

IRPS BULLETIN

Newsletter of the International Radiation Physics Society

Vol 28 Nos 2/3

September, 2014

ISRP-13

September 2015

now in:

Beijing

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IRPS BULLETIN : ISSN 1328533

Printing and postage of the Bulletin, and support for the IRPS web pages, are courtesy of the University of Canberra, Canberra, A.C.T, Australia

Internet Address : <http://www.canberra.edu.au/irps>

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From the Editors

Meetings, Meetings, Meetings!

*Come gather 'round scientists
Wherever you roam
And admit that the conferences
Around you have grown
And accept it that soon
You'll be informed to the bone
If your career to you
Is worth savin'
Then you better start presentin'
Or you'll sink like a stone
For the times they are a-changin'.
(With apologies to Bob Dylan.)*

Indeed! It is an exciting time to be a part of the International Radiation Physics Society, because times they are a-changin'...

The International Radiation Physics Society (IRPS) is now formally sponsoring and organizing three triennial (and temporally interlaced) international conferences related to various aspects and applications of radiation science. And at each of these meetings, we observe new members signing up. Indeed, *welcome* if this is your first issue of the IRPS Bulletin! For your orientation, our big-three sponsorships are:

- [1] the International Symposium on Radiation Physics (ISRP),
- [2] the International Topical Meeting on Industrial Radiation and Radioisotope Measurement Applications (IRRMA), and
- [3] the International Conference on Dosimetry and its Applications (ICDA).

At present, the calendar rotation looks like this:

2014 IRRMA-9 Valencia, Spain
2015 ISRP-13 Beijing, PRC
2016 ICDA-2 Guildford, UK
2017 IRRMA-10 Chicago, USA
and so it goes...

In addition, IRPS also endorses and/or publicizes other specialized or regional meetings and workshops of interest to our membership. A most

recent example was The European Conference on X-Ray Spectrometry, EXRS-2014 (Bologna, Italy, June 2014). Accordingly, in this "meetings, meetings, meetings" issue, conference chairs José Ródenas and Jorge E. Fernández (with possibly some helpful input) offer detailed reviews of IRRMA-9 and EXRS-2014, respectively. Our Vice President for Central and Eastern Europe reports on her participation at the second International Conference on Radiation Dosimetry in Various Field of Research (RAD2014) held in picturesque Niš, Serbia. Finally, we have news about ISRP-13, which has been highlighted with the cover art of this issue. The venue has been changed from Hefei to Beijing, PRC. It is thought that this will facilitate easier access for foreign participants. See within for the still-evolving details and exact dates offered by Zhiyun Pan and Ziyu Wu.

So while this issue of the Bulletin seems saturated with meetings, meetings, meetings, please stay tuned. This communiqué is often filled with technical content, spotlights on members and institutions, regional Vice President reports, *etc.* Recent back issues of the Bulletin are available here: <http://www.canberra.edu.au/irps/bulletin>.

As always, we encourage your input, editorials, news items, and other content in which our society could find shared interest.

Oh, excuse us now, got to run to a meeting!

Larry Hudson and Ron Tosh

President's Column

Dear Colleagues

At a recent meeting of the IRPS Council, there was a discussion on the range of activities that should be considered as part of the "territorial interests" of the International Radiation Physics Society, and about whether the name of our Society might need to be extended. The feeling of a need for a better definition of the range of scientific topics of special interest for our Society was raised again in informal discussions among the Council members present at the IRRMA-9 conference in Valencia at the beginning of July.

The original Constitution of our Society, formed nearly 30 years ago, interprets radiation physics in a relatively narrow sense:

"Radiation Physics is defined as the branch of science which deals with the physical aspects of interactions of ionizing radiations (both electromagnetic and particulate) with matter."

This definition shifts our thinking from the question: "What is radiation physics?" to the question: "What are the physical aspects?" and raises another question: "Is interaction of ionising radiations with matter the sole subject of radiation physics?"

The Book of Abstracts from the 3rd International Symposium on Radiation Physics in Ferrara in 1985, at which the Society was established, was divided into 8 sections:

1. Cross section for interactions between radiation and matter, and other physical parameters characterizing the primary events induced by radiation in matter.
2. Radiation transport.
3. Properties, planning and preparation of radiation sources.
4. Properties and realization of radiation detectors.
5. Radiation physics in fundamental research.

6. Radiation physics in biomedicine and environmental science.
7. Radiation physics in technology and energy research.
8. Radiation physics teaching at the university level.

Some of these sections, and also some of the topics covered in the papers, do not in fact deal with "interactions with matter". Some sections and papers correspond to the definition in the Constitution of our Society, some go beyond this definition, and some even explicitly connect radiation physics with branches of radiation sciences often considered to be independent (*cf.* Gudrun Alm Carlsson: Radiation Dosimetry - A Branch of Radiation Physics).

The discussions about the IRRMA group (which is associated with the International Topical Meetings on Industrial Radiation and Radioisotope Measurement Application) joining our Society, have raised the question of whether applications of radiation and radioisotope measurements form a part of radiation physics. Similar questions were raised in the past in the discussions of whether our Society should be involved in establishing a series of conferences on dosimetry and its applications.

Clearly, the range of professional interests of the members of our Society and of all colleagues attending our conferences and collaborating with the Society is very broad. It reflects increasing knowledge on properties of radiation, the spectrum of methods for measuring and applying radiation, increasing use of radiation even in such apparently distant disciplines as medical diagnostics and therapy, archaeology and art history, crime detection and attempts to prevent terrorism.

Science and engineering have become increasingly multidisciplinary. Various branches or fields have interpenetrated, blurring the differences between fundamental and applied research, and our Society should reflect these tendencies. There are no

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President's Column Continued :

clearly-defined boundaries between scientific disciplines - any effort to define exactly what is and what is not radiation physics is not only a waste of energy, but also counterproductive, as developments at and beyond the edges of traditional disciplines are often of particular interest, and may be particularly innovative.

In my opinion, we should not even attempt to distinguish between fundamental and applied research. We should accept a wide concept of radiation physics, and take under the roof of our Society the wide range of radiation sciences, from radiation production, through fundamental research on physical aspects of radiation, radiation

measurements and applications, biological effects and their impact upon medicine, dosimetry, environmental radiation, radiation protection, *etc.*

We should therefore cordially welcome the interest of the IRRMA group in joining our Society. Recent IRRMA meetings have become an integral part of our Society's activities and this engagement with our Society will continue in future. In this context, let me point out further upcoming conferences co-organised by our Society:

2015 - ISRP-13, in Beijing (China)

2016 - ICDA-2, in Guildford (UK)

2017 - IRRMA-10, in Chicago (USA)

Ladislav Musilek

New Memberships, Membership Renewals

Membership form for new members, and details for payments by cheque for new and renewing members are on the last 2 pages of this journal and information for payment by credit card is below

If you are unsure when your renewal is due, contact

Elaine Ryan

email: elaine.ryan@sydney.edu.au

Membership Payments by Credit Card

Internet payments by credit card (Visa, Mastercard, AMEX, Discover) can be made via the IRPS website

<http://www.canberra.edu.au/irps>

You do not need a PayPal account to use this method of payment

Go to the Home Page on our website (as above)
click on Membership, scroll down to the selection of buttons and click on the one that suits your membership.

