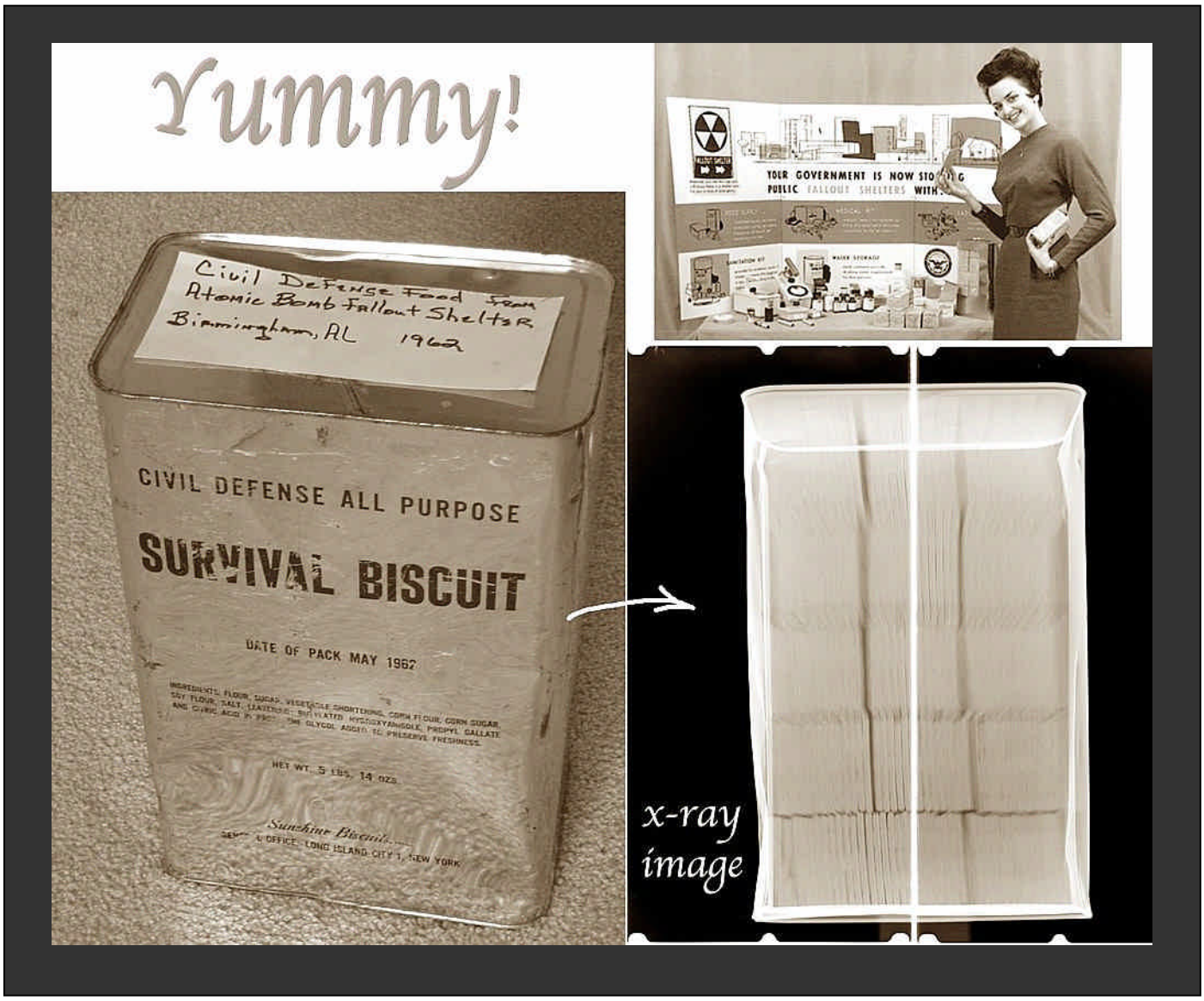
IRPS BULLETIN

Newsletter of the International Radiation Physics Society

Vol 25 No 1 **March 2011**



An unusual holiday gift to a member of the editorial staff that required further inspection before consumption !!!

