



*The highlights of this newsletter are the continuation of the FIRMS PT scheme as well as the recent Science & Justice Special edition containing papers from the 5<sup>th</sup> FIRMS Conference held in 2013...*

### In this issue...

Steering Group News	1
Proficiency Testing Scheme	2
Approved Practitioners Scheme	3
News in Brief For or From the FIRMS Community	3
6 <sup>th</sup> FIRMS Network Conference	4
Recent Publications	5

**Disclaimer:** Reference to or mention of any commercial product or process by specific trademark or manufacturer within this newsletter does not necessarily represent an endorsement by the FIRMS Network.

### Steering Group News

Since the last newsletter, Wolfram Meier-Augenstein has moved on from both the James Hutton Institute and his position as Director of the FIRMS Network. We take this opportunity to thank him for his invaluable contribution to the network over the years and hope that the future continues to bring him every success. Also, Tim Knowles has left Mass Spec Analytical to return to the University of Bristol as a researcher in Accelerator Mass Spectrometry - we wish him all the best for the future. Mass Spec Analytical are not renewing their institutional membership of FIRMS and we thank them for their input to FIRMS since its inception.

We welcome two new members to the Steering Group: Federica Camin and Rob Posey. Federica is the Head of the Stable Isotope and Traceability Platform at the Instituto Agario do San Michele all'Adige (IASMA) which performs various stable isotope analyses. She is also the scientific coordinator of the European Wine Isotope Databank. Rob is the Laboratory Manager of Food Forensics which is based in Norwich in the UK. Food

Forensics carries out a variety of isotope analyses on foods and beverages for traceability, origin and method of production investigations. Rob has also kindly volunteered to help collate the FIRMS newsletter.

The FIRMS Steering group currently consists of: Jim Carter (Chair & Director, Queensland Health Forensic and Scientific Services); Sean Doyle (Quality Manager, Director & Secretary, Linked Forensic Consultants Ltd); Phil Dunn (Membership Secretary & Newsletter Ed, LGC); Federica Camin (IASMA) Lesley Chesson (Iso-Forensics); Max Coleman (NASA Jet Propulsion Laboratory); Russell Frew (University of Otago); Kylie Jones (Australian Federal Police); Niamh Nic Dæid (University of Strathclyde); Gerard van der Peijl (Netherlands Forensic Institute); Rob Posey (Newsletter Ed, Food Forensics); Helen Salorous (National Measurement Institute, Australia); Sabine Schneiders (Bundeskriminalamt); Libby Stern (FBI); David Widory (University of Quebec in Montreal) and Wee Chaun Yeo (Health Sciences Authority, Singapore).



