A case study of a university-industry collaboration across three continents. *APSA 2009 – Australasian Pharmaceutical Science Association Annual Conference & Aus-CRS Symposium*, Hobart, Australia, 9-11 December 2009.

E.F Hilder, D. Schaller, T.J. Causon, M. Thomas, R.A. Shellie and P.R. Haddad. Improving the performance of polymer monoliths for the separation of small molecules, *33rd International Symposium on Capillary Chromatography & Electrophoresis*, Portland, OR, USA, 19-21 May 2009.

E.F. Hilder, D. Schaller, T.J. Causon, R.A. Shellie, S.A.F. Bon, C.J. Evenhuis, P.R. Haddad and C.A. Pohl. Improving the performance of polymer monoliths for the separation of small molecules. *HPLC 2009 – 34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

E.F. Hilder, T.J. Causon, A.M.M. Nordborg and R.A. Shellie. Organic polymer monoliths as temperature stable stationary phases for high temperature separations of intact proteins and peptides. *Separation Science Singapore*, Singapore, 26-28 August 2009.

E.F. Hilder, D. Schaller, C.J. Evenhuis, P.N. Nesterenko and P.R. Haddad. Scanning contactless conductivity measurements for quality assessment of monolithic columns. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

E.F. Hilder, A.M.M. Nordborg, M. Talebi, P.R. Haddad, B. Zhang and J. Wang. High performance ion-exchange phases for the separation of therapeutic proteins and oligonucleotides. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

E.F. Hilder, C.P. Palmer and P.R. Haddad. Amphiphilic RAFT nanoparticles as a pseudostationary phase for electrokinetic chromatography. *24th International Symposium on Microscale Bioseperations*, Dalian, China, 19-22 October 2009.

E.F. Hilder, A. Nordborg, M. Talebi, P.R. Haddad, B. Zhang and J. Wang. High performance ion-exchange phases for the separation of therapeutic proteins and oligonucleotides. *24th International Symposium on Microscale Bioseperations*, Dalian, China, 19-22 October 2009.

E.F. Hilder. Polymeric monolithic stationary phases based on photografting or nanoparticle coatings. *17th Annual RACI Research and Development Topics in Analytical & Environmental Chemistry*, Gold Coast, Australia, 6-9 December 2009.

P.J. Marriott, T. Tran and B. Mitrevski. Studies in comprehensive two-dimensional gas chromatography / mass spectrometry. *ANZSMS22 Biennial Mass Spectrometry Conference*, Sydney, Australia, 27-30 January 2009.

P.J. Marriott, B.K. Tan, K. Kouremenos, B. Maikhuntod and K. Samykanno. Ambling through Aromas: Headspace Analysis of Plant Materials by Using Comprehensive Two-Dimensional Gas Chromatography. *6th GC×GC Symposium*, Portland, USA, 16-21 May 2009.

P.J. Marriott. Micro-scale preparatory multidimensional capillary gas chromatography with NMR spectroscopy: Spectacular Separations with Scintillating Spectroscopies. *33rd ISCCE Symposium*, Portland, USA, 16-21 May 2009.

P.J. Marriott. Micro-scale preparatory multidimensional capillary gas chromatography with NMR spectroscopy. *Korean Pharmaceutical Society*, Wong Kwong University, Korea, July 2009.

P.J. Marriott. Singapore International Conference on Green and Sustainable Chemistry. *ICGSC SNIC Symposium*, 3-5 August 2009.

P.J. Marriott, B.K. Tan, C. Kouremenos, B. Maikhunthod, K. Samykanno and H.K. Choi. Headspace analysis of plant materials by using comprehensive two-dimensional gas chromatography: *Selected examples. Separation Science Singapore*, Singapore, 26-28 August 2009.

P.J. Marriott. Multidimensional capillary GC with MS and NMR Spectroscopy: Tools of the chemical characterization trade. *8th Balaton Symposium on High-Performance Separation Methods and 15th International Symposium on Separation Sciences*, Siófok, Hungary, 2-4 September 2009.

P.J. Marriott. Comprehensive and multidimensional GC with mass spectrometry for natural product analysis, including innovative approaches to MDGC-NMR spectroscopy for improved chemical characterisation. *Univesiti Sains Malaysia (USM)*, Department of Chemistry, Malaysia, 9 October 2009.