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Report from the RAD 2014 Conference

Ines Krajcar Bronić,
Goran Ristić, Jugoslav Karamarković



The Second International Conference on Radiation Dosimetry in Various Field of Research - shortly named RAD 2014 - was held from May 27 to May 30, 2014, in the city of Niš, Serbia. The chairman of the Organizing Committee was Goran Ristić, from the Applied Physics Laboratory (APL) at the Faculty of Electronic Engineering, University of Niš.

The conference was organized two years after the first one, which was very successfully organized within the FP7 project RADDOS supported by the European Commission. The First International Conference on Radiation and Dosimetry in Various Fields of Research (RAD 2012) was organized by the Faculty of Electronic Engineering in cooperation with Tyndall National Institute, Ireland, and Jožef Stefan Institute, Slovenia, and held in Niš from April 25-27, 2012. RAD 2012 attracted about 150 participants from 30 countries.

The aim of RAD 2014 conference was to provide a forum for researchers and professionals involved with radiation and radiation dosimetry to exchange and discuss their findings and experiences. The fields covered by the Conference were physics, electronics, medicine, biology, chemistry, environmental protection, and other areas related to ionizing and nonionizing radiation and their detection.

As a satellite meeting to RAD 2014 conference, the Second East European Radon Symposium

(SEERAS) was held at the same time and the same place and was co-chaired by Zora S. Žunić and Goran Ristić. The main goal of SEERAS was to promote continued development and to review and discuss recent achievements in the study of radon and thoron in different environmental circumstances, particularly within the Eastern European countries. When exchanging information through the presentation and discussion of papers dealing with all topics, these subjects can improve radiological protection of humans and the environment.

Having in mind that this was only the second conference, it was amazing that there were about 500 received abstracts and about 300 participants from almost 50 countries for both the main conference RAD 2014 and the satellite meeting SEERAS. The distribution of the number of received abstracts per country of current working position of the corresponding author is shown in *Figure 1*.

The Conference program included topical invited lectures (*Figure 2*), limited number of oral presentations, and poster presentations (*Figure 3*). Plenary talks were devoted to dosimetry standards in medical radiation dosimetry (talk by Ahmed Meghzifene, IAEA), re-evaluation of dose and dose rate effectiveness factor by using archival animal databases (Gayle Woloschak, USA), advanced semiconductor dosimetry in radiation therapy (Anatoly Rozenfeld, Australia),

../Continued

statistical and biological significance in hypothesis testing (Iveta Waczulikova, Slovakia), application of metal-oxide-semiconductor structures containing silicon nanocrystals in radiation dosimetry (Diana Nesheve-Slavova, Bulgaria), and management of patients with differentiated thyroid carcinoma

with ¹³¹I (Jasna Mihailović, Serbia). There was also a special talk by Goran Đorđević (Serbia and European Physical Society EPS) about integration of the physics community in CEI (Central European Initiative, <http://www.cei.int>) countries into the ERA (European Research Area).

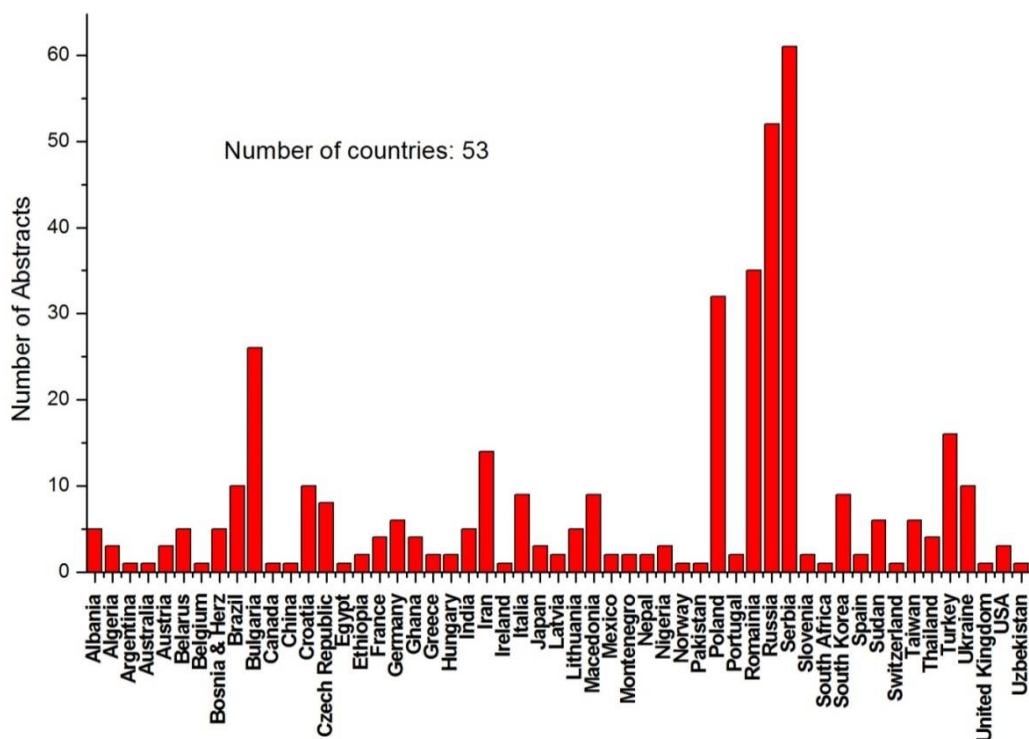


Figure 1. Distribution of the number of abstracts submitted for RAD 2014 and SEERAS conferences per country.