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Special Editorial

The Real Tragedy in Japan

As we were going to press, we learned with alarm and sorrow of the unfolding natural disasters in Japan. While receiving quantitative radiation reports from colleagues near the earthquake-tsunami zone, perhaps like most practitioners in radiation physics, we received queries from friends and relatives about the repercussions of the failing nuclear reactors. The media hype related to releases of radioactivity has tended to distract attention from the real tragedy in Japan: the sweeping loss of many lives, livelihoods, and communities from a cataclysmic quake-induced tsunami.

At this writing, the health effects of the damaged reactors appear limited in scope and geography. Alas, they are not limited in the imagination of the general public, even though per kilowatt hour produced, nuclear power generation has the lowest mortality rate, by far, than any other method that is a significant contributor to the global energy budget. Reaction to this event may well retard the nascent movement towards a global nuclear renaissance that has been promoted as an alternative to burning fossil fuels. The six Japanese reactors at the Fukushima Daiichi plant held up rather well relative to the stresses they were never designed to withstand (7.2 quake, 25 foot protective wall *vs*. 9.0 quake and 30 foot tsunami wave); issues surrounding the location of spent fuel and redundant or passive cooling systems will be among the lessons learned.

The Japanese crisis reminds us again of how interconnected, on so many levels, our world has become. Near term global energy policy will impact us all on many levels as well: food and hunger, war and peace, progress or regress. Research and development with respect to energy can help to avert the impact of future tragedies, both natural and manmade. As always, we welcome your views on these issues, as well as ways we can stand with the Japanese in a time such as this.

Larry Hudson and Ron Tosh

Word from the President

In the last weeks we have been through a series of important global events.

When the global economical crisis began to lose strength and the European Union and United States started a timid recovery, the political crisis in the Middle East exploded in a very brutal way, clamoring for democracy. A significant number of casualties together with an uncertainty about the future in those countries leads us to consider what is really happening there. The social networks played an important role and this is a new variable in geopolitics, but only years from now we will learn with more clarity what has happened and what the consequences will be.

In Brazil we have also had some disturbing events, but of natural origin. A downpour of record-breaking volume fell over a tourist mountain region near the city of Rio. It caused a series of landslides that changed the relief, the courses of rivers and more than eight hundred deaths. We are dealing with the consequences but it will take us a long time to recover.

In other aspects, for example economics, the situation is a little better than in the northern hemisphere. Last year we had elections for President and, for the first time in our history, a woman was elected President. She was the Chief of Staff of former President Luiz Inacio Lula da Silva, who left the position with an unbelievable approval rating of 82% after 8 years of leadership.

With the new government a huge dance of chairs is taking place and no one in a public position is certain about where one will be in the next months. But this is no reason to lose confidence in a bright future. With the recent discovery of giant deep-sea oil reserves, the so-called pre salt, energy sources are not a concern. ["Pre-salt oil" lies beneath a layer of compressed salt that sits 1.8 miles beneath the ocean surface and another 3 miles beneath the ocean floor.] Perhaps it could cause a delay in the construction of new nuclear power plants, but this is a good dilemma.

We are almost ready to start the calls for our next Radiation Physics Symposium. During the eleventh ISRP, in Melbourne, I proposed Salvador, Bahia, in the northeast of Brazil, as the city to host the symposium. Unfortunately, it was not possible to find a suitable team and place to run the event. We decided then to run the conference in Rio, and the Workshop, focused in dosimetry for radioprotection, in São Paulo. The venue is very nice and we hope to be able to organize a symposium as good as the former ones.

As a last word, I should say that my idea to share this space with the other members of the council was not a very bright one, as Mic Farquharson pointed out in a previous issue. However, I will always make Bulletin space available to society and council members who have something to say that will benefit the rest. Just send me a letter.