PUBLICATIONS

P.J. Marriott. Opportunities for improved analysis of fatty acids by using advanced gas chromatographic methodologies. Oil Crops Research Institute, *Chinese Academy of Agricultural Sciences International Seminar on Progress of Analysis on Agro-food Quality and Safety*, Wuhan, China, 27 November – 5 December 2009.

P.N. Nesterenko, J. Tria and P.R. Haddad. Direct determination of aluminium in seawater by high performance chelation ion chromatography. *CIA 2009*, Berlin, Germany, 2-4 March 2009.

P.N. Nesterenko. Chromatographic methods for determination of metal traces in seawater. *7th All Russian Conference on Analysis of Environmental Samples - EcoAnalytica*, Yoshkar-Ola, Russia, 21-27 June 2009.

P.N. Nesterenko. Diamond related materials as a new type of stationary phase in liquid chromatography. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

P.N. Nesterenko, J. Tria, P.R. Haddad, T. Remenyi, A.R. Bowie and E.C.V. Butler. Determination of aluminium in seawater by high performance chelation ion chromatography. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

J.P. Quirino and P.R. Haddad. On-line Sample Preconcentration using Analyte Focusing by Micelle Collapse. *Nordic Separation Science Society Symposium*, Tallin, Estonia, September 2009.

R.A. Shalliker and G. Guiochon. Understanding the importance of the column bed heterogeneity and the viscosity contrast between the sample solvent plug and the mobile phase and the consequence for solute elution profiles. *HPLC 2009 – 34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

R.A. Shellie. Enantio-GCxGC. *32nd International Symposium on Capillary Chromatography and Electrophoresis*, Portland, USA, 17-21 May 2009.

R.A. Shellie. One- and two-dimensional GC-MS for hop metabolomics. *Separation Science Singapore*, Singapore, 26-28 August 2009.

R.A. Shellie. Enhanced peak capacity in ion chromatography using gradient elution and multidimensional separations. *13th International Beijing Conference and Exhibition on Instrumental Analysis*, Beijing, China, 25-28 November 2009.

R.A. Shellie. Enhanced peak capacity in ion chromatography using gradient elution and multidimensional separations. *ACROSS Mini-Symposium on Aspects of Multidimensional Chromatography*, Hobart, Australia, 30 November 2009.

A. Soliven, G.R. Dennis, E.F. Hilder, G. Guiochon, P.R. Haddad and R.A. Shalliker. Derivatisation of silica monoliths using cyano-propyl silane: A description of a process for coating and re-coating. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

E.C. Tyrrell, G.W. Dicinoski, E.F. Hilder, R.A. Shellie, M.C. Breadmore, R.A. Shalliker, C.A. Pohl, X. Liu and P.R. Haddad. Development of a chromatographic detection system for pre-blast identification of inorganic and organic based improvised explosive devices. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

Other conference presentations

J.L. Adcock and P.J. Marriott. First dimension peak retention modeling in comprehensive two-dimensional gas chromatography. *6th GC×GC Symposium*, Portland, USA, 16-21 May 2009.

M. Boye, H. de Baar, A.R. Bowie, U. Bathmann, D. Cardinal, E. Murphy and P. Treguer. An overview of the biogeochemical features of the Southern Ocean during the International Polar Year. *ASLO 2009 Aquatic Sciences Meeting*, Nice, France, 25-30 January 2009.

M. Boye, H. de Baar, A.R. Bowie, P. Masque, F. Dehairs, M. Rutgers van der Loeff, E.C.V. Butler, A. Tovar-Sanchez, P. Croot and J. Nishioka. GEOTRACES in the International Polar Year: an overview. *ASLO 2009 Aquatic Sciences Meeting*, Nice, France, 25-30 January 2009.

A.R. Bowie, M. Boye, H. de Baar, U. Bathmann, D. Cardinal, E. Murphy and P. Treguer. An overview of the biogeochemical features of the Southern Ocean during the International Polar Year. *Gordon Research Conference: Polar Marine Science - Beyond IPY: Crossing Boundaries*, Lucca, Italy, 15-20 March 2009.

A.R. Bowie, D. Lannuzel, T.A. Remenyi, T. Wagener, P. Lam, P.W. Boyd, C. Guieu, A.T. Townsend, T.W. Trull and B. Griffiths. SAZ-Sense Team; Different processes drive biogeochemical iron budgets in the subantarctic and polar Southern Ocean. *Gordon Research Conference: Polar Marine Science - Beyond IPY: Crossing Boundaries*, Lucca, Italy, 15-20 March 2009.

