



## SPERA Newsletter December 2017

### **Special announcement**

**ORTEC® Training Course - Gamma Spectroscopy using Germanium Detectors and GammaVision Software: 19 – 23 March 2018 ANSTO, Lucas Heights, NSW, AUSTRALIA**

#### *About This Course*

This course is designed for beginning to intermediate gamma spectroscopists using germanium detectors and GammaVision software. This course begins with setup procedures for the detectors, electronics, computer, and software, followed by instruction on all aspects of the GammaVision interface. Other topics covered are the construction of nuclide libraries and analysis parameter files, and the setup of GammaVision for dedicated tasks. This is an interactive class - the students really have to play with spectra and get the right answers. Each participant will have access to a computer supplied by ANSTO and ORTEC software. Each student will receive a book of the class notes with space for notes and a CD with the examples to use later for more experience.

*The trainer:* Benson Davis, ORTEC.

*When:* 19 - 23 March 2018 in the Woods Centre training room at ANSTO, Lucas Heights, NSW, Australia

*Cost:* \$2,500 per person. Students will be provided with course notes, access to a computer and software for use during the course. Lunches, morning and afternoon teas will be provided. Students need to cover their own travel and accommodation expenses.

The course is limited to a maximum of 16 participants. If there is sufficient demand the course will be run again the following week.

For further information please contact: Rob Saunders (Rob@ radsaunders.com)

**Jeffree Environmental Research & Consulting** (Ross Jeffree, [ross.jeffree@hotmail.co.uk](mailto:ross.jeffree@hotmail.co.uk); [rossjeffree666@gmail.com](mailto:rossjeffree666@gmail.com))

#### Update

- The preparation of “Draft Guidelines for the Sampling, Preparation and Radio-Analysis of Marine Matrices” was coordinated for the IAEA/RCA Project “Enhancing Regional Capabilities for Marine Radioactivity Monitoring and Assessment of the Potential Impact of Radioactive Releases from Nuclear Facilities in Asia-Pacific Marine Ecosystems (RCA)”.

- The Draft Guidelines and related lectures were presented at the first Regional Training Course, Jakarta, August, 2017.
- A research program in phylogenetic and life-cycle radioecology has continued with several publications in 2017. Current studies are focussed on i) continued and enhanced transfer of radionuclides to progeny-post maternal exposure, in a dogfish, and ii) extension of a phylogeny-based model of bioaccumulation in marine chordates to freshwater fishes.
- A collaboration with the Marine Radioecology Group, BATAN, Indonesia, has led to a sampling program in Western Java to investigate in marine fishes, both the trophic transfer of Cs-137, stable Cs and K, and the effect of proximity to Anak Krakatoa on Po-210 levels.

### New Publications

Ross A Jeffree, Mathew P Johansen (2017). Experimental comparison of the bioaccumulation of anthropogenic radionuclides by egg and juvenile life stages of a small shark (2017). J. Env.Radioact., Journal of Environmental Radioactivity, 178–179, Nov., 430-438.