O. D. Gonçalves

About People and Places

Richard Hugtenburg

Swansea University, U.K

Dr Richard Hugtenburg has been a member of IRPS for nearly 10 years, attending the three most recent ISRP meetings, and is the current Editor-in-Chief of the Elsevier journal, Applied Radiation and Isotopes.

Richard began his career in New Zealand, working as a medical physicist, while studying for a PhD, in which he focussed on the use of Monte Carlo methods in radiation oncology. Richard moved to the UK in 1997, and continues to practice in radiotherapy physics; first at the Queen Elizabeth Medical Centre in Birmingham and then at Singleton Hospital, in Swansea, Wales. He has been strongly involved with Masters-level training of medical physicists and is co-ordinator of the MSc in Medical Radiation Physics at Swansea University.

The College of Medicine at Swansea University in Swansea, South Wales, works closely in teaching and research with nearby Singleton Hospital, a constituent of the Abertawe Bro Morgannwg University (ABMU) Health Board. Recently the College joined forces with the College of Engineering and ABMU Health Board to form the Institute of Life Science, which includes as a focus the development of nanoscale technology in medicine and a clinical imaging research facility.

Through studies initiated at Universities of Exeter and Birmingham, Richard has an evolving interest in the structural analysis of tissue and the use of this data in emergent radiotherapy techniques, including binary therapy, where cancer is targeted more effectively with radiation-activated compounds. In recent years this work has focussed on the use of laboratory and synchrotron-based micro-CT, as well as novel MRI modalities.

Current research includes the development of silicon and diamond-based dosimeters, needed for the dosimetry of high-resolution radiotherapy modalities and Monte Carlo modelling of radiation processes, in particular of radiation effects at microscopic and nanoscopic dimensions, including the sub-cellular volumes associated with the therapeutic and carcinogenic effects of radiation. He and his group have developed computational techniques for the modelling of the risk of radiation-induced cancer in medical practice, utilising basic data from in-vitro and epidemiological studies.

PhD students, Maria Piliero and Wafa Alsaleh, assist in the irradiation of cell cultures. Here the induction of micronuclei in DNA is investigated using a therapeutic linear accelerator. X-rays from a linear accelerator offer a number of advantages over other sources of radiation used in radiation biology, including reproducible and accurate dosimetry. High energy (6 MV) X-rays are also more closely similar to the sources of exposure in important epidemiological data, such as the life-span study of the survivors of the atomic bomb detonations in Hiroshima and Nagasaki.

UNIVERSITY FAREWELL FOR MALCOLM COOPER

In September 2009 the University of Warwick bid "farewell" to Professor Malcolm Cooper who had served the university for forty years, the last decade as Head of Physics. To mark this occasion a two-day symposium was organized by his close colleagues, Bill Stirling, Joanne McCarthy, and Sandra Beaufoy. The general "theme" was the measurement of spin, charge, and momentum densities of electrons in materials, Malcolm's principal research interest for the past four decades. This inevitably involved the use of synchrotron radiation.

Malcolm had a long and distinguished career at the University of Warwick, commencing there as a lecturer in 1970, not long after the university was founded. He has completed his active academic career with a period of almost a decade as Head of Physics during which he contributed substantially to raising the profile of the Physics Department to be one of the top departments in the UK.

Speakers at the Symposium all were long-standing friends and colleagues: people who have gained much through their interactions with Malcolm (Fig. 1). They came from distant parts to celebrate the occasion: from Australia, Denmark, Finland, France, Japan, Germany, and the USA. In his opening address **Gerry Lander** (ILL) discussed Compton scattering and the contributions Malcolm had made in the field of Compton scattering and to the development of techniques for the measurement of electron spin, charge, and momentum density in materials.