A.R. Bowie, D. Lannuzel, T.A. Remenyi, T. Wagener, P. Lam, P.W. Boyd, C. Guieu, A.T. Townsend, T.W. Trull and B. Griffiths. SAZ-Sense Team; Different processes drive biogeochemical iron budgets in the subantarctic and polar Southern Ocean. *2nd International Forum on the Sub-Antarctic (IFSA), Environmental Change in the Sub-Antarctic*, Hobart, Australia, 26-27 April 2009.

M.C. Breadmore, E. Candish and R.M. Guijt. Dry film photoresist: Saving time and money without compromising on performance. *μTAS 2009 – 13th International Conference on Miniaturized Systems for Chemistry and Life Sciences*, Jeju, Korea, 1-5 November 2009.

M.C. Breadmore, E. Candish and R.M. Guijt. Dry film photoresist: Saving time and money without compromising on performance. *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

J.T. Brenna, Y. Zhang, H.J. Tobias, G.L. Sacks, B.S. Mitrevski and P.J. Marriott. Urinary steroidomics by comprehensive two dimensional gas chromatography-TOFMS (2D GC×GC-TOFMS) and isotope ratio mass spectrometry (IRMS). Instrumentation and application to sports antidoping. *ASMS 2009. Sanibel Meeting, Lipidomics and Lipids in Mass Spectrometry*, TradeWinds Island Grand Hotel, St. Petersburg Beach FL, USA, 23-26 January 2009.

S.S. Brudin, R.A. Shellie and P.J. Schoenmakers. Analysis of low molecular mass organic acids using multidimensional liquid chromatography. *HPLC 2009 – 34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

T.J. Causon, R.A. Shellie and E.F. Hilder. High temperature liquid chromatography using organic polymeric monolithic columns. *33rd International Symposium on Capillary Chromatography & Electrophoresis*, Portland, OR, USA, 19-21 May 2009.

T.J. Causon, E.F. Hilder and R.A. Shellie. Understanding performance improvements for liquid chromatography: Limitations and solutions for ion chromatography. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

S.T. Chin and P.J. Marriott. Specific analysis of sulphur and phosphorous compounds by comprehensive bidimensional gas chromatography coupled to flame photometric detection. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

B.O. Clarke, N. Porter, J. Blackbeard, R. Symons and P.J. Marriott. Persistent organic pollutants in Australian biosolids. *Division of Environmental Chemistry for the 238th ACS National Meeting*, Washington DC, USA 16-20 August 2009.

G.W. Dicinoski, P.R. Haddad, P.J. Zakaria, R.A. Shellie, M. Hanna-Brown and C.A. Pohl. Rapid computerised method development for the separation simulation of pharmaceutically related compounds using ion-exchange chromatography. *HPLC 2009 – 34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

G.W. Dicinoski, N. Karu, P.R. Haddad and M. Hanna-Brown. Multiple approaches for non-chromophoric pharmaceutical detection. *HPLC 2009 – 34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

A. Eltmimi, A. Rafferty, P.N. Nesterenko, L. Barron, J. Hanrahan and B. Paull. Gold modified carbon monolithic columns for chromatographic applications. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

X. Gao, X. Yang and P.J. Marriott. Simultaneous analysis of seven alkaloids in Zuojin pill formula by using ultra performance liquid chromatography with accelerated solvent extraction. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

J.L. Gathercole, J. Li, R.A. Shellie, M.C. Breadmore, E.F. Hilder, S.B. Pyecroft and N.K. Fox. GC-MS metabolite profiling as a preclinical diagnostic test for Tasmanian devil facial tumour disease. *33rd International Symposium on Capillary Chromatography & Electrophoresis*, Portland, OR, USA, 19-21 May 2009.

J.L. Gathercole, J. Li, R.A. Shellie, M.C. Breadmore, E.F. Hilder, N.K. Fox and S.B. Pyecroft. How can chemistry help the plight of the Tasmanian devil. Oral presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

P. McA. Harvey and R.A. Shellie. Design considerations for GCxGC with pulsed flow modulation (PFM): Dynamic flow model approach. *32nd International Symposium on Capillary Chromatography and Electrophoresis*, Portland, USA, 17-21 May 2009.