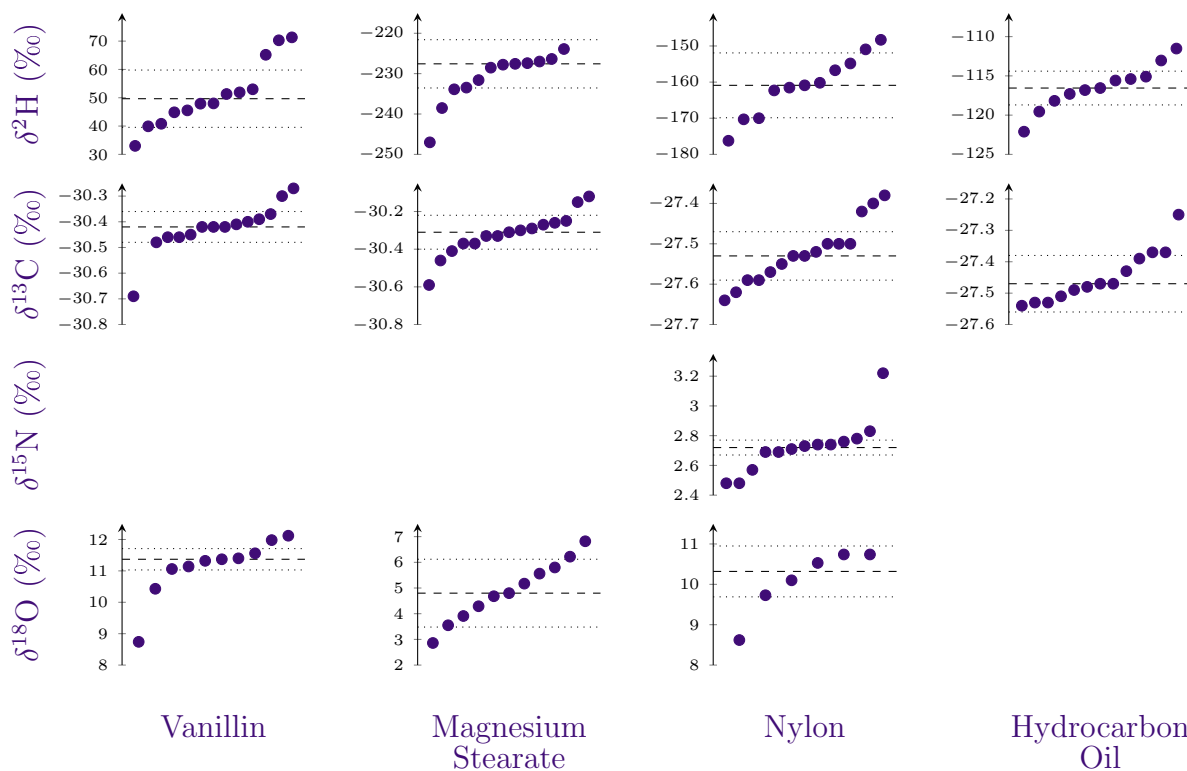
## Proficiency Testing Scheme

There have been two further rounds of the FIRMS PT scheme during 2014 - a summary of the results can be found below while a copy of the main report can be downloaded from [the FIRMS website](#). Compared with 2013 there was a small increase in the number of participants with a maximum of 16 reporting results for a given analyte, however it was a little disappointing that there were so few reported results for  $\delta^{18}\text{O}$  in Nylon. Carbon and nitrogen analyses continue to give good inter-laboratory results, while hydrogen and oxygen less so. For hydrogen, the presence of exchangeable H in the PT materials will no doubt contribute to the wide spread of results, due to the differences in how this is taken into account by participating laboratories.

LGC have applied to UKAS to add the FIRMS PT scheme to the scope of their accreditation to ISO/IEC 17043:2010. This process began in September 2014 and bar a few minor issues

that remain to be resolved, accreditation should follow in the near future.

For the 2015 rounds of the PT scheme, a fixed standard deviation for performance assessment (SDPA) of 0.15 ‰ will be used to calculate the z-scores for  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values (note that a satisfactory performance score is 2 x SDPA). This is based upon the results from previous rounds as well as expected inter-laboratory performance. This change should have little effect upon the C and N isotope results as the new values are similar to the spread from the previous rounds. For H and O, the PT scheme will continue to use the robust standard deviation arising from the reported results to calculate z-scores. This is because there isn't sufficient data available yet to fully justify assigned SDPA values for these elements. The PT scheme steering group will be revising this position following the completion of the two rounds scheduled for this year.



Results from FIRMS PT scheme in 2014. The lines represent the median of the results (dashed) plus or minus the robust standard deviation (dotted) following the exclusion of outliers.



## Approved Practitioners Scheme



In the last twelve months there have been no new applications for Approved Practitioner status. Unfortunately, two of our Approved Practitioners, Wolfram Meier-Augenstein and Helen Kemp have

decided to withdraw from the scheme for personal reasons. Individuals working in the field of isotope forensics who are interested in seeking approval should contact FIRMS via the usual e-mail address. Candidates for approval will be sent further details together with an initial assessment questionnaire.

The IAEA have released two new sets of three reference waters each: one set of singly labelled waters, only enriched in  $^2\text{H}$  (IAEA 604-606), and another set of doubly labelled waters, enriched in both  $^2\text{H}$  and  $^{18}\text{O}$  (IAEA 607-609). They cover  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  values in the range of 80016000 ‰ and 1002000 ‰, respectively and should be available to order soon.

## News in Brief For or From the FIRMS Community

The FIRMS Good Practice Guide is now several years old and the FIRMS Steering Group are currently considering updating the document. Any suggestions over what additions or revisions you'd like to see should be passed on to the SG via the special [BestPractice@forensic-isotopes.org](mailto:BestPractice@forensic-isotopes.org) e-mail address.

Thermo have released an updated version of their [GC-IsoLink](#) combustion interface for GC-C-IRMS analyses.

Isoprime have released a new model of IRMS the [VisION](#) - a smaller instrument with lower gas and electricity requirements.

Picarro have released the [A0217 Continuous Water Sampler](#), the first commercially-available device for real-time continuous analysis of  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  in liquid water.

[Nu Instruments](#) has unveiled their latest mass spectrometer: the Panorama. The instrument has been designed specifically to measure diagnostic ratios of the rare methane isotopologues  $^{12}\text{CH}_2\text{D}_2$  and  $^{13}\text{CH}_3\text{D}$  and is capable of unprecedented measurements of isotopic bond ordering in methane gas.

The [Elliott Review](#) into the integrity and assurance of food supply networks was published last year following increasing concern over the security of the UK food supply chain. The review calls for a zero tolerance policy on food fraud and will catalyse the formation of centres of excellence for food authenticity testing to include IRMS.

The [Global Stable Isotope Ratio Mass Spec-](#)

[trometer Industry Report 2014](#) has been published.