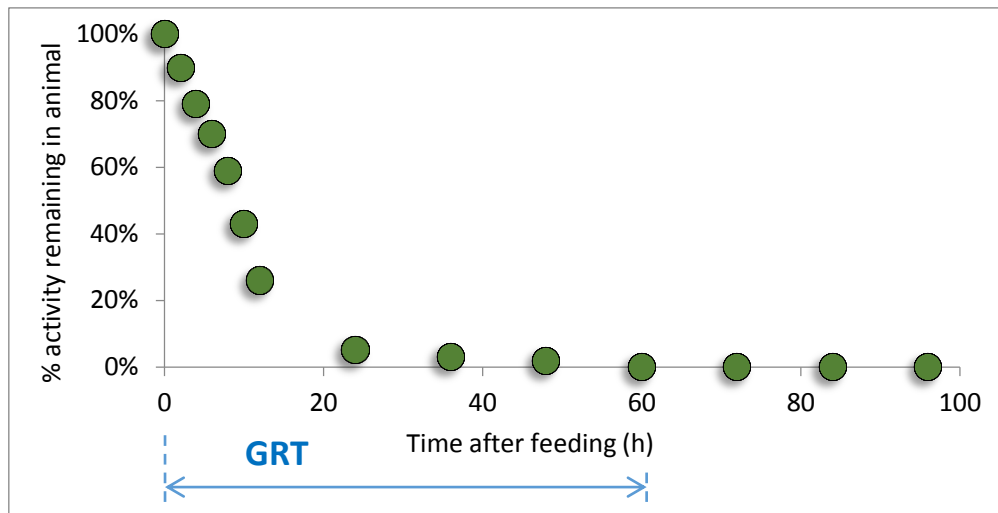
Ross A.Jeffree, Scott J.Markich, Francois Oberhaensli, Jean-Louis Teyssie (2017). Radionuclide biokinetics in the Russian sturgeon and phylogenetic consistencies with cartilaginous and bony marine fishes. Journal of Environmental Radioactivity 177, Oct., 266-279.

Narimane Dorey, Sophie Martin, François Oberhänsli, Jean-Louis Teyssié, Ross Jeffree, Thomas Lacoue-Labarthe (submitted). Ocean acidification modulates the incorporation of radio-labeled heavy metals in the larvae of the Mediterranean sea urchin *Paracentrotus lividus*.

**ANSTO Aquatic Ecosystems Research** (Tom Cresswell, [tom.cresswell@ansto.gov.au](mailto:tom.cresswell@ansto.gov.au))

### Update

ANSTO are involved in collaboration with the International Atomic Energy Agency (IAEA) to investigate how nuclear techniques can be used to better understand marine microplastic pollution and effects to biota. The collaboration includes researchers from Woods Hole Oceanographic Institute in Boston, the Heriot-Watt University and the University of Plymouth in the UK, Patras University in Greece and Université Libre de Bruxelles, Belgium. The project seeks to understand sorption/desorption kinetics of organic contaminants to plastic surfaces as well as generating information on the biokinetics of plastic particles within organisms. ANSTO will be involved in producing radiolabelled microplastic (polyethylene) beads, which will allow for studies to be conducted at ANSTO and in Europe to determine the gut retention time of microplastics to numerous organisms. The potential for microplastic bioaccumulation (e.g. uptake across epithelial membranes into internal organs) will also be explored for a range of marine organisms. The production and characterisation of a microplastic radiotracer will open opportunities for research in many areas including aquatic ecotoxicology, agricultural ecotoxicology and the human health field.



Using microplastic radiotracers, organisms are fed active microplastics once (pulse) then are radioanalysed regularly and the % of activity remaining in each animal after feeding on radioactive plastics is determined at each time point. Gut residence time (GRT) can be estimated from this data.

Tom Cresswell was part of the organising committee and presented at the BRITE (Biomarkers of Radiation In The Environment) advanced research workshop in Yerevan, Armenia from the 28<sup>th</sup>-30<sup>th</sup> November. The NATO funded workshop brought together leading international experts from ecology and radioecology to medical science and statistical modelling to evaluate currently available and developing radiation biomarker methods for environmental applications. The workshop aimed to establish the current state-of-the-art and advance the development of robust field-friendly biomarkers of radiation exposure of humans and the environment. The workshop also explored the practicalities of operationalising biomarker usage within NATO response strategies.

### New Publications

Cresswell, T., Metian, M., Golding, L. A. and Wood, M. D. (2017). Aquatic live animal radiotracing studies for ecotoxicological applications: Addressing fundamental methodological deficiencies. *Journal of Environmental Radioactivity*; **178-179**: 435-460 DOI: <https://doi.org/10.1016/j.jenvrad.2017.05.017>.