Keiji Hamalainen (University of Helsinki) asked the question (and answered it) as to what could be learnt about molecular bonding using Compton and X-ray Raman scattering. The wonderful world of synthetic materials, and the determination of the electronic properties within them using X-ray techniques, was discussed by **Genevieve Loupias** (University of Paris 6), and **Yoshiharu Sakurai** (JASRI: Spring 8) spoke on determination of the electron momentum densities in high Tc cuprates using high resolution Compton scattering .

At the conclusion of the first day's program the conference dinner was held, at which all the participants celebrated Malcolm's achievements in the way he likes best: consuming good food, good wine, and listening to witty, even erudite, speeches (Fig. 1).

George Srajer (APS) commenced the second day of the symposium with an address entitled "Malcolm Cooper and the reason I decided to abandon Compton scattering and instead use X-rays to probe quantum criticality". And **Simon Brown** (ESRF) gave a history of the (highly successful) XMaS beamline which Malcolm and Bill Stirling set up as a UK beamline for diffraction studies at the ESRF. **Steve Collins** (Diamond) describes experiments concerning the measurement of temperature effects in X-ray spectroscopy. In a dazzling essay into the world of free electron lasers , **Jochen Schneider** (Euopean FEL facility), described the fascinating experiments which can now be performed and simulations of experiments which have yet to be attempted.

As an exercise in describing what occurs in the here-and-now **Dudley Creagh** (University of Canberra) spoke on matters of great interest to frequent travellers, the airline passenger portal, in his talk "Compton scattering and the travelling public : are we just fiddling at the borders".

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Sine Larsen (President, International Union of Crystallography) described Malcolm's involvement in the IUCr from the twelve years he spent as Secretary, then Chairman, of the IUCr's Commission on spin, charge, and electron density, to the present. He has been Convenor of the IUCR's Finance Committee since 1999.

Bill Stirling gave the closing remarks, and then **Malcolm** delivered his reply (rebuttal?) and farewell speech.

Malcolm will maintain his contact with the university and with the European Synchrotron Facility.

He remains the Co-director of the XMaS beamline, and is a member of the ESRF Scientific Advisor Committee.

As well, he is involved in the establishment of a Pan-European Synchrotron Users Organization.

Within the IRPS community Malcolm is well known for his service as Vice President, President, Chairman of the Advisory Board, and (now) Treasurer. Thankfully, from the point of view of this Society, Malcolm has no intention of relinquishing his role as Treasurer.

Fig.1. Symposium photograph. Joan and Malcolm Cooper are in the centre of the front row

Member's Report

Kulwant Singh Thind

Surrey BC, Canada

I started my career as assistant professor in 1984 at Guru Nanak Dev University, Amritsar, India becoming a Professor in 2001. At this institution, I worked as Head, Department of Physics, Indian Administrative Services and University Administrator (Co-ordinate and Deputy Co-ordinate of many state level competitive examinations).

With more than 150 scientific publications, 4 books, 2 articles in Encyclopedia of Punjabi and 41 conference presentations at National and International congresses, I have contributed principally in the study of nuclear spectroscopic properties of some radioactive nuclides, environmental radiation assessment, the applications of lead borate glasses (as radiation shielding materials and bioactive glasses), spectroscopic properties of rare earth doped oxide glasses and the setting up new experiments for M.Sc. Laboratories.

In the area of collaboration with developing countries, I have done research with the KVL University, Denmark, Bhabha Atomic research Centre, Mumbai, India and Nuclear Science Centre, New Delhi. I have managed 8 research projects as principle investigator.

Nationally and internationally, I have served as member executive of the International Radiation Physics Society (IRPS) and have written a book entitled "Experiments in Nuclear Physics" co-authored with Prof. L. Gerward, Department of Physics, Technical University of Denmark and Prof. H.S. Sahota, Department of Physics, Punjabi University, Patiala, India.

I have organized activities such as

(i) 14th National Symposium on Radiation Physics (NSRP), Guru Nanak Dev University, Amritsar Nov, 1-3, 2001

(ii) Nuclear and Radiochemistry Symposium (NUCAR 2005) Guru Nanak Dev University, Amritsar March 15-18, 2005 and

(iii) Workshop on Experimental Techniques in Physics, Guru Nanak Dev University, Amritsar Sept. 16-17, 2005.