LGC are coordinating a forthcoming Key Comparison (KC) for the Inorganic Analysis Working Group (IAWG) of the Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM). The measurand will be carbon isotope ratios (delta values) in honey with potentially S isotope ratios also included. While this KC is only open to National Measurement Institutes (NMIs) and Designated Institutes (DIs), there is potential for the same material to be more widely distributed to other laboratories for a parallel inter-laboratory comparison exercise should there be sufficient interest. Note that this is separate from the PT scheme organised by LGC PT on behalf of FIRMS. For further information, please contact the KC co-ordinator [Phil Dunn](#).

Forthcoming conferences of interest to the FIRMS community include the [Advances in Stable Isotope Techniques and Applications \(ASITA\)](#) conference (27<sup>th</sup>-30<sup>th</sup> June 2015 in Ottawa, Canada), [Pittcon](#) (8<sup>th</sup>-12<sup>th</sup> March 2015 in New Orleans, USA), the [UK Archaeological Sciences Conference](#) (8<sup>th</sup>-11<sup>th</sup> April 2015 at Durham



University, UK), the EGU General Assembly (12<sup>th</sup>-17<sup>th</sup> April 2015 in Vienna, Austria), the IAEA International Symposium on Isotope Hydrology: Revisiting Foundations and Exploring Frontiers (11<sup>th</sup>-15<sup>th</sup> May 2015 in Vienna, Austria), Goldschmidt (16<sup>th</sup>-21<sup>st</sup> August 2015 in

### 6<sup>th</sup> FIRMS Network Conference

We extend a warm welcome to you all to Auckland, New Zealand, for the 6<sup>th</sup> FIRMS Network Conference to be held in conjunction with the 23<sup>rd</sup> Australian and New Zealand Forensic Sci-

ence Society (ANZFSS) International Symposium on the Forensic Sciences. The Symposium is to be held from Sunday 18<sup>th</sup> to Friday 23<sup>rd</sup> September 2016 at the SkyCity Convention Centre in the heart of downtown Auckland. You can already register your interest!

ence Society (ANZFSS) International Symposium on the Forensic Sciences. The Symposium is to be held from Sunday 18<sup>th</sup> to Friday 23<sup>rd</sup> September 2016 at the SkyCity Convention Centre in the heart of downtown Auckland. You can already register your interest!







## Recent Publications

### Books & Book Chapters

There have been no books or book chapters of interest to the FIRMS community published since the last newsletter that we are aware of.

### Journal Special Editions

There has been one journal special editions of interest to the FIRMS community since the publication of the last newsletter: the Science & Justice issue containing papers relating to the FIRMS Conference. This issue was guest-edited by Sean Doyle and Jim Carter and the papers from this special edition are highlighted within the recent publications below.

### 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.

- Ai, G., Sun, T. and Dong, X., "Gas chromatography/isotope ratio mass spectrometry: Analysis of methanol, ethanol and acetic acid by direct injection of aqueous alcoholic and acetic acid samples," *Rapid Commun. Mass Spectrom.* (2014), **28**:1–9
- Ansmann, I.C., Lanyon, J.M., Seddon, J.M. and Parra, G.J., "Habitat and resource partitioning among indo-pacific bottlenose dolphins in moreton bay, australia," *Marine Mammal Science* (2015), **31**:211–230
- Barbieri, A.B., Sarkis, J.E.S., Martinelli, L.A., Bordon, I.C.A.C., Mitteregger, H. and Hortellani, M.A., "Forensic evaluation of metals (Cr, Cu, Pb, Zn), isotopes ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ), and C:N ratios in freshwater sediment," *Environ. Forensics* (2014), **15**:134–146
- Bartelink, E.J., Berg, G.E., Beasley, M.M. and Chesson, L.A., "Appliocation of stable isotope forensics for predicting region of origin of human remains from past wars and conflicts," *Annals of Anthropological Practice* (2014), **38**(1):124–136
- Baumann, E.J. and Crowley, B.E., "Stable isotopes reveal ecological differences amongst now-extinct proboscideans from the cincinnati region, usa," *Boreas* (2015), **44**(1):240–254
- Bay, L.J., Chan, J.S.H. and Walczyk, T., "Isotope ratio analysis of carbon and nitrogen by elemental analyser continuous flow isotope ratio mass spectrometry (EA-CF-IRMS) without the use of a reference gas," *J. Anal. At. Spec.* (2014), **30**:310–314
- Beckett, N.M., Cresswell, S.L., Grice, D.I. and Carter, "Isotopic profiling of seized benzylpiperazine and trifluoromethylphenylpiperazine tablets using  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  stable isotopes," *Sci. & Just.* (2015a), **55**:51–56, **FIRMS Special Issue**

## Feature Article

The FIRMS Steering Group feel that the recent IUPAC Technical Report by Brand *et al.* (2014) merits special attention. In this paper, the authors have collated the isotope ratios of all internationally distributed primary and secondary reference materials with specified delta values for elements where delta scales have been adopted. This allows easy access to the suggested values and uncertainties for a range of reference materials in one location. Where materials have been calibrated more than once, all historical data is presented together with a recommended value for users to apply. Note that material certificates may be updated more frequently than this publication.