R.D. Henderson, R.M. Guijt, E.F. Hilder, M.C. Breadmore, P.R. Haddad, T. Lewis, G.G. Wallace, L. Dennany and P. Innis. Revolutionising Lab on a Chip: Polymer electrodes. *ACES: Electromaterials Symposium 2009 – Nanostructured electromaterials*, IC Central, University of Wollongong Innovation Campus, Squires Way, Fairy Meadow, 4-6 February 2009.

R. Hibbert, P.J. Marriott, N. Lahoutifard and P. Wynne. Structure-retention relationships on different 5% phenyl equivalent GC phases. *8th Balaton Symposium on High-Performance Separation Methods and 15th International Symposium on Separation Sciences*, Siófok, Hungary, 2-4 September 2009.

E.F. Hilder, D. Schaller, T.J. Causon, R.A. Shellie, S.A.F. Bon, C.J. Evenhuis, P.R. Haddad and C.A. Pohl. Improving the performance of polymer monoliths for the separation of small molecules. *34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques, HPLC2009*, Dresden, Germany, 28 June – 2 July 2009.

N. Kawila, P.D. Morrison, P.J. Marriott, S. Tian and D.M. Small. Current research on the formation of the toxin acrylamide during processing of cereal grain foods. *Cereals*, Wagga Wagga, Australia, September 2009.

A.A. Kazarian, E.F. Hilder, M.C. Breadmore. Investigation of new strategies to improve the sensitivity of capillary electrophoresis for carbohydrate analysis. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

PUBLICATIONS

A.R Keeffer, E.F. Hilder and C.P. Palmer. Characterization of latex nanoparticles as pseudostationary phases for electrokinetic chromatography. *33rd International Symposium on Capillary Chromatography & Electrophoresis*, Portland, OR, USA, 19-21 May 2009.

E. Kondo, P.J. Marriott and P.D. Morrison. Comprehensive analysis of yeast metabolite using orthogonal acceleration accurate mass time-of-flight mass spectrometry. *Poster presentation at 17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

K. Kouremenos, P.J. Marriott, J. Pitt and P.D. Morrison. Development of GC derivatization and separation techniques for metabolic profiling of infant urine. *6th GC×GC Sympopsium*, Portland, USA, 16-21 May 2009.

B. Maikhunthod, P.D. Morrison and P.J. Marriott. Development of a switchable comprehensive gas chromatography/multidimensional gas chromatography analysis system as an advanced separation technique. *Oral presentation at 17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

L. Mauko, A.M.M. Nordborg, N. Lacher, E.F. Hilder and P.R. Haddad. Glycan profiling of monoclonal antibodies – Comparison of ZIC-HILIC and normal phase chromatography, coupled wit CCAD, fluorescence and MS detection. Oral presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

R.W. McGifford and A.J. Seen. Application of colorimetric DGT binding phases to metal contaminant analysis. Oral presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

B. Mitrevski, P. Wilairat and P.J. Marriott. GC×GC-TOFMS improves the separation and identification of anabolic agents in doping control. *TIAFT Conference*, Geneva, Switzerland, August 2009.

M. Murillo-Tovar, O. Amador-Muñoz, R. Villalobos-Pietrini and P.J. Marriott. Selective separation of n-alkanes, PAHs and oxy-PAHs in complex organic mixtures extracted from airborne particulate matter ≤ 2.5 µm. *HPLC 2009 – 34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

Y.H. Nai, O. Zemb, M. Manefield, S.M. Powell and M.C. Breadmore. In search of sieving polymers for non denaturing capillary electrophoresis separation of ribonucleic acid. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

E.P. Nesterenko, P.N. Nesterenko, F. Lacroix and B. Paull. Micro-bore titanium housed polymer monoliths for high temperature and high pressure reversed phase liquid chromatography. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

P.N. Nesterenko, J.C. Dias, G.W. Dicinoski, L.T. Kubota and P.R. Haddad. Determination of trace metals in ethanol fuel by high-performance chelation ion chromatography with post-column reaction and photometric detection. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

B.K. Ng, R.A. Shellie, G.W. Dicinoski and P.R. Haddad. Porting data from conventional to microbore ion chromatographic systems. Oral presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

A.M.M. Nordborg, M. Talebi, B. Zhang, J. Wang, E.F. Hilder and P.R. Haddad. Polymeric monolithic ion-exchange stationary phases for the separation and purity profiling of biopharmaceuticals. *29th International Symposium & Exhibit on the Separation of Proteins, Peptides & Polynucleotides*, Florida, USA, 25-28 October 2009.