RESEARCH CONDUCTED

1. Nuclear Structure and Spectroscopy

Detailed studies have been carried out in various aspects of the nucleus such as energies and intensities of gamma ray transitions, conversion coefficients, level schemes, level characteristics such as electric and magnetic moments and transition multipolarities applying directional correlation techniques.

Electron-capture probabilities to various levels, atomic fluorescence yield of elements, nuclear quadrupole interaction (NQI) parameters in different inorganic compounds of biological

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complexes with a single detector have been studied by the sum peak method. Results are compared with theoretical predictions by the Angular Overlap Model (AOM), which is the only existing model.

High spin states of the ^{78}Kr nucleus had been studied by fusion-evaporation 63Cu (19F, p2n) reaction at beam energy of 60 MeV delivered by 15-UD Pelletron Machine, New Delhi, India. The existence of Magnetic Rotation Phenomenon in ^{137}Pr by the use of ^{122}Sn (19F, 4n) ^{137}Pr reaction at 80 MeV delivered by 15-UD Pelletron Machine, New Delhi, India had been investigated.

2. Radiation Physics

The parameters like absorption coefficients, mass energy absorption coefficients, effective atomic numbers, atomic cross sections of biologically important substances and aqueous solutions of inorganic substances have been accurately measured by transmission methods. The results have provided a base to study the interactions of photons with the solvated (hydrated ions) rather than bare ions in the solid form. Multiple scattering of gamma rays in composite materials of water, concrete and sand has been studied for thorough understanding of the process of transport and energy degradation of a primary photon.

The patients of head and neck cancers have been treated with hyper fractionation treatment schedule in a Cobalt-60 Teletherapy unit at Department of Radiotherapy Shri Guru Teg Bahadur Hospital & Govt. Medical College Amritsar, India. The study assesses the effectiveness of the treatment of hyper fractionation with that of the conventional fractionation treatment for early and late effect, tumour control, estimation of α/β ratio for tumour response and normal tissue complications of radiation by linear quadratic model and prediction of normal tissue complication probability (NTCP) and tumour control Probability (TCP) for the normal tissues and tumours using α/β ratio obtained for tumour and normal tissue complications.

3. Environmental Radiation Assessment

The main aim of the work is to estimate the mean annual radon progeny concentrations and effective inhalation radiation dose in indoor environment and to study the parameters affecting the indoor radon progeny concentrations, such as the seasonal variation of temperature and mechanical ventilation. A new grab sampling method is being employed for the determination of radon progeny concentrations in air. This method is based on gross beta counting of a filtered aerosol sample over successive time intervals by an end-window Geiger-Muller counter. The evaluation of the activity concentrations is based on:

(1) the analysis of the measured complex decay curve and

(2) the evaluation of the individual beta-counting efficiencies for the progeny using the Defined Solid Angle Absolute Beta Counting (DSAABC) method, taking the effect of the flow rate of the air, the duration of the sampling, the delay between sampling and counting, the background and dead time of counter, the counting geometry and filter parameters into account

4. Irradiation Effects on Heavy Metal Oxide Borate Glasses

Effects of gamma irradiation on heavy metal oxide (HMO) glasses are our centre of interest as the response of glasses to γ-irradiation is related to the rate of formation and

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accumulation of induced defects during progressive irradiation. The work has been done to study the structure and optical properties of heavy metal oxide glasses before and after gamma irradiation.

