FIRMS Forensic Isotope Ratio Mass Spectrometry Network

Iso-Topics: FIRMS Newsletter Issue: March 2017

Welcome to the FIRMS Spring 2017 newsletter. In this issue we look back at the 6th FIRMS Network conference and look forward to improvements to the FIRMS website and the publication of the second edition of the FIRMS Good Practice Guide. Don't forget to register for this years FIRMS Proficiency Testing Scheme ...

In this issue...

Steering Group News

This year the FIRMS steering group aims to provide more regular communication to its members through improved use of the FIRMS website, newsletter, email and social media. The new role of Communications Officer has been introduced to help facilitate this and Rob Posey (Food Forensics) has agreed to perform this role.

You may have already noticed that a redesign of the FIRMS logo has been completed. This will be followed during 2017 with an update, spring clean and partial redesign of the FIRMS website to ensure that it is a useful tool for FIRMS members. If you have any upcoming workshops, conferences, publications or vacancies that may be of interest to the FIRMS community, please contact news@forensic-isotopes.org.

The FIRMS Steering group currently consists of: Phil Dunn (Chair, LGC); Jim Carter (Director, Queensland Health Forensic and Scientific Services); Sean Doyle (Quality Manager, Director & Secretary, Linked Forensic Consultants Ltd); Federica Camin (IASMA); Lesley Chesson (IsoForensics); Max Coleman (NASA Jet Propulsion Laboratory); Kylie Jones (Membership Secretary, Australian Federal Police); Gerard van der Peijl (Netherlands Forensic Institute); Rob Posey (Communications Officer, Food Forensics); Helen Salouros (National Measurement Institute, Australia); Thomas Schaefer (Bundeskriminalamt); Libby Stern (FBI); David Widory (University of Quebec in Montreal) and Wee Chuan Yeo (Health Sciences Authority, Singapore).

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Faces of FIRMS

This new section will introduce you to some of the familiar and not so familiar faces from around the FIRMS network. In this issue we meet three of the founding members who have been integral to the development of the FIRMS network as we know it ...

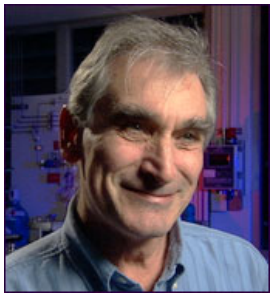
Jim Carter, Director, FIRMS Network

Jim has been involved with the FIRMS Network since its first conference and is a founding Director and the first elected Chair. He has worked with IRMS since 1991 and was closely involved in the early development of combined GC-IRMS. Jim has published over seventy peer reviewed papers based on research and innovations in analytical and forensic science and is a reviewer for a number of journals. He has worked at both the EPSRC and NERC mass spectrometry facilities in the UK and has provided expert evidence in criminal cases, using IRMS for the characterisation of drugs and drug packaging materials. Jim is currently developing IRMS methodologies with a steady eye on quality assurance and inter-laboratory comparability for the Forensic and Scientific Services in Queensland.

Sean Doyle, Director, Company Secretary and Quality Manager, FIRMS Network

Sean Doyle is a co-founder and Director of Quality of the FIRMS Network. Not only was Sean integral to the inception of FIRMS, he has played a leading role in gaining ISO9001 certification and maintaining the quality required for this standard. Sean has nearly 40 years experience of forensic practice and has served on a number of national and international bodies developing standards in forensics including the position of Head of Forensic Chemistry and Research at the Forensic Explosives Laboratory (FEL), part of the UK Ministry of Defence. Sean is currently a director of Linked Forensic Consultants Ltd, a company providing a range of forensic science related services including casework, particularly in relation to assessing the quality and reliability of scientific evidence.

Max Coleman, Founding Member, FIRMS Network



In 2000 Max was Principal Investigator for the successful EPSRC research proposal that allowed Sean and himself to establish the FIRMS network. He has more than 30 years experience of mass spectrometry, stable isotope science and technique development and has published more than 100 peer-reviewed papers. Some of his published methods are now standard analytical approaches. Max is currently Principal Scientist and Senior Research Scientist at NASA JPL, Caltech with particular interest in astrobiology, particularly mineral biosignatures. Recently, he pioneered methods and data interpretation developments in chlorine and bromine stable isotope geochemistry, relevant to understanding evaporite deposits and characterizing perchlorate for forensic purposes.