W.J. Percey, S. Shabala and R.M. Guijt. Measuring sodium flux around plant tissues. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

O.G. Potter, F. Svec, E.F. Hilder and M.C. Breadmore. Polymer monoliths for microscale boronate affinity extractions hyphenated to ESI-MS. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

J.P. Quirino, P.N. Nesterenko, D. Li and G.G. Wallace. Separation of oxidised grapheme nanosheets by capillary electrophoresis. *ACES: Electromaterials Symposium 2009 – Nanostructured electromaterials*, IC Central, University of Wollongong Innovation Campus, Squires Way, Fairy Meadow, 4-6 February 2009.

C. Ruehle and P.J. Marriott. Multiple component isolation in preparative multidimensional gas chromatography with characterisation by mass spectrometry and nuclear magnetic resonance spectroscopy. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

K. Samykanno, E. Pang and P.J. Marriott. Environmental effects on the volatile profiles of Australian strawberry varieties. Oral presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

K.C. Saunders, E.F. Hilder, W.B. Hon, A. Ghanem and P.R. Haddad. Mixed-mode porous polymer monoliths for microscale analysis of pharmaceuticals. *HPLC 2009 – 34th International Symposium on High-Performance Liquid Phase Separations and Related Techniques*, Dresden, Germany, 28 June – 2 July 2009.

R.A. Shellie. Comprehensive two-dimensional gas chromatography-quadrupole mass spectrometry with differential flow modulation. *22nd ANZSMS Conference*, Sydney, Australia, 27-30 January 2009.

P. de Souza, Z. Cardeal and P.J. Marriott. Quantitative analysis of volatile compounds in Brazilian Cachaca by using GCxGC. *33rd ISCCE Symposium*, Portland, USA, 16-21 May 2009.

B.K. Tan and P.J. Marriott. GCxGC reveals chemico-botanical classification of orchid species through aroma fingerprinting. Oral presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

B.K. Tan and P.J. Marriott. Isolation and elucidation of biomarkers in Chinese herbal medicine, Salviae miltiorrhizae (Danshen). Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

T.W. Trull, A.R. Bowie, P.W. Boyd, N. Cassar, A. Davidson, F.B. Griffiths, S.R. Rintoul, P. Thomson, B. Tilbrook and S. Wright. SAZ-Sense team; The Australian SAZ-Sense Study of the sensitivity of the Sub-Antarctic zone to Climate Change. *2nd International Forum on the Sub-Antarctic (IFSA), Environmental Change in the Sub-Antarctic*, Hobart, Australia, 26-27 April 2009.

Z.Y. Wu and P.J. Marriott. Offline LC-GCxGC analysis of nonylphenol polyethoxylates. Poster presentation at *17th RACI Research and Development Topics Conference*, Goldcoast, 7-9 December 2009.

Lectures to Universities and Companies

M.C. Breadmore. Electrophoresis @ ACROSS. Dalian Institute of Chemical Physics, Dalian, China, 17 April 2009.

M.C. Breadmore. Enhancing electrophoresis through on-line concentration. Lanzhou University, Lanzhou, 21 April 2009.

M.C. Breadmore. Analytical chemistry at the University of Tasmania. Lanzhou University, Lanzhou, 21 April 2009.

M.C. Breadmore. Shedding LED light on electrophoresis. Sichuan University, Chengdu, 24 April 2009.

M.C. Breadmore. Sensitivity in electrophoresis: Fundamentals and applications. Shanghai Jiao Tong University, 27 April 2009.

M.C. Breadmore. Doing the CE limbo: How low can we go? Department of Chemistry, University of Alberta, Edmonton, Canada, 29 May 2009.

M.C. Breadmore. Doing the CE Limbo: How low can we go? Department of Chemistry, University of Virginia, Charlottesville, Virginia, USA, 9 June 2009.

G.W. Dicinoski. Software for the Simulation and Optimisation of Ion-Exchange Separations of Organic Ions – Modelling, Pfizer Global Research and Development, Sandwich, UK, 23 June 2009.

G.W. Dicinoski. Software for the Simulation and Optimisation of Ion-Exchange Separations of Organic Ions – Application, Pfizer Global Research and Development, Sandwich, UK, 24 June 2009.

E.F. Hilder. Monoliths in separation science. University of Warwick, Department of Chemistry, Coventry, UK, 28 January 2009.