Figure 2. The opening ceremony and invited talk sessions were held in a large auditorium

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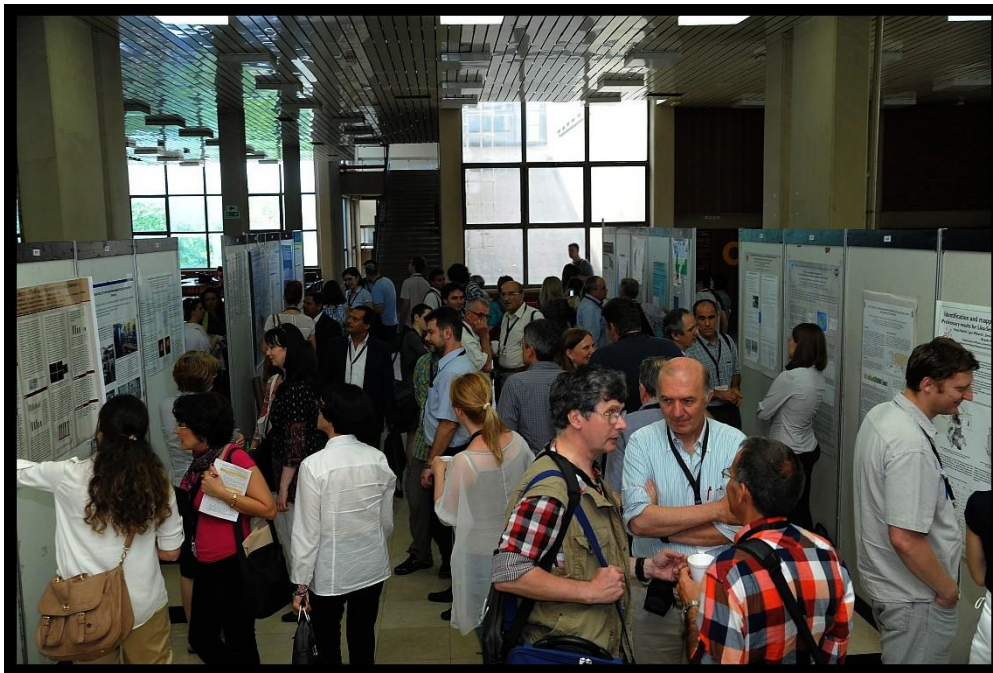


Figure 3. Interesting posters attracted a large number of participants to a poster area

The main part of the RAD 2014 conference was devoted to oral and poster presentations grouped into several main topics: radiation physics (5 oral and 10 poster presentations), radiation chemistry (7 posters), radiobiology and radiation effects (16 oral and 14 posters), medical use and pharmacological aspects of radiation (13 posters), radioecology (7 oral, 31 posters), radiation protection (12 oral, 24 posters), radiation measurements (20 oral, 31 posters), radiation detectors (10 oral, 11 posters), neutron radiation and space radiation (5 oral and 17 posters), medical imaging and medical physics (6 oral, 19 posters), non-ionizing radiation (5 oral, 15 posters), biomedicine (6 oral, 5 posters), biomedical engineering (5 posters), biophysics (6 oral), biochemistry (4 posters). Altogether, about 100 oral contributions and about 200 posters were presented at RAD 2014 and 40 oral and 40 posters at SEERAS.

The Book of Abstracts containing all abstracts submitted for both RAD 2014 and SEERAS meeting was published before the conference as hard copy, while the Proceedings were distributed in electronic versions on USB drives. Participants had also an opportunity to publish papers (after the usual reviewing process) in prestigious scientific journals, such as Central European Journal of Physics, Central

European Journal of Chemistry, Central European Journal of Biology and Radiation Protection Dosimetry.

The RAD conference gives three awards - for the best oral, best poster and best student contribution based on the marks given by the chairperson of the corresponding session. In the final decision-making, the advantage is given to authors who submitted full papers. The award consists of a plaque, and the winner is exempt from paying the fee for the next conference at which the award is received.

RAD 2014 Conference is sponsored and funded by the International Union of Pure and Applied Physics, Central European Initiative (CEI), Ministry of Education and Technological Development of the Republic of Serbia, Landauer Europe, and Regional Cooperative Agreement (RCA).

The conference and symposium also included a technical exhibition of the following companies - Landauer Europe, Regional Cooperative Agreement (RCA), Baltic Scientific Instruments (BSI), Canberra Packard, Orthoaid, SARAD GmbH, and RadPro International GmbH.

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An optional intercomparison exercise for outdoor active detector measurements was organized on the last day of the SEERAS symposium at appropriate field sites in Niška Banja (The Spa of Niš). This was a full-day measurement organize and performed from the early morning until the late evening hours (Figure 4). There were eleven teams with about 30 participants in total.A



Figure 4. One sequence of the intercomparison field measurement exercise

The conference offered excellent opportunities for socializing. On the day of arrival and registration, a welcome reception was held at the Faculty of Electronic Engineering.

The cocktail party of the first official day was held in Atrium of the University of Niš (Figure 5), while the cocktail reception of the second day was held in The Grand Hotel, Niš.

In the afternoon of the second day an excursion to the Roman complex called Felix Romuliana (Figure 6), one of the most important late Roman sites in Europe, was organized.

The social highlight of the conference was the gala dinner held in the evening of the third day in a famous national restaurant. Not to forget, after the talks and posters on the last day of the conference a farewell party was organized.

All receptions, and especially the gala dinner, offered a great variety of national and regional specialties, and everyone was able to find something to enjoy. Each evening gathering was accompanied by local musicians who demonstrated their skills and talents.

More details of the conference, and extensive photo gallery can be found at the internet address

<http://www.rad2014.elfak.rg/>



Figure 5 Cocktail party in the Atrium of the University of Niš

../Continued



Figure 6. RAD 2014 and SEERAS participants during the excursion to the Roman complex Felix Romuliana

The International Radiation Physics Society was also present at the RAD 2014: the Executive Council and the conference organizers agreed to display IRPS posters at the conference site (Figure 7) and distribute the Registration forms for those who are interested in joining the Society.



Figure 7. Goran Ristić, the Chairman of the RAD 2014 Conference (right), Jugoslav Karamarković (left) and I. Krajcar Bronić (IRPS Vice-President for Eastern and Central Europe) in front of IRPS poster

Report on EXRS 2014

On behalf of The Organising Committee

Jorge E. Fernandez

Chair EXRS-2014

The European Conference on X-Ray Spectrometry (EXRS-2014) was organized in Bologna 15-20 June 2014, hosted by Alma Mater Studiorum University of Bologna, founded in 1088, the first university of the western world. The conference site was "Belmeloro Complex", a modern and dedicated facility in the heart of the university district.

EXRS-2014 was the 16th of a series of traditional meetings planned with the purpose of bringing together scientists and engineers from around the world who share an interest in x-ray spectrometry or in one of the several related techniques: X-ray fluorescence (conventional, micro-fluorescence, synchrotron-based and total-reflection), electron microprobe, PIXE, *etc.* This Conference series started in Goteborg (1984, 1986) and continued in Vienna, Antwerp, Mykonos, Budapest, Lisbon, Bologna, Krakow, Berlin, Alghero, Paris, Dubrovnik, Figueira da Foz and Vienna.

EXRS-2014 represented an exciting discussion forum for basic research and applications of x-ray spectrometry in a rich variety of fields like materials science, chemistry (analysis of materials, quantification), radiation physics, medicine (medical physics, medical imaging), biology, environment, cultural heritage, technology and industry.