- Beckett, N.M., Grice, D.I., Carter, J. and Cre, “Precursor discrimination of designer drug benzylpiperazine using  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  stable isotopes,” *Sci. & Just.* (2015b), **55**:57–62, **FIRMS Special Issue**
- Bendrey, R., Vella, D., Zazzo, A., Balasse, M. and Lepetz, S., “Exponentially decreasing tooth growth rate in horse teeth: implications for isotopic analyses,” *Archaeometry* (2015):in press
- Bontempo, L., Ceppa, F., Ziller, L., Pedrini, P., Hobson, K.A., Wassenaar, L.I. and Camin, F., “Comparison of methods for stable isotope ratio ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ,  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$ ) measurements of feathers,” *Meth. Ecol. Evo.* (2014), **5**:363–371
- Bowen, G.J., Liu, Z., Vander Zanden, H.B., Zhao, L. and Takahashi, G., “Geographic assignment with stable isotopes in IsoMAP,” *Methods in Ecology and Evolution* (2014), **5**(3):201–206
- Brand, W.A., Coplen, T.B., Vogl, J., Rosner, M. and Prohaska, T., “Assessment of international reference materials for isotope-ratio analysis (IUPAC Technical Report),” *Pure Appl. Chem.* (2014), **86**:425–467, **Feature Article**
- Brooker, L., Cawley, A., Drury, J., Edey, C., Hasick, N. and Goebel, C., “Stable carbon isotope ratio profiling of illicit testosterone preparations - domestic and international seizures,” *Drug Testing and Analysis* (2014), **6**(10):996–1001
- Buckberry, J., Montgomery, J., Towers, J., Mldner, G., Holst, M., Evans, J., Gledhill, A., Neale, N. and Lee-Thorp, J., “Finding vikings in the danelaw,” *Oxford Journal of Archaeology* (2014), **33**(4):413–434
- Carter, J.F. and Doyle, S., “An introduction to the FIRMS 2013 conference special edition of Science and Justice,” *Sci. & Just.* (2015), **55**:1–1, **FIRMS Special Issue**
- Carter, J.F., Doyle, S., Phasumane, B. and Nic Dæid, N., “The role of isotope ratio mass spectrometry as a tool for the comparison of physical evidence,” *Sci. & Just.* (2014), **54**:327–334
- Carter, J.F., Yates, H.S.A. and Tinggi, U., “A global survey of the stable isotope and chemical compositions of bottled and canned beers as a guide to authenticity,” *Sci. & Just.* (2015), **55**:18–26, **FIRMS Special Issue**
- Cengiz, M.F., Durak, M.Z. and Ozturk, M., “In-house validation for the determination of honey adulteration with plant sugars (C4) by isotope ratio mass spectrometry (IR-MS),” *Food Sci. Tech.* (2014), **57**:9–15
- Chesson, L.A., Tipple, B.J., Barnette, J.E., Cerling, T.E. and Ehleringer, J.R., “The potential for application of ink stable isotope analysis in questioned document examination,” *Sci. & Just.* (2015), **55**:27–33, **FIRMS Special Issue**
- Çinar, S.B., Eksi, A. and Coskun, I., “Carbon isotope ratio ( $^{13}\text{C}/^{12}\text{C}$ ) of pine honey and detection of HFCS adulteration,” *Food Chem.* (2014), **157**:10–13
- Coleman, M. and Meier-Augenstein, W., “Ignoring iupac guidelines for measurement and reporting of stable isotope abundance values affects us all,” *Rapid Communications in Mass Spectrometry* (2014), **28**(17):1953–1955
- Collins, M. and Salouros, H., “A review of some recent studies on the stable isotope profiling of methylamphetamine: Is it a useful adjunct to conventional chemical profiling?” *Sci. & Just.* (2015), **55**:2–9, **FIRMS Special Issue**