Cresswell, T., Mazumder, D., Callaghan, P. D., Nguyen, A., Corry, M. and Simpson, S. L. (2017). Metal transfer among organs following short- and long-term exposures using autoradiography: cadmium bioaccumulation by the freshwater prawn *Macrobrachium australiense*. *Environmental Science & Technology*; **51**(7): 4054-4060 DOI: <http://dx.doi.org/10.1021/acs.est.6b06471>.

Lanctôt, C. M., Cresswell, T., Callaghan, P. D. and Melvin, S. D. (2017). Bioaccumulation and biodistribution of selenium in metamorphosing tadpoles. *Environmental Science & Technology*; **51**(10): 5764-5773 DOI: <http://dx.doi.org/10.1021/acs.est.7b00300>.

Lanctôt, C. M., Melvin, S. D. and Cresswell, T. (2017). Selenium speciation influences bioaccumulation in *Limnodynastes peronii* tadpoles. *Aquatic Toxicology*; **187**: 1-8 DOI: <http://dx.doi.org/10.1016/j.aquatox.2017.03.009>.

**Australian National Project Team for the IAEA Regional Cooperative Agreement RAS 7028** (Advancing technologies for monitoring and analysis of the potential impact of radioactive releases from nuclear power plants (NPPs) in Asia-Pacific marine ecosystems following the Fukushima Daiichi accident):

Several members of the Australian National Project Team (IAEA RCA 7028) recently helped organise and conduct a successful IAEA Regional Training Course, 14-25 August, 2017, in Jakarta Indonesia. More than twenty students from eighteen different Austral-Asia-Pacific countries were provided with expert lectures & laboratory exercises on assessing radionuclides in environmental samples. The students learned details of Sampling planning, sampling, sample preparation, storage, and analysis. Courses were provided by Mat Johansen and Henk Heijnis (ANSTO), Ross Jeffree (Jeffree Environmental Research & Consulting), Sandra Sdraulig (ARPANSA). Additional project team members are Tom Cresswell (ANSTO), Pere Masque (Edith Cowan U.), Steve Tims (ANU), Megan Cook, Julia Carpenter and Marcus Grzechnik (ARPANSA).



*(Left) Ross Jeffree (Jeffree Environmental Research & Consulting) discussing fish dissection in preparation for radiological analysis.*

*(Right) Sandra Sdraulig (ARPANSA) discussing detection of Cs-137 in seawater.*

### **Studies at the former Montebello Island nuclear test sites**

Staff members from the Contaminant Impacts Programme, ANSTO, in collaboration with ARPANSA and the WA Parks and Wildlife Department, have initiated a series of studies at the former Montebello Island nuclear test sites, WA. Three nuclear tests were conducted at the Montebello Islands in the 1950s, including the first British test (“Hurricane,” aboard the ship HMS Plymouth) and the largest detonation (“Mosaic G2,” from a 30m tower on Alpha Island). Plutonium, uranium and other radionuclides of interest remain at elevated concentrations, and have potential to persist for thousands of years. Numerous “hot fallout particles” were formed during the tests, from which the release rates of bioavailable radionuclides are largely unknown, making it a challenge to predict biological uptake into the future. The degree to which actinides can accumulate in, and impact plants and animals at this marine site has both conservation (e.g. what are potential impacts to protected sea turtles nesting on contaminated Montebello beaches) and workplace safety implications (what PPE should researcher wear?).

Field work was performed in November 2015 and initial results were presented by Mathew Johansen at the International Conference on Radioecology and Environmental Radiation, September 2017, Berlin. While many samples have yet to be analysed, results so far indicate the activity concentrations from gamma emitters are decreasing, while the elevated levels of alpha emitters (e.g. Pu, Am) are persistent. Much of the activity is

contained within hot particles which can provide long-term ongoing sources. Understanding the chemical form of the particles, their sizes and structure, and their weathering rates are important to understanding dose rates at Montebello. The  $^{240/239}\text{Pu}$  isotope ratios are different for each of the 3 test sites, raising the potential to use Pu as a tracer for mobile/migrating species. Currently, ANSTO is processing the remaining samples with alpha-spectrometry and Accelerator Mass Spectrometry, as well as better defining hot particle characteristics using a range of tools including the Australian Synchrotron.