5. Biomedical Applications of Borate Glasses:

In vitro analysis of borate and phosphate based glasses is made to check their suitability as bioactive materials by using XRD and Fourier Transform Infrared Spectroscopy (FTIR). The various chemical compositions of the glasses with respect to the network former and network modifier ions are studied to see changes in important parameters such as mechanical properties, physical properties, structural and bioactive properties. Our main concern for phosphate glasses is their suitability as bioactive glasses. Control of degradation kinetics is a key issue in the field of resorbable materials for bone regeneration. We have studied Calcium Sodium Phosphate glasses reinforced with Al_2O_3. Results show that phosphate glasses in the system P_2O_5-CaO-Na_2O reinforced with Al_2O_3 offer an interesting option for slowly resorbable materials as compared to other calcium phosphate glasses with high degradation velocity.

6. Spectroscopic Properties of Rare Earth Doped Oxide Glasses:

The spectroscopic properties of certain Nd^{3+} doped lead borate glasses for their application as laser host materials are being carried out on alkali/alkaline oxides and alkali halides as modifiers by applying Judd-Ofelt theory. The room temperature absorption spectra of the glasses using a double beam UV-VIS spectrophotometer is being studied to elucidate the effect of host matrix on the local environment of given rare earth ions. The addition of alkali/alkaline modifiers and even variation in composition of rare earth ions can highly enhance the laser action of lead borate glass. The three phenomenological Judd-Ofelt intensity parameters: Ω_2, Ω_4 and Ω_6 are related to local structures in the vicinity of rare-earth ions and/or the covalency of the rare-earth ion sites. The parameters in turn are utilized to determine the radiative transition probabilities, radiative lifetimes and branching ratios of $(RE)^{3+}$ transitions in different host materials.

ABOUT THE INSTITUTION

Guru Nanak Dev University was established at Amritsar on November 24, 1969 to mark the 500th birth anniversary of Sri Guru Nanak Dev Ji. It is both a residential and an affiliating university. The motto of the University as engraved on its emblem "Guru's wisdom illumines all" speaks of the vision and idealism for which the University stands. In conceiving the future course of the University, the objectives enshrined in the Guru Nanak Dev University Act 1969, emphasized that the new University would make provision for imparting education and promoting research in the humanities, learned professions, sciences, especially of applied nature and technology. Studies and research on the life and teachings of Guru Nanak, in addition to working towards the promotion of the Punjabi language and spreading education among educationally backward classes and communities were the other commitments.

Guru Nanak Dev University campus is spread over 500 acres (2 km^2) near the village of Kot Khalsa, some eight kilometers west of

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the Amritsar City on Amritsar-Lahore highway, next to Khalsa College, Amritsar.Guru Nanak Dev University campus presents a picture of modern architecture. Traditional red brick geometrical blocks represent its regard for time-honoured values and its commitment to scientific advancement. It is highly innovative in designing its teaching and research programmes and offers a comprehensive range of general and applied courses.

Making its humble beginning in an annex of the adjoining Khalsa College, the University today boasts 41 academic departments, two regional centres, three constituent colleges and a score of support service departments together with several administrative offices. In addition to academics, it has also created necessary facilities for recreation and all round development of its students.

The University takes pride in the fact that its community over the years has developed a great participative work culture. The University has won the Maulana Abul Kalam Azad Trophy seventeen times and the inter-varsity youth festival championship four times consecutively. University Grants Commission, New Delhi has granted the University Centre for Excellence in Sport Science.

The University has contributed tremendously in making higher education accessible to women in this otherwise educationally backward area. Being an affiliating University, it also performs the parenting role of directing and monitoring the academic programmes of more than 100 colleges located in the five districts of Amritsar, Jalandhar, Kapurthala, Nawanshehar and Gurdaspur, some of which have a long and creditable history of imparting higher education since late nineteenth century.

It is the first university in the country to get re-accreditation at the highest A-grade level from National Assessment and Accreditation Council (NAAC). Being rated at such a high level will inspire its community to make strides ahead still faster and stronger with academic excellence and commitment to social upliftment as the core ideals.