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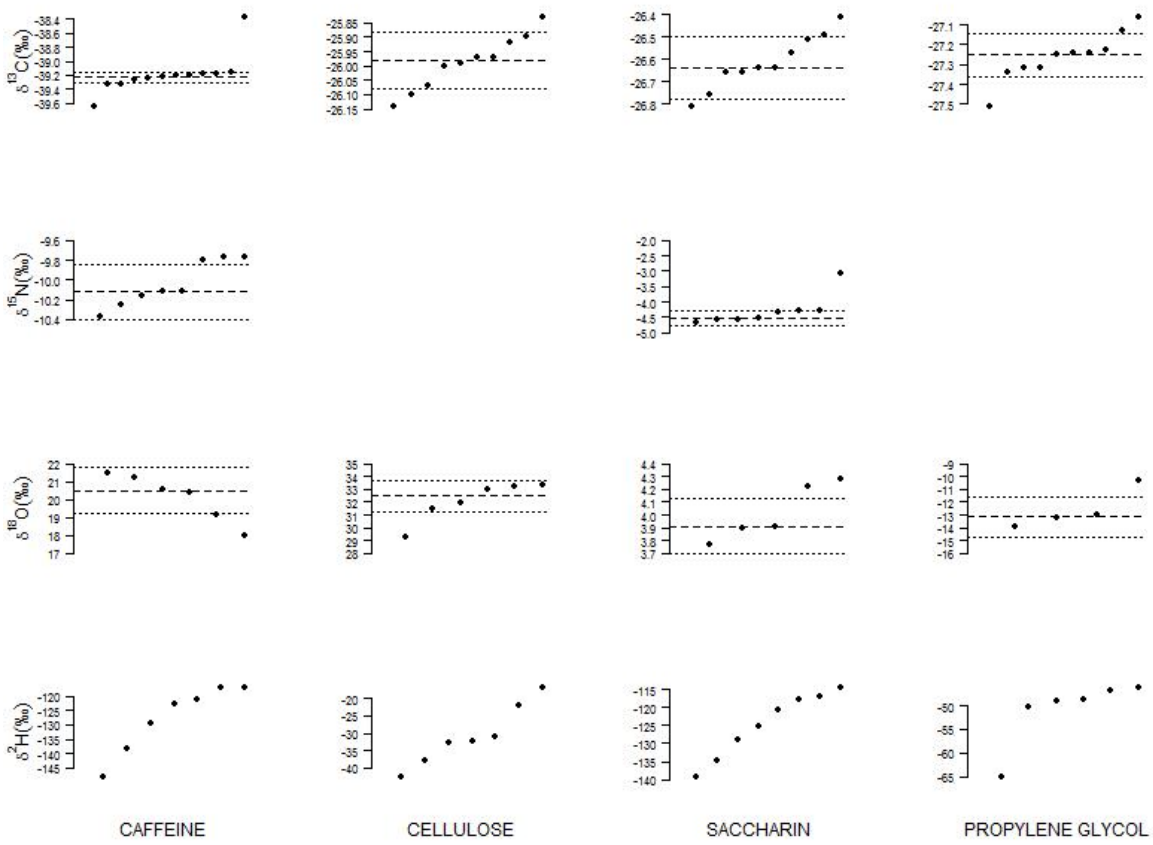
Proficiency Testing Scheme

There have been two further rounds (240 and 245) of the FIRMS PT scheme during 2016 - a summary of the results can be found below while a copy of the main report can be downloaded from the FIRMS website. This year saw a similar number of participants to 2015 with a maximum of 17 reporting results for a given analyte. Samples this year were cellulose and saccharin in round 240 and caffeine and propylene glycol in round 245. Generally the data reported were good for most analytes. However a wide range of values was reported for δ^2H of all of the samples and therefore performance scores were not calculated for this analyte.