The great vitality of this area of knowledge was apparent from the 323 presentations given by more than 300 authors coming from 49 countries in 16 topical areas. The intense scientific programme of the Conference was made lighter thanks to the excellent level of the 16 invited speakers who offered sound lectures on the relevant topics of their expertise:

- **J.L. (Iain) Campbell**, University of Guelph, Canada (keynote talk)
"XRF and PIXE on the Mars Science Lab Curiosity rover"
- **Chris Chantler**, University of Melbourne, Australia
"X-ray Spectroscopic Advances in Atomic and Condensed Interactions of X-rays with matter"
- **Jose Maria Fernandez-Varea**, University of Barcelona, Spain
"Ionization of K and L shells by 10-100 keV electrons"
- **Mauro Guerra**, University of Lisbon, Portugal
"Absolute measurements of X-ray standards and plasma parameters in highly charged ion plasmas with a double crystal spectrometer"
- **Richard Hugtenburg**, Swansea University, UK
"Transmission Dosimetry via MAPS-based Event Discrimination in a Therapeutic LINAC"
- **Koen Janssens**, University of Antwerp, Belgium
"The use of MA-XRF for better understanding the paint layer buildup in the two donor portraits of 'Adoration of the Mystic Lamb' (1430-1432) by Jan and Hubert Van Eyre"
- **Chris Jeynes**, University of Surrey, UK
"Particle-induced X-ray emission as a crucial element of the Total IBA technique for traceable accuracy in thin film depth profiling of complex samples"
- **Birgit Kanngießer**, TU Berlin, Germany
"From synchrotron into the lab - the transfer of modern X-ray methods from synchrotron sources into the BLIX-laboratory"

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- **Jun Kawai**, Kyoto University, Japan
"Smaller the Better --- Palm-Top Electron Probe X-ray Microanalyzer, Portable TXRF and Portable X-ray Reflectometer"
- **Andreas Nutsch**, Physikalisch-Technische Bundesanstalt, Germany "X-Ray Spectrometry - Applications for Nano Electronics and Life science Industry"
- **János Osán**, KFKI Atomic Energy Research Institute, Hungary "X-ray spectrometry investigation of radionuclide uptake on argillaceous rocks"
- **Giancarlo Pepponi**, FBK, Trento, Italy
"Modelling Grazing Incidence X-Ray Fluorescence Analyses"
- **Kenji Sakurai**, National Institute for Materials Science & University of Tsukuba, Japan "Realtime X-ray analysis of buried layers and interfaces"
- **Dimosthenis Sokaras**, Stanford Synchrotron Radiation Lightsource - SLAC, USA
"Advances in High Energy Resolution X-ray Spectroscopy at SSRL and LCLS"
- **Laszlo Vincze**, Ghent University, Belgium
"Scanning versus full-field X-Ray Fluorescence and Absorption Microspectroscopy using synchrotron radiation"
- **Ziyu Wu**, National Synchrotron Radiation Laboratory, Hefei, China
"New promising electrode materials for next generation batteries: a X-ray absorption spectroscopy investigation"

The other reports were communicated and discussed as oral presentations or posters. The scientific level of the presentations was high, as evidenced by the sustained interest and enthusiastic participation of the delegates to the topical sessions. The perfect synchronization of the intense scientific program in parallel sessions was possible thanks to the strict control of the timing kept by the chair persons.

A selection of the presentations will be published in special issues of the international journal X-Ray Spectrometry.

A special exhibition of scientific equipment and materials (*Photo 2 on page ...*) was organized during the Conference and was attended by 24 sponsoring companies: Ametek srl - AMT ORTEC Division; AMPTEK Inc.; BrightSpec NV/SA; Bruker; CANBERRA; Claisse Europe; Elvatech; Excillum; GNR Analytical Instruments Group; Helmut Fischer; Hitachi High-Tech Science Corporation; HSFoils; KETEK; Moxtek; PNDetector GmbH; PNSensor GmbH; Quantum Detectors; Rigaku Europe SE; SGX Sensortech; SPEX CertiPrep Ltd.; Thermo Scientific; XGLab SRL; XOS; and X-Ray Instrumentation Associates.

Besides the intense academic programme, an active four-day programme with social activities was organised for participants and accompanying persons. Delegates attended the Welcome Mixer (Sunday 15th), the Concert (Tuesday 17th), and the Banquet Dinner (Thursday 19th) in three different attractive settings in Bologna. A guided cultural tour to Ravenna was also organised (Wednesday 18th).

The Conference was the occasion for several awards.

- The journal *Applied Radiation and Isotopes* (Elsevier) awarded Professor J.L. (Iain) Campbell with the JARI Medal Award and Dr. Joanna Hoszowska with the 2014 JARI Enterprise Award.
- The European X-Ray Spectrometry Association (EXSA) awarded Dr. Matthias Alfeld with 2014 year's Young PhD Award in X-ray Spectrometry; Dr. Beatrix Pollakowski with 2014 year's Young post-doc Award in X-ray Spectrometry and Professor Alex von Bohlen with the Outstanding Career Award in X-ray Spectrometry.
- The journal X-Ray Spectrometry (John Wiley & Sons) awarded Professor Ziga Smit with the XRS Best Referee Award.

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- Best Poster Awards of EXRS-2014 were assigned to: "The nuclear e-ecology remote laboratory: the lesson on heavy metal levels in roadside plants using XRF technique for school pupils", by Punsiri Dam-O (1st Prize); "Intercomparison of three confocal micro X-ray fluorescence (CXRF) systems for the non-destructive characterization of experimental paint layers", by Laclavetine Kilian, Wrobel Pawel, Ager F.J., Arquillo J., Calligaro T., Eveno M., Lankosz M., Müller K., Reiche I., Respaldiza M.A. and Menu M (2nd Prize); and "High resolution Scanning Transmission Soft X-ray microscopy for rapid probing of nanoparticle distribution and sufferance features in exposed cells", by George Kourousias, Lorella Pascolo, Jessica Ponti, Giacomo Ceccone, Maya Kiskinova and Alessandra Gianoncelli (3rd Prize).