- Cooper, R.J., Krueger, T., Hiscock, K.M. and Rawlins, B.G., “Sensitivity of fluvial sediment source apportionment to mixing model assumptions: A bayesian model comparison,” *Water Resources Research* (2014), **50**(11):9031–9047
- Coplen, T., Qi, H., Tarbox, L., Lonenz, J.M. and Buck, B., “USGS 46 Greenland Ice Core water - a new isotopic reference material for  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  measurements of water,” *Geostd. Geoanal. Res.* (2014), **38**:153–157
- Dunn, P.J.H., Malinovsky, D. and Goenaga-Infante, H., “Calibration strategies for the determination of stable carbon absolute isotope ratios in a glycine candidate reference material by elemental analyser-isotope ratio mass spectrometry,” *Anal. Bioanal. Chem.* (2014), =:in press
- Faghihi, V., Verstappen-Dumoulin, B.M.A.A., Jansen, H.G., van Dijk, G., Aerts-Bijma, A.T., Kerstel, E.R.T., Gröning, M. and Meijer, H.A.J., “A new high-quality set of singly ( $^2\text{h}$ ) and doubly ( $^2\text{h}$  and  $^{18}\text{o}$ ) stable isotope labeled reference waters for biomedical and other isotope-labeled research,” *Rapid Commun. Mass Spec.* (2015), **29**:311–321
- Font, L., Jonker, G., van Aalderen, P.A., Schlitmans, E.F. and Davies, G.R., “Provenancing of unidentified World War II casualties: Application of strontium and oxygen isotope analysis in tooth enamel,” *Sci. & Just.* (2015a), **55**:10–17, **FIRMS Special Issue**
- Font, L., van der Peijl, G., va Leuwen, C., van Wetten, I. and Davies, G.R., “Identification of the geographical place of origin of an unidentified individual by multi-isotope analysis,” *Sci. & Just.* (2015b), **55**:34–42, **FIRMS Special Issue**
- Fourel, F., Martineau, F., Seris, M. and Lécuyer, C., “Simultaneous N, C, S stable isotope analyses using a new purge and trap elemental analyzer and an isotope ratio mass spectrometer,” *Rapid Commun. Mass Spectrom.* (2014), **28**:1–8
- Gauchotte-Lindsay, C., McGregor, L.A., Assal, A., Thomas, R. and Kalin, R.M., “Highlighting the effects of co-eluting interferences on compound-specific stable isotope analysis of polycyclic aromatic hydrocarbons by using comprehensive two-dimensional gas chromatography,” *ChemPlusChem* (2014), **79**(6):804–812
- Gilevska, T., Gehre, M. and Richnow, H.H., “Performance of the wet oxidation unit of the HPLC isotope ratio mass spectrometry system for halogenated compounds,” *Anal. Chem.* (2014), **86**:7252–7257
- Good, S.P., Kennedy, C.D., Stalker, J.C., Chesson, L.A., Valenzuela, L.O., Beasley, M.M., Ehleringer, J.R. and Bowen, G.J., “Patterns of local and nonlocal water resource use across the western u.s. determined via stable isotope intercomparisons,” *Water Resources Research* (2014), **50**(10):8034–8049
- Hahn, S., Dimitrov, D., Rehse, S., Yohannes, E. and Jenni, L., “Avian claw morphometry and growth determine the temporal pattern of archived stable isotopes,” *Journal of Avian Biology* (2014), **45**(2):202–207
- Helliker, B.R., “Reconstructing the  $\delta^{18}\text{O}$  of atmospheric water vapour via the cam epiphyte tillandsia usneoides: seasonal controls on  $\delta^{18}\text{O}$  in the field and large-scale reconstruction of  $\delta^{18}\text{O}_a$ ,” *Plant, Cell & Environment* (2014), **37**(3):541–556
- Hobson, K.A. and Koehler, G., “On the use of stable oxygen isotope ( $\delta^{18}\text{O}$ ) measurements for tracking avian movements in north america,” *Ecology and Evolution* (2015):in press