Registration for participation in the FIRMS PTS for 2017 is now open with samples for the first round due for dispatch in April. The test materials scheduled for 2017 are cellulose, glutamic acid, polythylene glycol and nylon 6. To register for the scheme or for more information contact **ptcustomerservices@lgcgroup.com**.



Results from FIRMS PT scheme in 2016. The lines represent the median of the results (dashed) plus or minus the robust standard deviation (dotted) following the exclusion of outliers. Median and robust standard deviation have not been calculated for δ^2H of the samples due to the wide range of values observed

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Approved Practitioners Scheme

September 2017 will see the end of the four year approval cycle for the currently Approved Practitioners and the first re-approval exercise by FIRMS of those wishing to maintain their approved status. FIRMS recommends that ideally laboratories providing a forensic service should gain accreditation to ISO17025. However, where such accreditation might not be justified the FIRMS Approved Practitioner scheme provides a cost effective alternative.

The management of the scheme is certified to ISO9001. Subsequent to the introduction of the new edition in 2015, FIRMS is transitioning to ISO9001:2015 compliance and will be audited by LRQA against the new edition in April 2017.

Anyone interested in the AP scheme can find out more and apply via the FIRMS website.

News in Brief For or From the FIRMS Community

Congratulations to FIRMS membership secretary Kylie Jones from the Australian Federal Police who graduated with her PhD in October 2016 from the University of Technology, Sydney. Focusing on the use of IRMS to compare document papers, the full time Forensic Document Examiner completed her PhD part time, with the aim of introducing a new examination capability for use in forensic casework. Also published in a number of articles, the new examination capability has been used in two cases so far, with evidence successfully presented in court in support of one these cases.

The $\delta^2 H_{VSMOW-SLAP}$ values of the intrinsic hydrogen fractions in human hair stable isotopic reference materials USGS42 and USGS43 have been revised following research by Coplen *et al* 2016. On average the revised $\delta^2 H_{VSMOW-SLAP}$ values are 5.7 ‰ more positive than previously measured. This should be taken into consideration when comparing data from previous publications.

If you aren't already familiar with IsoMap, created by Gabe Bowen and colleagues, you can visit it here. IsoMap is an open source resource providing sophisticated tools for research and analysis but is designed with accessibility in mind. The online resource enables users to query available data and produce Isoscapes as well as encouraging data sharing within the isotope community.

Forthcoming conferences of interest to the FIRMS community include the PITTCON Conference and Expo (5^{th}-9^{th} March 2017) in Chicago, USA; Emirates Forensic Conference and Exhibition (2^{nd}-4^{th} April 2017) in Dubai, UAE; 253^{rd} American Chemical Society National Meeting and Exposition (2^{nd}-6^{th} April 2017) in San Francisco, USA; European Geosciences Union General Assembly (EGU 2017) (23^{rd}-28^{th} April 2017) in Vienna, Austria; Forensics Europe Expo (3^{rd}-4^{th} May 2017) in London, UK; Food Integrity Conference (10^{th}-11^{th} May 2017) in Parma, Italy; World Conference and Exhibition on Forensic Science (15^{th}-17^{th} May 2017) in Kuala Lumpur, Malaysia; European Society for Isotope Research (ESIR) Isotope Workshop XIV (25^{th}-29^{th} June 2017) in Baile Govora, Romania; Stable Isotope Mass Spectrometry User Group 2017 conference (5^{th}-7^{th} July 2017) in Keyworth, UK; Isotopes 2017 conference (9^{th}-14^{th} July 2017) in Ascona, Switzerland; Goldschmidt 2017 conference (13^{th}-18^{th} August 2017) in Paris, France; 21st International Association of Forensic Sciences (IAFS) conference (21^{st}-25^{th} August 2017) in Toronto, Canada; 19th International Conference on Isotope Hydrology and Geochemistry (ICIHG 2017) (18^{th}-19^{th} Sept 2017) in Rome, Italy and GCC Forensic Science conference (14^{th}-15^{th} Nov 2017) in Abu Dhabi, UAE. If you are planning to attend the 14th Australasian Environmental Isotope Conference 2017 in Wellington, New Zealand, be aware that the date is cur-

rently postponed, check the website for details.