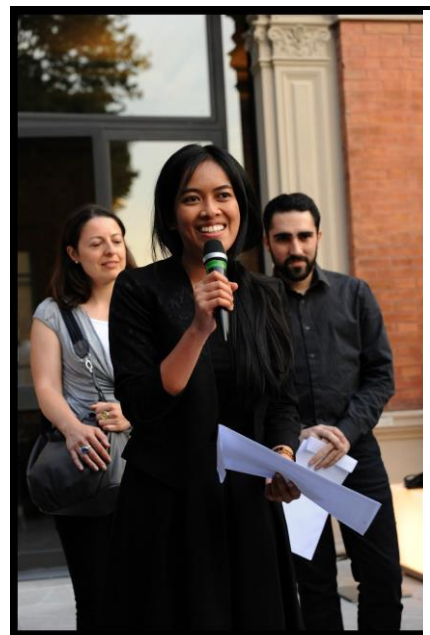
The organisers acknowledge the support and assistance from all the sponsors and exhibitors, especially the University of Bologna for granting the use of the conference site, the Department of Industrial Engineering (DIN) of the University of Bologna for financial support; the European X-Ray Spectrometry Association (EXSA) for sponsoring the participation of 10 young scientists, the International Radiation Physics Society (IRPS) for funding the Best Poster Award, and "Fondazione Cassa di Risparmio in Bologna/la Museo della Città di Bologna" for granting the use of Santa Cristina Church. Finally the organisers thank Fondazione Alma Mater for their assistance in the organization of this event.

Additional information can be found on the web site exrs2014.ing.unibo.it, still active.

Some photos from EXRS-14 below



The main hall during the presentation by Giancarlo Pepponi



Best poster awards. First prize winner Punsiri Dam-O speaking to the audience.



The sponsors' exhibition in the corridors

Mars Lander Physicist, Professor Iain (J.L.) Campbell, is awarded the JARI Medal

The Elsevier journal, Applied Radiation and Isotopes, periodically awards its JARI Medal to senior scientists in recognition of outstanding contribution in the fields of radiation physics and radiochemistry. The medal was established in 1980, when the Journal was published by Pergamon Press, and over the years the Medal has been awarded on 12 separate occasions, including most recently at the European Conference on X-ray Spectrometry (EXRS-2014) held in Bologna in June, 2014, when the Medal was presented to Prof. Iain (J.L.) Campbell.



Presentation of the JARI Medal
to Prof. Campbell by Dr Richard Hugtenburg,
Editor-in-Chief of Applied Radiation and
Isotopes, at EXRS-2014, in Bologna.

The JARI medal was awarded on its first occasion to an auspicious team of researchers, that of Purser, Litherland and Gove, who provided the first demonstration of the detection of exquisitely minute quantities of the isotope ^{14}C with an accelerator mass-spectrometer (AMS). Like Prof. Campbell, "Ted" Litherland was of British origins, working most of his career in Canada, and ultimately extremely

international in his impact.

The JARI Medal has been awarded to Prof. Campbell in recognition of his contribution to the science of X-ray and particle fluorescence spectrometry, including his substantial contribution to the design and subsequent analysis of data generated by the PIXE instrumentation used in the Mars lander programmes. His efforts culminated in the high-profile discovery of a method for extracting the 'invisible' bound-water content in Martian rock. His contributions therefore have had a positive impact on the public perception of physics and physicists, in the way that the Mars-lander programme captures our imagination. Prof Campbell took a potentially dry science and gave it the water of crystallisation.

In his early work Prof. Campbell led on the construction of Canada's first scanning proton microprobe publishing extensively on analysis of sulfide ore deposits and more recently in the development of the widely used GUPIX and the GUAPX codes and their well-regarded software training schools. His broad scholarship continues unabated with his recent appointment to the editorial board of the journal of X-Ray Spectrometry.

Other recent recipients include Prof. David Taylor, for renown in the field of actinide chemistry, and to Prof. David Bradley, for his pioneering use of small-angle X-ray scattering in the characterisation of tissue. As has been typical of the Medal recipients, their contributions to the health and wealth of the field have been broad and substantial. Prof. Taylor and Prof. Bradley, along with Prof. John Hubbell, awarded the Medal posthumously in 2007, are previous Editors-in-Chief of the Journal.

* * * * *

The full list of previous recipients are as follows:

- | | |
|------------------------------|--|
| 2014: Iain (J.L.) Campbell | 1995: Prof. William L. McLaughlin |
| 2012: Prof. David Taylor | 1992: Dr. Jörg W. Müller |
| 2011: Dr. Ronald Collé | 1990: Dr. Syed Muhammad Qaim |
| 2009: Dr. David Bradley | 1988: Dr. Wilfred B. Mann |
| 2007: Prof. John Hubbell | 1986: Dr. Alfred P. Wolf |
| 2006: Prof. Richard H. Pratt | 1980: Prof. K.H Purser, Prof. A. E. Litherland and Prof. H.E. Gove |

Report on IRRMA-9

9th International Topical Meeting on Industrial Radiation and Radioisotope Measurement Applications

José Ródenas



UNIVERSITAT
POLITÈCNICA
DE VALÈNCIA



Attendees at IRRMA-9

The **IRRMA-9** Meeting (<http://irrma-9.webs.upv.es>) was held at the Paraninfo of the UPV (**Universidad Politècnica de Valencia**), on the Vera Campus from 6 to 11 July 2014. Approximately 200 attendees came from 30 different countries.

On **Sunday 6th** there was a **Welcome Party** at the terrace of the Hotel Astoria Palace. More than 100 people attended the party enjoying the beautiful views of the old city from the terrace.

On **Monday 7th**, after the **Opening** of the Conference by the **Rector of the UPV**, the session began at 9:30 with the presentation of the invited lecture given by Prof. **Patrick Regan**, University of Surrey, UK, entitled "*Precision Sub-Nanosecond Lifetime Measurements of Excited States for Some 'Interesting' Nuclei*". Precision measurements

of electromagnetic transition rates provide inputs into nuclear data evaluations and are used to test and validate predictions of state-of-the-art nuclear structure models. The lecture presented examples of recent precision measurements using a combined LaBr_3 —HPGe array. The presentation also discusses the ongoing development of a new LaBr_3 -based multi-detector gamma-ray spectrometry coincidence array.

The morning session on the topic **Radiation Sources and Measurements for Applications** was chaired by Prof. **David A. Bradley**, and seven oral lectures were given covering different aspects and uses of experimental measurements of radiation sources. *Dose distribution measurements around the microbeam white X-rays* (N. Nariyama). This work is focused on measuring the distribution