- Hobson, K.A., Van Wilgenburg, S.L., Faaborg, J., Toms, J.D., Rengifo, C., Sosa, A.L., Aubry, Y. and Brito Aguilar, R., “Connecting breeding and wintering grounds of neotropical migrant songbirds using stable hydrogen isotopes: a call for an isotopic atlas of migratory connectivity,” *Journal of Field Ornithology* (2014), **85**(3):237–257
- Howa, J.D., Lott, M.J., Chesson, L.A. and Ehleringer, J.R., “Carbon and nitrogen isotope ratios of factory-produced RDX and HMX,” *Forensic Sci. Int.* (2014a), **240**:80–87
- Howa, J.D., Lott, M.J. and Ehleringer, J.R., “Isolation and stable nitrogen isotope analysis of ammonium ions in ammonium nitrate prills using sodium tetraphenylborate,” *Rapid Commun. Mass Spec.* (2014b), **28**:1530–1534
- Howa, J.D., Lott, M.J. and Ehleringer, J.R., “Observations and sources of carbon and nitrogen isotope ratio variation of pentaerythritol tetranitrate (PETN),” *Forensic Sci. Int.* (2014c), **244**:152–157
- Hyodo, F., Matsumoto, T., Takematsu, Y. and Itioka, T., “Dependence of diverse consumers on detritus in a tropical rain forest food web as revealed by radiocarbon analysis,” *Functional Ecology* (2014):in press
- Jackson, G.P., An, Y., Konstantynova, K.I. and Rashaid, A.H.B., “Biometrics from the carbon isotope ratio analysis of amino acids in human hair,” *Sci. & Just.* (2015), **55**:24–42, **FIRMS Special Issue**
- Jasper, J.P., Zhang, F., Poe, R.B. and Linhardt, R.J., “Stable isotopic analysis of porcine, bovine, and ovine heparins,” *Journal of Pharmaceutical Sciences* (2014):in press
- Kamenov, G.D., Kimmerle, E.H., Curtis, J.H. and Norris, D., “Georeferencing a cold case victim with lead, strontium, carbon and oxygen isotopes,” *Annals of Anthropological Practice* (2014), **38**(1):137–154
- Kaown, D., Shouakar-Stash, O., Yang, J., Hyun, Y. and Lee, K.K., “Identification of multiple sources of groundwater contamination by dual isotopes,” *Groundwater* (2014), **52**(6):875–885
- Kaupová, S., Herrscher, E., Velemínský, P., Cabut, S., Poáček, L. and Bruzek, J., “Urban and rural infant-feeding practices and health in early medieval central europe (9<sup>th</sup> - 10<sup>th</sup> century, czech republic),” *American Journal of Physical Anthropology* (2014), **155**(4):635–651
- Kirillova, E.N., Andersson, A., Tiwari, S., Srivastava, A.K., Bisht, D.S. and Gustafsson, r., “Water-soluble organic carbon aerosols during a full new delhi winter: Isotope-based source apportionment and optical properties,” *Journal of Geophysical Research: Atmospheres* (2014), **119**(6):3476–3485
- Kloppmann, W., Leroux, L., Bromblet, P., Guerrot, C., Proust, E., Cooper, A.H., Worley, N., Smeds, S.A. and Bengtsson, H., “Tracing medieval and renaissance alabaster works of art back to quarries: A multi-isotope (Sr, S, O) approach,” *Archaeometry* (2014), **56**:203–219
- Knudson, K.J., Goldstein, P.S., Dahlstedt, A., Somerville, A. and Schoeninger, M.J., “Paleomobility in the tiwanaku diaspora: Biogeochemical analyses at rio muerto, moquegua, peru,” *American Journal of Physical Anthropology* (2014), **155**(3):405–421
- Krajko, J., Varga, Z., Yalcintas, E., Wallenius, M. and Mayer, K., “Application of neodymium isotope ratio measurements for the origin assessment of uranium ore concentrates,” *Talanta* (2014), **129**:499–504
- Landwehr, J.M., Coplen, T.B. and Stewart, D.W., “Spatial, seasonal, and source variability in the stable oxygen and hydrogen isotopic composition of tap waters throughout the usa,” *Hydrological Processes* (2014), **28**(21):5382–5422





- Langel, R. and Dyckmans, J., “Combined  $^{13}\text{C}$  and  $^{15}\text{N}$  isotope analysis on small samples using a near-conventional elemental analyzer/isotope ratio mass spectrometer setup,” *Rapid Commun. Mass Spectrom.* (2014), **28**:1019–1022
- Laursen, K.H., Schjoerring, J.K., Kelly, S.D. and Husted, S., “Authentication of organically grown plants - advantages and limitations of atomic spectroscopy for multi-element and stable isotope analysis,” *TrAC* (2014), **59**:73–82
- van Leeuwen, K.A., Prenzler, P.D., Ryan, D. and Camin, F., “Gas chromatography-combustion-isotope ratio mass spectrometry for traceability and authenticity in foods and beverages,” *Comp. Rev. Food Sci. & Food Safety* (2014), **13**:814–837
- Lehn, C., Rossmann, A. and Graw, M., “Provenancing of unidentified corpses by stable isotope techniques - presentation of case studies,” *Sci. & Just.* (2015), **55**:72–88, **FIRMS Special Issue**
- Levitt, N.P., “Sample matrix effects on measured carbon and oxygen isotope ratios during continuous-flow isotope-ratio mass spectrometry,” *Rapid Communications in Mass Spectrometry* (2014), **28**(21):2259–2274
- Lorenz, J.M., Tarbox, L., Buck, B., Qi, H. and Coplen, T.B., “Biscayne aquifer drinking water (USGS45): A new isotopic reference material for  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  measurements of water,” *Rapid Commun. Mass Spectrom.* (2014), **28**:2031–2034
- Magioli, M., Moreira, M.Z., Ferraz, K.M.B., Miotto, R.A., de Camargo, P.B., Rodrigues, M.G., da Silva Canhoto, M.C. and Setz, E.F., “Stable isotope evidence of puma concolor (felidae) feeding patterns in agricultural landscapes in southeastern brazil,” *Biotropica* (2014), **46**(4):451–460
- McLean, S.J., Ikegaya, H., Saukko, P.J., Zheng, H.Y., Itoh, K. and Fushiki, S., “The utilization of stable isotope analysis for the estimation of the geographic origin of unidentified cadavers,” *Forensic Sci. Int.* (2014), **245**:45–50
- Meier-Augenstein, W. and Coleman, M., “Ignoring IUPAC guidelines for measurement and reporting of stable isotope abundance values affects us all,” *Rapid Commun. Mass Spectrom.* (2014), **28**:1953–1955
- Meier-Augenstein, W., Kemp, H.F., Schenk, E.R. and Almirall, J.R., “Discrimination of unprocessed cotton on the basis of geographic origin using multi-element stable isotope signatures,” *Rapid Commun. Mass Spec.* (2014), **28**:545–552
- Mizota, C. and Yamanaka, T., “The stable isotopic composition of historical black powder applicable to a japanese tanegashima matchlock,” *Archaeometry* (2015):in press
- Mizota, C., Yamanaka, T. and Ichinose, A., “The provenance of historical gunpowder from south-western japan: A stable isotopic approach,” *Archaeometry* (2014):in press
- Muhammad, S.A., Hayman, A.R., Van Hale, R. and Frew, R.D., “Assessing carbon and hydrogen isotopic fractionation of diesel fuel n-alkanes during progressive evaporation,” *J. Forensic Sci.* (2014), **60**:S56–S65
- Muhammad, S.A., Hayman, A.R., Van Hale, R. and Frew, R.D., “Assessing carbon and hydrogen isotopic fractionation of diesel fuel n-alkanes during progressive evaporation,” *Journal of Forensic Sciences* (2015), **60**:S56–S65