Within the span of 38 years, the infrastructure of Guru Nanak Dev University, Amritsar has developed a lot with informative computerized library, well equipped laboratories, Academic Staff College, Instrumentation Centre, Physiotherapy Centre, All India Services Training centre, Language Laboratory, Multimedia Centre, Botanical Garden, Computer Centre with all kinds of facilities, Placement Unit and many more. The university has recently established video conferencing facility and campus wide networking based on Wi-Fi and Wi-Max.

../Photographs


ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ
GURU NANAK DEV UNIVERSITY
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The International Radiation Physics Society is a proud sponsor of the

8th International Topical Meeting on Industrial Radiation and Radioisotope Measurement

IRRMA - 8

to be held from 26 June to 1 July 2011 in Kansas City, Missouri, USA.

The triennial IRRMA series is organized for the purpose of bringing together scientists and engineers from around the world who share an interest in radiation and radioisotope measurement applications. The first meeting in the series took place in Pinehurst, North Carolina, USA, in 1988. The IRRMA-8 meeting is devoted to current trends and potential future issues involving radiation and radioisotopes. The scientific sessions will include invited lectures by leading experts in their fields, contributed oral papers, and poster presentations of contributed papers.

Topics will include:

- Radiation Detection
- Radiation Gauging
- Imaging Applications
- Shielding and Dosimetry
- Monte Carlo Methods
- Modeling and Data Analysis
- Quantitative Analysis Applications
- Radiotracing
- Biomedical Applications of Radiation
- Threat Detection Methods
- Radiation Sources
- Applications to Art and Cultural Heritage
- Radiation Effects on Materials
- Emerging Technologies and Applications

Invited Speakers and Titles

Robin P. Gardner N.C. State University
On the Inverse Spectral Analysis Problem for Nuclear Threat Cargo Monitoring

Ed Morton, Rapiscan Systems
Security Screening with Ionising Radiation

Thomas Booth, Los Alamos National Lab
Common Misconceptions in Monte Carlo Particle Transport

Christian Broennimann
Single Photon Counting X-Ray Detectors for Scientific and Industrial Applications

Guillaume Potdevin
Biomedical X-Ray Imaging Using Phase and Dark-Field Contrast

Roger Dale, Imperial College
The Role of Radiation Physics and Systems Engineering in Cancer Radiobiology

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Invited Speakers and Titles continued :

Geoffrey Harding, Morpho Detection GmbH
X-Ray Diffraction Imaging with the Multiple Inverse Fan Beam Topology: Principles, Practice and Potential for Security Screening

Ladislav Musilek, Czech Technical University
Use of Radiation in Investigation of Cultural Heritage

Alexander Fridman, Drexel University
Plasma Applications in Medicine and Biology

Paddy Regan, University of Surrey
The DESPEC Fast-Timing Project at FAIR: Sub-nanosecond Nuclear Timing Spectroscopy with LaBR3 Scintillators

Brad Roscoe, Schlumberger-Doll
Current Tools and Methods in Nuclear Well Logging

Dudley Creagh, University of Canberra
Application of Neutron Technology to the Study of Objects of Cultural Heritage Significance

Richard Hugtenburg, University of Swansea
Monte Carlo Modeling of Radiotherapy Acute and Late Effects

Jorge Fernández, University of Bologna
Deterministic and Monte Carlo Codes for Multiple Scattering Photon Transport

Further information in Calendar, page 18

The conference excursion includes a visit to the 8,600-acre Konza Prairie Preserve, located in the Flint Hills region of northeastern Kansas.