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around the microbeam in air with new GafChromic films and with a multi-ring parallel-plate ionization chamber. Both measures are compared with Monte Carlo simulations. A good agreement is observed. *Measurement of the absolute gamma emission probabilities of ^{223}Ra and decay progeny in equilibrium* (S. M. Collins). Recently, ^{223}Ra chloride has been used successfully in clinical trials for the treatment of skeletal metastases caused by prostate cancer. Accurate nuclear data are required for modelling the dose delivered to the patient and tumor for the most effective treatment plans. *An Analytical Approach for Treating Background in Spectral Analysis Measurements* (Thomas W. Holmes). Experimental determination of background in spectral analysis measurements is usually very difficult due to problems in collecting and due to the fact that materials can alter the background itself. One approach to the problem makes use of the residuals from the library least-squares when the libraries of the SNM or radioisotopes of interest can be obtained either by experiment or calculations. *Radiological measures acquired and lessons learned by the Radiological Emergency Network of Extremadura in the international exercise CURIEX 2013* (J.A. Corbacho). In this work, the experience of authors in their participation in the international exercise CURIEX 2013 is explained. It is concluded that for nuclear emergencies with requirements of reliability, speed of response and consistency of the recorded data (as required in CURIEX), both LML (LARUEX's Mobile Laboratory) and RARE (Radiological Emergency Network of Extremadura) ground stations have good capabilities and versatility. *Microbial biofilm study by Synchrotron X-ray Microscopy* (S. Pennafirme). The goal of this work is to find, isolate and cultivate bacteria consortium from mangrove's sediment, test its resistance to zinc at 50 mg/l and observe whether its biofilm sequestered the metal, as well the spatial distribution of the metal within the biofilm, using synchrotron X-ray fluorescence microscopy. *Interlaboratory comparison (ILC) on ^{137}Cs activity concentration in fume dust* (F. Tzika). The ILC was conducted in the framework of a EMRP (European Metrology Research Program) project "MetroMetal". Results of the ILC will be used for

the certification of the activity of the fume dust reference standard. *An overview of measurements of radionuclides in foods of the Comunidad Valenciana (Spain)* (L. Ballesteros). Environmental radioactivity monitoring includes determination of radionuclides in foods because they are an important way of intake to the human organism. Samples of fruits, cereals, vegetables, milk, etc have been analyzed. The paper discusses the preparation of samples, analysis and results obtained from 1991 to 2013.

The **Poster Session 1** included posters corresponding to three topics: **Dosimetry and detector applications** (22 posters); **Applications to archaeometry, art and cultural heritage** (10 posters); and **Radiation effects on materials** (3 posters). This poster session was a success in the view of the attendees. In general, the posters exhibited a high technical level. The participation of young researchers was enhanced by means of an award to students.

In the session of Monday afternoon, devoted to **Industrial Applications of Radiation** (chairman **Larry Hudson**), an invited lecture entitled "*Analysis of Precious Metals at Parts-per-Billion Levels in Industrial Applications*" was given by Dr. **James Tickner**. Precious metals are mined commercially at concentrations of a few parts-per-million. Mineral exploration, mine control, etc, demand sensitive and rapid analysis at concentrations down to 100 parts-per-billion (ppb) and below. The presentation discusses two technologies being developed by CSIRO Process Science and Engineering to meet this challenge.

The session continued with four lectures analyzing relevant topics, such as production of radioisotopes, effects of radiation in some materials used in industry, applications of radiation in food preservation and NORM. *Progress towards the production of ^{236}gNp standard sources* (C. Larijani). ^{236}gNp is a good candidate for neptunium yield tracer meaning that it is useable for both radiometric and mass spectrometric measurements. In this paper, authors examine the options for the production of ^{236}gNp ,

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A comprehensive investigation of chemical, mechanical and acoustic modifications in wood treated with high doses of gamma radiation for sterilization (G. Ricci). Large radiation doses might have adverse effects on desirable properties of wood. The aim of this work is to determine the effect on acoustic, chemical and mechanical characteristics of interest when wood is irradiated. One of the conclusions of this work is that acoustic tests reveal a shift toward higher frequencies of all the vibration modes for all the wood species investigated, leading to the realization that irradiation with high doses is bound to affect the way instruments sound.

Ionizing Radiation Applications for a Sustainable Environment: Food Preservation Processing by Gamma Radiation (A. L. Antonio). A brief overview of technical aspects regarding dosimetry and dosimetric systems, the physicochemical effects of gamma irradiation on post-harvest processed chestnut fruits, comments on consumers' acceptance and prospects for future uses.

Application of gamma-ray spectrometry in a NORM industry for its radiometrical characterization (J. Mantero). The assessment of the potential radiological risk for workers or natural environment is important in NORM/TENORM industries. In this work an experimental and semi-empirical method of self-absorption correction were applied to NORM samples, in order to establish the best practice in relation to the circumstances of an individual laboratory.

Two sessions on **Tuesday 8th** morning were devoted to **Dosimetry and Detector Applications**. The first session chaired by Prof. **William L. Dunn** started with an interesting and impressive invited lecture given by Prof. **Douglas S. McGregor**: *Microstructured Semiconductor Neutron Detectors*, where he presented a review of the evolution and state of the art on semiconductor neutron detectors.

Seven works were presented in this session and six more after coffee break in the 2nd session chaired by Prof. **François Tondeur**.

Presentations showed a wide range of radiation measurement techniques, mainly for neutrons and

gamma spectrometry. A great number of presentations were centered on different materials for dosimeters, such as Fricke gel dosimeters, Ge-doped optical fiber, MgB₄O₇ and Li₂B₄O₇ thermoluminescent dosimeters by proteic sol-gel, etc.

Cerium Bromide scintillators and Neutron Activation Metal Detectors were also the centre of some presentations. Finally, a Whole Body Counter contamination technique was presented.

The presentation of D. A. Bradley, (University of Surrey) about *Optical Fibers by Fabricating a Novel Microstructured Fiber* should be underlined. He gave a most interesting presentation explaining in detail how to use optic fiber for personal dosimetry in radiotherapy and some of its benefits and advantages from traditional TLD.

Without a doubt, the scientific community is focusing many of its efforts on improving the benefits and technical characteristics of actual personal dosimetry systems.

Poster Session 2 was very well attended.. Topics of this poster session were **Industrial Applications of Radiations** and **Monte Carlo Methods and Applications**.

Poster authors, other attendees and reviewers visited the various posters with interest, while people talked amicably.. The jury members were also in the session, focusing their interest on posters of students with the option to win the award, asking them about their work.

After the lunch break, an invited lecture *Fricke-gel dosimetry in epithermal or thermal neutron beams of a research reactor* was given by Prof. **Grazia Gambarini**, from the Università degli Studi di Milano and INFN in Italy, presenting a Fricke-gel (various models) detector which allows discrimination of thermal and epithermal neutrons, both of which are present in research reactors.

The last session of the day, chaired by Dr. **James Tickner**, was devoted to **Radiation Shielding**. There were five oral presentations of different

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applications and situations where an exhaustive analysis of shielding was necessary. Some calculations were based on Monte Carlo studies, others on pre-calculated library estimations.

To finish the day, as part of the **Social Program**, an amazing **concert** was organized at the Auditorium Alfons Roig of the UPV, where the **CHERNE Jazz Quartet** thrilled the audience with its music and magical performance.

On **Wednesday 9th** of July there were two morning sessions, both devoted to **Monte Carlo Methods and Applications**. The first session, chaired by Dr. **Pedro Vaz**, started with the invited lecture given by Prof. **Robin P. Gardner** from North Carolina State University. Prof. Gardner spoke about the use of Monte Carlo simulations and the variance reduction techniques, like the weight windows, for neutron transport, under the watchful gaze of the audience.