- Munksgaard, N.C., Cheesman, A.W., Wurster, C.M., Cernusak, L.A. and Bird, M.I., "Microwa adulteration-isotope ratio infrared spectroscopy (ME-IRIS): a novel technique for rapid extraction and in-line analysis of  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  values of water in plants, soils and insects," *Rapid Commun. Mass Spec.* (2014), **28**:2151–2161
- Nietner, T., Haughey, S.A., Ogle, N., Fahl-Hassek, C. and Elliot, C.T., "Determination of geographical origin of distillers dried grains and solubles using isotope ratio mass spectrometry," *Food Res. Int.* (2014), **60**:146–153
- Pate, F.D. and Owen, T.D., "Stable carbon and nitrogen isotopes as indicators of sedentism and territoriality in late holocene south australia," *Archaeology in Oceania* (2014), **49**(2):86–94
- Pekarsky, S., Angert, A., Haese, B., Werner, M., Hobson, K.A. and Nathan, R., "Enriching the isotopic toolbox for migratory connectivity analysis: a new approach for migratory species breeding in remote or unexplored areas," *Diversity and Distributions* (2015):in press
- Qi, H., Coplen, T.B., Olack, G.A. and Vennemann, T.W., "Caution on the use of NBS 30 biotite for hydrogen-isotope measurements with on-line high-temperature conversion systems," *Rapid Commun. Mass Spectrom.* (2014a), **28**:1987–1994
- Qi, H., Coplen, T.B., Tarbox, L., Lorenz, J.M. and Scholl, M., "USGS 48 Puerto Rico precipitation - a new isotopic reference material for  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  measurements of water," *Isotop. Environ. Health Stud.* (2014b), **50**:442–447
- Qi, H., Lorenz, Coplen, T. B. Tarbox, L., Meyer, B. and Taylor, S., "Lake louise water (USGS47): A new isotopic reference water for stable hydrogen and oxygen isotope measurements," *Rapid Commun. Mass Spectrom.* (2014c), **28**:351–354
- Redfern, R.C., DeWitte, S.N., Pearce, J., Hamlin, C. and Dinwiddy, K.E., "Urban & rural differences in roman dorset, england: A bioarchaeological perspective on roman settlements," *American Journal of Physical Anthropology* (2015):in press
- Remien, C.H., Adler, F.R., Chesson, L.A., Vaenzuela, L.O., Ehleringer, J.R. and Cerling, T.E., "Deconvolution of isotope signals from bundles of multiple hairs," *Oecologia* (2014), **175**:781–789
- Retief, K., West, A.G. and Pfab, M.F., "Can stable isotopes and radiocarbon dating provide a forensic solution for curbing illegal harvesting of threatened cycads?" *Journal of Forensic Sciences* (2014), **59**(6):1541–1551
- Robertson, K.L., Rowland, N.E. and Krigbaum, J., "Effects of caloric restriction on nitrogen and carbon stable isotope ratios in adult rat bone," *Rapid Communications in Mass Spectrometry* (2014), **28**(19):2065–2074
- Schlacher, T.A. and Connolly, R.M., "Effects of acid treatment on carbon and nitrogen stable isotope ratios in ecological samples: a review and synthesis," *Meth. Ecol. Evo.* (2014), **5**:541–550
- Sjastad, K., Simonsen, S.L. and Andersen, T.H., "Lead isotope ratios for bullets, a descriptive approach for investigative purposes and a new method for sampling of bullet lead," *Forensic Sci. Int.* (2014), **244**:7–15
- Snoeck, C., Lee-Thorp, J., Schulting, R., de Jong, J., Debouge, W. and Mattielli, N., "Calcined bone provides a reliable substrate for strontium isotope ratios as shown by an enrichment experiment," *Rapid Communications in Mass Spectrometry* (2015), **29**(1):107–114