If there are any upcoming conferences, exhibitions or workshops that are not included above that you would like to highlight to the FIRMS community please contact news@forensic-isotopes.org so that they can be included on the FIRMS website.

A look back at the 6^{th} FIRMS Network Conference

The 6th FIRMS Network Conference was held in conjunction with the 23^{rd} Australian and New Zealand Forensic Science Society (ANZFSS) symposium between the 18th and 20th September in Auckland, New Zealand. This was a new venture for both FIRMS and ANZFSS, but we hoped that the opportunities for information exchange amongst a wider audience as well as having some of the logistics taken off our hands would be beneficial.

FIRMS Workshop: CSI-Crime and Stable Isotopes

Prior to the formal opening of the ANZFSS/FIRMS conference, members of the steering group (Jim Carter, Lesley Chesson, Sean Doyle and Phil Dunn) presented a half-day workshop entitled "Crime and Stable Isotopes" (CSI - get it). Attendees at the workshop came from five continents and represented a broad cross-section of the stable isotope community; law enforcement, research labs and instrument manufacturers. The workshop outlined areas in which stable isotope forensics have been successfully applied to solving crime but the main focus was on what turns stable isotope data into reliable evidence - traceability, quality standards, measurement uncertainty and methods of data analysis. With one small exception (i.e. the size of the presentation screen) the workshop was well received which was encouraging given that the attendees rated themselves anywhere between expert and novice in the field.

Please contact the steering group if you are interested in hosting a similar workshop

ANZFSS and FIRMS Conference

The official welcoming ceremony to the ANZFSS symposium included a brief welcome from FIRMS Chair Phil Dunn in which he encouraged non-isotope specialists to come along to the FIRMS stream of the conference as well as for FIRMS stalwarts to head over to other sessions to see if isotope analysis might be of use. There was a strong cultural element to the ceremony as New Zealand is rightly proud of its Maori heritage.

Each day began with a plenary session, however FIRMS did not have a slot (something we would change given the chance) so our part of the conference kicked off with a Keynote from Gabe Bowen (Spatio-Temporal Isotope Analytics Lab group at the University of Utah). Gabe is no stranger to opening FIRMS conferences having done the same at the previous conference in Montreal and again gave an excellent presentation on the use of isotope ratios to create and query isoscapes.

The FIRMS sessions included talks on a variety of topics including illicit drugs; explosives; packaging materials; hair, fingernails and other human remains; palm oil as well as more general aspects of forensic IRMS analysis including new software and measurement uncertainty considerations. New Zealand based researchers also presented on isotopic analyses of Maori dog-coat cloaks as well as a project using analytical methods to trace the source of mud traditionally used to die flax - again highlighting the history of New Zealand and linking modern analytical methods to historic traditions. The full program of the conference including details of the 20 presentations from the FIRMS sessions can be found here. Many thanks to all those who contributed to the interesting and successful session content.

The conference concluded with a review and outlook of the FIRMS Network followed by a

panel discussion in which FIRMS members and non-members alike were able to suggest ways in which the FIRMS Network could improve. There were certainly a lot of suggestions around improving the FIRMS website which we will incorporate in a major overhaul that will go live in early 2017. Databases and the current problem with accessing those which are private for regulatory purposes were also discussed.

Conference Prize Winners

Jennifer Mallette - Best Oral; Christy Manusco - Highly Commended Oral; Brett Tipple - Best poster.

One of our members, Felicity Koens, who is a chemist for the Australian Federal Police, was presented with the prestigious Ian Riebeling Memorial Medal. The winner of this award is selected from a pool of presenters who are in the first five years (or part-time equivalent) of their employment as a forensic practitioner. Her presentation to the symposium was entitled 'A background survey of polymers in the Australian Capital Territory - diversity in isotopic abundance values'. The presentation explored the potential of using Isotope Ratio Mass Spectrometry (IRMS) to enhance the discrimination of commonly encountered polymers (e.g. adhesive tapes, cable ties) in forensic casework, such as drug importations or assaults. A survey of polymers collected in the ACT region was undertaken, and variation was assessed across bulk polymer samples using IRMS. The results of this baseline survey indicated a high variability among polymers and therefore reinforced the value of using IRMS for future polymer examinations.