The plenary session continued with contributed oral presentations. Two presentations should be highlighted: *'Monte Carlo calculation of the spatial response of a scintillation flat panel and comparison to experimental results'* by Belen Juste in which a validation of the response of MCNP5 flat panel model with experimental measurements was done, taking into account the transport of photons in the optical range; and *'Uncertainty analysis in environmental radioactivity measurements using the Monte Carlo code MCNP5'* by Sergio Gallardo, about the usefulness of the MC codes to complement the experimental measurements in the HPGe detector calibration procedure, as well as an uncertainty analysis of the efficiency curve of the HPGe detector.

In the second session, chaired by Prof. **Domiziano Mostacci**, some presentations should be remarked upon: *'Generalised Perturbation Method for Instrument Evaluation and Optimisation using Monte Carlo transport'* in which the author, James Tickner, explained the tool to make a sensitivity analysis by means of the perturbed simulations of the base case; *'Monte Carlo study of the thyroid structural and morphological effects on Iodine spectra measured by X-ray spectrometry'* by

Fausto Pozuelo, in which a method is explained to measure the iodine concentration in the thyroid using CdTe detectors and a parametric study of morphological effects using MC simulations; and finally *'Using lattice tools for improving the HPGe detector efficiency simulation with the Monte Carlo code MCNP5'*, where Andrea Querol presents a lattice technique for improving the agreement between the measurements and the MC simulation in the HPGe detector calibration.

The **Poster Session 3** included three topics: **Radiation Sources and Measurements for Applications, Radiation Shielding and Radiation Protection**. The session was again well attended and the dialog flowed among those present in the room.

In the evening, the **Social Program** of the conference offered an **excursion** to the **Albufera Lake**. Participants enjoyed observing the biodiversity in a boat trip through the lake. Afterwards, they tasted *Spanish Tapas* in an informal dinner setting.

Thursday 10th began with an invited lecture by Dr. **Pedro Vaz**: *The radiological Protection, Safety and Security Issues in the Industrial and Medical Applications of Radiation Sources*. Prof. W. Dunn asked about limiting the use on industrial and medical sources. The Session chaired by Prof. **Ladislav Musilek** had 8 presentations, 5 regarding **Radiation Protection** and 3 for **Detection of Threat Material and Contraband**: for the first three given by S. Xiao, Y. Huang and E. Tomarchio, respectively, there were no questions. Next presentation given by Prof. Domiziano Mostacci, *Radiological risk from Thoron : a case study: the particularly radon-prone area of Bolsena, and the lesson learned*, was of interest for some people. Prof. Tondeur said that dose results were so high. They concluded that the work should be meliorated. *Evaluating Imaging Performance of Security X-Ray Systems* by L. Hudson concluded with a question of unconventional pixel, like not rectangular, could be better for this work. Next presentation by W Dunn about *Fast Neutron Interrogation* had one question regarding an optimization procedure, being asked as not applied in this study.

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The second Session of the day, chaired by Prof. **Robin Gardner** started with an invited lecture by Prof. **Marios Anagnostakis** about *Environmental Radioactivity Measurements and Applications*.

Four oral contributed talks followed: A Bajoga on *Anthropogenic Radioactivity in Kuwait*, was pointed out by Professor Anagnostakis, who clarified that Radium graphs had not enough points to be statistically significant and that U-235 contributions were not taken into account. *Radiactivity of Coal and Charcoal* was the issue of presentation by P. Rubio-Montero. The third presentation was about the *IAEA Initiatives on Environmental Remediation*, by Sunil Sabharwal. Some members of the public had some discussion on the security of large sources. T. Santos presented the last lecture, on *Brazilian Underground Mines Radionuclides*.

After the **Poster Session 4** and the lunch break, the afternoon Session (Chairman Prof. **Sergio Gallardo**) introduced the invited lecture by Dr. **Hugo Schelin**, which dealt with *Radiation Dose Measurements in Pediatric Radiology*. Four oral contributed lectures on **Biological and Medical Applications of Radiation** completed the session. S. Mokri talked about *Hybrid registration of PET/CT in Thoracic Region*. Next lecture was given by F. Mostafaei on In-vivo Quantification of Gadolinium. A question regarding the increase of gadolinium into the body was addressed. Third presentation was done by Hedi Mohseni which elaborated on a *Pilot Study Measuring Al in Bone in Alzheimer's Subjects*. A couple of questions on the maximum neutron activation and irradiation time and measurement were made. The last lecture of this session was given by C. Vilorio on *Breast Phantom Anatomic Evaluation of Microcalcifications*. A couple of questions of interest were made, one regarding the ethical implications of the work and the other about the results (good and bad) that could be looked up at the result web page.

Thursday finished with the central act of the **Social Program: the Conference Dinner at Las Arenas Restaurant**, close to the seaside. After a cocktail reception in the garden in front of the

beach, attendants enjoyed the dinner that ended with informal "presentations" by the members of the Program Committee, including the invitation by C. Sullivan for the **next IRRMA in Chicago**. A lot of questions, remarks, and jokes ensued... and friendship was contagious.

On **Friday 11th** the first session, chaired by Prof. **Jorge E. Fernández**, started with the invited lecture "*Application of X-Ray Fluorescence in Investigation of Photographic heritage*" given by Prof. **T. Cechak**. In this interesting lecture, the use of X-ray fluorescence to investigate photographic heritage was explained, showing some of the examples analysed.

The session included three topics: **Use of Radiation in Environmental Sciences, Applications to Archaeometry, Art and Cultural Heritage, and Dosimetry and Detector Applications**.

Two papers in the first topic were presented. The first one related to the application of kO-Prompt Gamma Activation Analysis to geological samples obtained in Yeongnam Massif (South Korea). It was presented by Gwang-Min Sun. The second one described measurements on the radon concentration of soil gas within the metropolitan region of Belo Horizonte, Brazil, was presented by T. Santos. Different measurements were performed and the highest values were found in the "Periferric Red latosol" area where there are numerous iron-rich formations. Some questions were asked by the attendees to the speakers in both cases.

The session continued with two papers related to the applications to archaeometry, art and cultural heritage. In the first one, H. Bartova presented the determination of U and Th using different techniques such as neutron activation analysis (NAA), X-ray fluorescence (XRF) and gamma spectrometry in several samples obtained from different locations such as a Gothic basilica or a townhouse. The second one was related to the results obtained with XRF, X-ray diffraction (XRD) and radiography performed in the Emperor D. Pedro II of Brazil carriage to be restored. It was very interesting and the results were shown with detail in many images.