*Field work at the former Montebello nuclear test sites.*

**ANSTO Lithosphere Research** (Tim Payne, [Tim.Payne@ansto.gov.au](mailto:Tim.Payne@ansto.gov.au))

Tim Payne attended the 9<sup>th</sup> International Conference on Isotopes (9ICI) in Doha, Qatar, in November 2017. This is a broad ranging conference, with a number of isotope-related themes, including isotope production and nuclear medicine. One conference theme is on “Isotopes in the Environment”, and Tim helps to organise this component of the ICI conferences. The conference was very successful although impacted by political tension in the region which reduced the attendance significantly. During the conference the committee selected the host for the next ICI conference, which will be held in Malaysia (tentatively 3-7 February 2020).





*Members of 9ICI conference committee: From left: Bernard Ponsard (SCK-CEN), Tim Payne (ANSTO), Professor Ilham Al Qaradawi (University of Qatar); Van Zyl De Villiers (IAEA-NECSA), Paul Dickman (LLNL); Nigel Stephenson (partly obscured, WCI); Meera Venkatesh (IAEA); Myung-Chung Lee (KARA), Woo-Geun Song (WCI). Note: Some SPERA members may remember Paul Dickman from a recent SPERA conference held in Sydney, where he was an invited speaker.*



*Some participants of 9ICI in Qatar*

**Newcomers to the ANSTO Isotope Tracing In Natural Systems (ITNS) Radiochemistry Group** (Jay Chellappa; [jayc@ansto.gov.au](mailto:jayc@ansto.gov.au) and Sabika Maizm; [sbm@ansto.gov.au](mailto:sbm@ansto.gov.au) )

Jay CHELLAPPA joined the Isotope Tracing in Natural Systems (ITNS) at the Australian Nuclear Science and Technology Organisation (ANSTO) in September 2017.



At ANSTO-ITNS my role is to manage samples for gamma spectroscopy. This includes sample preparation and processing of data post counting. Low level radioactivity from soil, sediment and water is the main focus of the spectrometry. The laboratory has potential for six high purity germanium detectors and they cater to varied needs accounting the difference in shape and form of the samples. I find my role extremely interesting as it reveals the intensity and pattern of radioactivity in nature which in turn shows the pivotal clue to the bigger picture that client researchers are seeking. The challenge in ensuring the efficacy and validity of the spectroscopic methods adds to the interest of the profile of my role. Earlier experience in positron lifetime spectroscopy has built a familiarity that helps in understanding and applying the physics behind radioactivity and radiometric analysis. Acquiring knowledge of software and computing techniques that goes along with the spectrometry has a life of its own and has kept me engaged for days.

I also supervise students who come to our laboratory to process samples for various isotopes (e.g. Cs-137, Pb-210). I have enjoyed learning the new analytical techniques since joining ITNS. I look forward to meeting others in this field outside ANSTO and share our experience.

Sabika MAIZMA is an alpha spectrometry laboratory officer at Isotope Tracing in Natural Systems (ITNS), Australian Nuclear Science and Technology Organisation (ANSTO).



I have been at ANSTO for 8 years. I was initially employed at ANSTO Minerals as a laboratory technician, processing uranium orebodies samples to recover valuable metals such as copper, rare earths, cobalt, silver and gold.

At ANSTO ITNS, my role is to process samples for alpha spectrometry analysis to measure low level radioactivity in environmental samples such as soil, sediment and water. We have 40 alpha detectors which I operate. I also supervise students who come to our laboratory to process samples for lead-210 dating. I look forward to meeting other radiochemists through SPERA and share our experience.