- Stepanczak, B., Szostek, K. and Pawlyta, J., "Human bone oxygen isotope ratio changes with aging," *Geochronometria* (2014), **41**:147–159
- Stojanovska, N., Tahtouh, M., Kelly, T., Beavis, A. and Fu, S., "Qualitative analysis of seized cocaine samples using desorption electrospray ionization- mass spectrometry (desi-ms)," *Drug Testing and Analysis* (2014):in press
- Sturchio, N.C., Beloso, A., Heraty, L.J., Wheatcraft, S. and Schumer, R., "Isotopic tracing of perchlorate sources in groundwater from Pomona, California," *Appl. Geochem.* (2014), **43**:80–87
- Teng, F.Z. and Yang, W., "Comparison of factors affecting the accuracy of high-precision magnesium isotope analysis by multi-collector inductively coupled plasma mass spectrometry," *Rapid Commun. Mass Spectrom.* (2014), **28**:19–24
- Toews, D.P.L., Brelsford, A. and Irwin, D.E., "Isotopic variation across the audubon's - myrtle warbler hybrid zone," *Journal of Evolutionary Biology* (2014), **27**(6):1179–1191
- Tonra, C.M., Both, C. and Marra, P.P., "Incorporating site and year-specific deuterium ratios ( $\delta^2\text{H}$ ) from precipitation into geographic assignments of a migratory bird," *Journal of Avian Biology* (2014):in press
- Toske, S.G., Morello, D.R., Berger, J.M. and Vazquez, E.R., "The use of  $\delta^{13}\text{C}$  isotope ratio mass spectrometry for methamphetamine profiling: Comparison of ephedrine and pseudoephedrine-based samples to P2P-based samples," *Forensic Sci. Int.* (2014), **234**:1–6
- Trincherini, P.R., Bafi, C., Barbero, P., Pizzoglio, E. and Spalla, S., "Precise determination of strontium isotope ratios by TIMS to authenticate tomato geographical origin," *Food Chem.* (2014), **145**:349–355
- Tsutaya, T., Nagaoka, T., Sawada, J., Hirata, K. and Yoneda, M., "Stable isotopic reconstructions of adult diets and infant feeding practices during urbanization of the city of edo in 17th century japan," *American Journal of Physical Anthropology* (2014), **153**(4):559–569
- Tsutaya, T., Shimomi, A., Nagaoka, T., Sawada, J., Hirata, K. and Yoneda, M., "Infant feeding practice in medieval japan: Stable carbon and nitrogen isotope analysis of human skeletons from yuigahama-minami," *American Journal of Physical Anthropology* (2015), **156**(2):241–251
- Tsutaya, T. and Yoneda, M., "Reconstruction of breastfeeding and weaning practices using stable isotope and trace element analyses: A review," *American Journal of Physical Anthropology* (2015), **156**:2–21
- Vander Zanden, H.B., Wunder, M.B., Hobson, K.A., Van Wilgenburg, S.L., Wassenaar, L.I., Welker, J.M. and Bowen, G.J., "Contrasting assignment of migratory organisms to geographic origins using long-term versus year-specific precipitation isotope maps," *Methods in Ecology and Evolution* (2014), **5**(9):891–900
- Vautour, G., Poirier, A. and Widory, D., "Tracking mobility using human hair: What can we learn from lead and strontium isotopes?" *Sci. & Just.* (2015), **55**:63–71, **FIRMS Special Issue**
- Waldron, S., Scott, E.M., Vihermaa, L.E. and Newton, J., "Quantifying precision and accuracy of measurements of dissolved inorganic carbon stable isotopic composition using continuous-flow isotope-ratio mass spectrometry," *Rapid Commun. Mass Spectrom.* (2014), **28**:1117–1126
- Walsh, R.G., He, S. and Yarnes, C.T., "Compound-specific  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  analysis of amino acids: a rapid, chloroformate-based method for ecological studies," *Rapid Commun. Mass Spectrom.* (2014), **28**:96–108



- Webb, E.C., White, C.D., Van Uum, S. and Longstaffe, F.J., “Integrating cortisol and isotopic analyses of archeological hair: Reconstructing individual experiences of health and stress,” *American Journal of Physical Anthropology* (2014):in press
- West, A.G., February, E.C. and Bowen, G.J., “Spatial analysis of hydrogen and oxygen stable isotopes (“isoscapes”) in ground water and tap water across South Africa,” *J. Geochem. Expl.* (2014), **145**:213–222
- Willmes, M., McMorrow, L., Kinsley, L., Armstrong, R., Aubert, M., Eggins, S., Falgueres, C., Maureille, B., Moffat, I. and Grun, R., “The IRHUM (Isotopic Reconstruction of Human Migration) database - bioavailable strontium isotope ratios for geochemical fingerprinting in France,” *Earth Syst. Sci. Data* (2014), **6**:117–122
- Zhou, X.L., Xu, Y.C., Yang, S.H., Hua, Y. and Stott, P., “Effectiveness of femur bone indexes to segregate wild from captive minks, *Mustela vison*, and forensic implications for small mammals,” *Journal of Forensic Sciences* (2015), **60**(1):72–75