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The third topic of this session included three papers. F. A. Brandao presented the construction and the assembly needed to use a remote probe for a portable spectrometer using the energy dispersive X-ray Fluorescence technique. Results showed that the system works properly but some adjustments are required. Douglas S. McGregor presented some design variations in Li-Foil neutron detectors. S. Martorell shared results obtained from the radiological characterization of the main raw materials used in the manufacture of ceramic products, one of the most important industrial sectors in Valencia. For this study, gamma spectrometry and an HPGe detector were used.

After the coffee break, Dr. S. Diez from Hospital Clínico Universitario de Valencia presented an invited lecture related to medical applications of radiation. He presented different algorithms employed to enhance the images used for radiotherapy treatment planning. The presentation was very interesting and with many real images. It

was easy to follow and improvements achieved by the use of different algorithms were clearly observed.

Contributed lectures of the second session, chaired by Prof. **Rafael Miró**, were devoted to the topic **Biological and Medical Applications of Radiation**. David Fleming showed the results obtained from the study of the Arsenic and Selenium concentration in an animal model using Portable X-Ray Fluorescence. It turned out interesting and showed pictures of hamsters analysed. E. Tomarchio proposed the using of THERP + HEART methodologies to investigate accident scenarios including operator errors during radiotherapy.

A. Sulieman presented the last lecture related with the assessment of patient effective and organ dose during endoscopic retragrade cholangiopancreatography. Results demonstrated the necessity to optimize the methodology for minimizing radiation doses.

The Conference ended with the **Closing Ceremony** chaired by the **Research Vice-Rector** of the UPV.

During the ceremony, José Ródenas, chairman of both the Organizing and the Technical Program Committees thanked all the people who collaborated on the conference.

As well, **Prizes for students** were awarded to
the **best oral communications** (H. Mohseni and A. Infantino)
the **best poster presentations** (F. Faria, J. Batista, and L. Rodrigues).

PHOTOS FROM IRRMA-9 :



Reception

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The Chairman



Some of the attendees



The Excursion !!



13th International Symposium on Radiation Physics

7-13 September, 2015, Beijing, P. R. China

Dear colleague,

The 13th International Symposium on Radiation Physics (ISRP-13) will be held in Beijing, P. R. China on 7-13 September 2015. It will be organized by University of Science and Technology of China (USTC).

The venue is still "work in progress" and will be advised to you as soon as arrangements are made.

The intended list of topics is as below:

- Theoretical investigation & Quantitative analytical techniques in radiation physics
- New radiation sources, techniques & detectors
- Absorption & Fluorescence spectroscopy (XAFS, XANES, XRF, Raman...)
- Applications in quantum control
- Applications in Material science, Nano-science & Nanotechnology
- Applications in Biology & Medical science
- Applications in Space, Earth, Energy & Environmental sciences
- Applications in Cultural heritage & Art
- Applications in Industry
- Radiation physics & Nuclear fuel cycle

We are pleased to invite you to attend this exciting meeting and present your recent research to researchers and students coming from all over the world.

Looking forward to meeting you in Beijing.

Yours sincerely,



Ziyu Wu (吴自玉)

Chairman of ISRP-13 conference

Chairman of Chinese Specialized Committee on Synchrotron Radiation

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Calendar

2015

7 – 13 September

ISRP-13

13^h International Symposium on Radiation Physics

Beijing, P.R. China

(Venue to be advised)

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Internet Address : <http://www.canberra.edu.au/irps>

And we have a developing “sister website “ : <http://radiationphysics.org/>

INTERNATIONAL RADIATION PHYSICS SOCIETY

The primary objective of the International Radiation Physics Society (IRPS) is to promote the global exchange and integration of scientific information pertaining to the interdisciplinary subject of radiation physics, including the promotion of (i) theoretical and **experimental research in radiation physics**, (ii) investigation of physical aspects of interactions of radiations with living systems, (iii) education in radiation physics, and (iv) utilization of radiations for peaceful purposes.

The Constitution of the IRPS defines Radiation Physics as "the branch of science which deals with the physical aspects of interactions of radiations (both electromagnetic and particulate) with matter." It thus differs in emphasis both from atomic and nuclear

physics and from radiation biology and medicine, instead focusing on the radiations.

The International Radiation Physics Society (IRPS) was founded in 1985 in Ferrara, Italy at the 3rd International Symposium on Radiation Physics (ISRP-3, 1985), following Symposia in Calcutta, India (ISRP-1, 1974) and in Penang, Malaysia (ISRP-2, 1982). Further Symposia have been held in Sao Paulo, Brazil (ISRP-4, 1988), Dubrovnik, Croatia (ISRP-5, 1991) Rabat, Morocco (ISRP-6, 1994), Jaipur, India (ISRP-7 1997), Prague, Czech Republic (ISRP-8, 2000), Cape Town, South Africa (ISRP-9, 2003), Coimbra, Portugal (ISRP-10, 2006), Australia (ISRP-11, 2009) and ISRP-12 in Rio de Janeiro, Brazil in 2012. The IRPS also sponsors regional Radiation Physics Symposia.

The **IRPS Bulletin** is published quarterly and sent to all IRPS members.

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The IRPS welcomes your participation in this "global radiation physics family."

INTERNATIONAL RADIATION PHYSICS SOCIETY

Membership Registration Form

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5. Field(s) of interest in Radiation Physics (Please attach a list of your publications, if any, in the field:

6. Please list any national or international organization(s) involved in one or more branches of Radiation Physics, of which you are a member, also your status (e.g., student member, member, fellow, emeritus):

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7. The IRPS has no entrance fee requirement, only triennial (3-year) membership dues. In view of the IRPS unusually low-cost dues, the one-year dues option has been eliminated (by Council action October 1996), commencing January 1, 1997. Also, dues periods will henceforth be by calendar years, to allow annual dues notices. For new members joining prior to July 1 in a given year, their memberships will be considered to be effective January 1 of that year, otherwise January 1 of the following year. For current members, their dues anniversary dates have been similarly shifted to January 1.

Membership dues (stated in US dollars - circle equivalent-amount sent):

Full Voting Member: 3 years	Student Member: 3 years
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Acceptable modes of IRPS membership dues payment, to start or to continue IRPS membership, are listed below. Please check payment-mode used, enter amount (in currency-type used), and follow instructions in item 8 below. (For currency conversion, please consult newspaper financial pages, at the time of payment). All cheques should be made payable to :

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Amount paid (in U.S. dollars) _____

- [] (in U.K. pounds): Send to Prof. Malcolm J. Cooper, Physics Dept., University of Warwick, Coventry, CV4 7AL, U.K.. Bank transfer details:

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8. Send this Membership Registration Form **AND** a copy of your bank transfer receipt (or copy of your cheque) to the Membership Co-ordinator:

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 Department of Radiation Sciences
 University of Sydney
 75 East Street, (P.O. Box 170)
 Lidcombe, N.S.W. 1825, Australia
email: elaine.ryan@sydney.edu.au

9.

Signature

Date