E.F. Hilder. Monolithic polymers for sample preparation. Pfizer Global Research and Development, Sandwich, UK, 5 February 2009.

E.F. Hilder. Applications of polymer nanoparticles in separation science. The Molecular Foundry, E.O. Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 27 May 2009.

E.F. Hilder. Polymeric monolithic stationary phases based on photografting or nanoparticle coatings. Institute for Physical Chemistry - DFG Collaborative Research Center (SFB) 625, University of Mainz, Mainz, Germany, 25 June 2009.

E.F. Hilder. Polymeric monolithic stationary phases for LC and CE. BOKU - University of Natural Resources and Applied Life Sciences, Division of Analytical Chemistry, Vienna, Austria, 8 July 2009.

E.F. Hilder. CE Analysis in ACROSS. Agilent Technologies, R&D and Marketing, Waldbronn, Germany, 9 July 2009.

P.J. Marriott. Modular integrated comprehensive and multidimensional gas chromatography systems – designing advanced GC methods including MDGC-NMR spectroscopy. Johannes Kepler University, Linz, January 2009.

P.J. Marriott. Comprehensive and multidimensional GC with mass spectrometry for natural product analysis, including innovative approaches to MDGC-NMR spectroscopy for improved chemical characterisation. Division of Chemistry & Biological Chemistry, School of Physical & Mathematical Sciences, Nanyang Technological University, Singapore, 16 Sept 2009.

P.J. Marriott. Comprehensive and multidimensional GC with mass spectrometry for natural product analysis, including innovative approaches to MDGC-NMR spectroscopy for improved chemical characterisation. Univesiti Sains Malaysia (USM), Department of Chemistry, Penang, Malaysia, 9 October 2009.

P.J. Marriott. Comprehensive and multidimensional GC with mass spectrometry and innovative approaches to NMR spectroscopy for improved chemical characterisation. Department of Chemistry Seminar, NUS (National University of Singapore, 15 October 2009.

P.J. Marriott. Comprehensive and multidimensional GC with mass spectrometry, and innovative approaches to NMR spectroscopy for improved chemical characterisation. Tsinghua University, China, 5 December 2009.

J.P. Quirino. Strategies to improve detection sensitivity in capillary electrophoresis. Ateneo de Manila University, Quezon City, Philippines, February 2009.

J.P. Quirino. New on-line sample preconcentration techniques in capillary electrophoresis. University of Montpellier II, Montpellier, France, September 2009.

PUBLICATIONS

J.P. Quirino, EDTA modified capillary zone electrophoresis with ESI-MS detection of metal ions. University of Physical Sciences (BOKU), Vienna, Austria, September 2009

Philip Marriott,Visiting Professor
National University of Singapore, September/December 2009. Presentation of Advanced Instrumental course lectures, Research Seminar.

Philip Marriott
World Class Universities Program
Distinguished Visiting Professor, Korea Research Foundation KOSEF; Korean Organisation for Science and Education 2009. 2 month attachment to Chung-Ang University, Seoul; workshops and visiting lectures.

Workshops

G. W. Dicinoski. Introduction to modern ion chromatography – Short course. *IICS 2009 – 21st International Ion Chromatography Symposium*, Dublin, Ireland, 21-24 September 2009.

F. Svec, E.F. Hilder, M. Lee and M. Novotny. What has happened with CEC? - Panel Discussion. *33rd International Symposium on Capillary Chromatography & Electrophoresis*, Portland, USA, 19-21 May 2009.

P.J. Marriott. Applications of GCxGC – Part 2. Miscellaneous. One day GCxGC course, *33rd ISCC Symposium and 6th GCxGC Symposium*, Portland USA, 16-21 May 2009.

P.J. Marriott. Method optimisation in GCxGC. One Day GCxGC Course, *33rd ISCC Symposium and 6th GCxGC Symposium*, Portland USA, 16-21 May 2009.

P.J. Marriott. One day workshop on comprehensive and multidimensional GC, Chung-Ang University, Seoul, Korea, June 2009.

R.A. Shalliker, D.Shock and G.Guiochon, *Multidimensional HPLC workshop*, Parramatta, NSW, Australia, 24 November 2009.

ACROSS

Australian Centre for Research on Separation Science

Private Bag 75 Hobart
Tasmania Australia 7001
Telephone +61 (0) 3 6226 2179
Facsimile +61 (0) 3 6226 2858
www.across.utas.edu.au