'Three chair for FIRMS...' Sean, Phil and Jim who, along with Lesley hosted the CSI workshop at ANZFSS 2016

Prize winners Jennifer Mallette, Christy Manusco, Brett Tipple and Felicity Koens

FIRMS members James Ehleringer, Edna Ehleringer, Anastasia Lott, Michael Lott, Sean Doyle, Dianne Doyle, Hiroto Kawashima, Sonia Hernandez, John Howa, and Christy Mancuso enjoying the ANZFSS Dinner 2016

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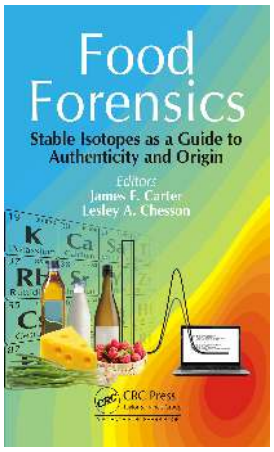
FIRMS members Brett Tipple, Yusuf Jameel, Thuan Chau, Malia Harrison Chau, Michael Brgoch, Lesley Chesson, Gareth Davies, Joanne Davies, and Jennifer Mallette enjoying the ANZFSS Dinner 2016

Recent Publications

Books & Book Chapters

Food Forensics, Stable Isotopes as a Guide to Authenticity and Origin, CRC Press, due 2017



Jim Carter and Lesley Chesson are the editors for this book which will be released later this year. Content includes contributions from a number of FIRMS members. Food forensics is a multi-disciplinary science involving advanced analytical techniques, plant and animal metabolism, and sophisticated data interpretation tools. This book explains how plants, and in turn animals eating those plants, assimilate stable isotopes and trace elements from their environments. It provides extensive reviews of the use of stable isotope and trace element measurements for the authentication of major food groups and how these can be used to detect fraudsters.

Stable Isotope Forensics, An Introduction to the Forensics Application of Stable Isotope Analysis, Second Edition, Wiley, due 2017

Watch out for the release of the second edition of this internationally acclaimed guide from Prof. Wolfram Meier-Augenstein later this year.

Science and Justice Special Edition

Thank you to all those who provided content for the 6 th FIRMS Network Conference. Jim Carter and Phil Dunn will be guest editing a Special Edition of Science and Justice later this year. This is open to everyone who made oral or poster presentations at the conference. Named presenters should have already received information for this, Jim and Phil can be contacted at special@forensic-isotopes.org. Don't forget the closing date for articles is May 2017.

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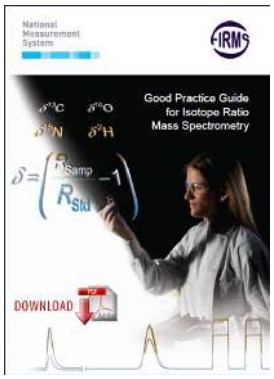
FIRMS Good Practice Guide



The first edition of the FIRMS Good Practice Guide for IRMS was published in 2011 and has proven an invaluable resource. In 2016 many FIRMS members contributed to updating this document and a second edition is due for publication mid-2017.

The second edition is being updated to encompass the many recent advances in the understanding of what constitutes good practice, especially in terms of measurement uncertainty. The new edition will be greatly expanded with new sections on hydrogen and sulphur isotope measurements and hyphenated-techniques, such as GC-IRMS and LC-IRMS.

Like the 1st Ed. this will be made freely available.

Featured Article

Glen Jackson's article Error Terror in Forensic Science published in Spectroscopy (Vol 31, Issue 11, Nov 01, 2016) provides a fascinating and clear discussion of the difficulty in reporting measurement uncertainty in Forensics. The article discuses in basic, general terms, this complex and often misunderstood topic that is vitally important for the accurate reporting of analytical results.

Papers

Disclaimer: This section contains a non-comprehensive list of recent publications that may be of interest to the FIRMS community. Inclusion of an article in this list does not mean that FIRMS approves the content. You are encouraged to consider critically whether (i) the experimental work complies with SI guidelines and the FIRMS Good Practice Guide; and (ii) whether the conclusions drawn are based on sound scientific background information.

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