Please register by 15 April, 2011 to receive the early rates.
Registration, lodging, and other information is available at the IRRMA-8 web site:

http://www.dce.k-state.edu/conf/irrma/

Items from Physics World, Volume 24, No 2 February 2011

Frontiers, page 4 :

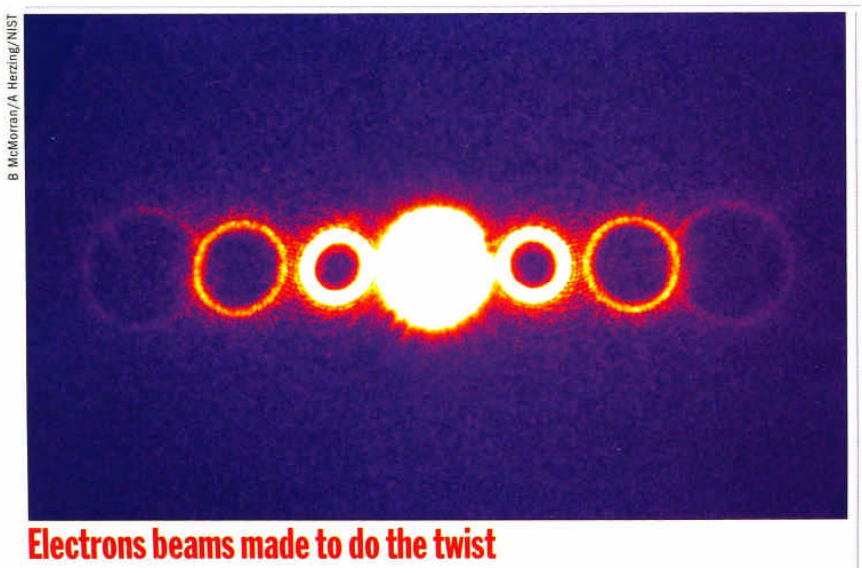
Repeat performance for quantum memory

Two independent groups of researchers have demonstrated how a pair of entangled photons can transfer entanglement to and from a solid. This process, claim the researchers, could help overcome one of the limitations to quantum communication - the problem of signal degradation. In conventional information networks, engineers stop a signal from degrading by installing repeaters, which record waning signals and then re-emit them at their optimum strength. This process is, however, much harder in quantum communication systems, where information is stored between two or more particles via delicate entanglement states that can be easily disturbed by interactions with their surroundings.

But a team of researchers led by Wolfgang Tittel of the University of Calgary in Canada has now created a primitive form of quantum repeater that for the first time is made from solid materials. By doping lithium niobate with ions of thulium, a rare-earth material, Tittel's group has created a crystal that can absorb a pair of entangled photons as an excitation before emitting another photon a fraction of a second later with the same entanglement state (*Nature* 10.1038/nature09719). Meanwhile, an independent group of researchers, including Nicolas Gisin from the University of Geneva in Switzerland, has created a similar device using neodymium-doped yttrium silicate and a different type of laser set-up (*Nature* 10.1038/nature 09662).

Gisin's group reports a maximum storage time of some 200 ns at an efficiency of more than 20%, whereas Tittel's group reports a shorter storage time of 7 ns at a lower efficiency of 2%. However, the quantum memory of Tittel's group functions at a bandwidth of 5 GHz - some 40 times greater than Gisin's device - so it could potentially send far more information at the same time.

Frontiers, page 5 :



Electrons beams made to do the twist

Researchers in the US have presented a new twist on transmission microscopy (TEM) by creating a helical-shaped beam of electrons that could significantly improve the resolution of images. In conventional TEM, a beam of electrons is fired through a sample and an image is built up by measuring how the material absorbs and deflects the particles. Twisted beams of electrons, however, should increase the interaction between the electrons and the material under study because the beams can

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exchange large amounts of orbital angular momentum with the sample. But while twisted beams are already used in optical microscopy, it is much more difficult to twist beams of electrons. The problem is that the wavelength of an electron is much less than that of light, which means that the electrons need to pass through much smaller structures to become twisted. However, this feat has now been achieved by a group of researchers, including Ben McMorran of the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland, which fired a beam of electrons through a specially designed hologram. This caused the beam to diffract and created several helical-shaped beams, as can be seen in the image above, where a bright central beam is surrounded by high-order electron vortices with large vortex cores. In fabricating the holograms, McMorran's group used a finely focused ion beam to cut a pattern of tiny slits just 20 nm across through a thin silicon membrane 30 nm thick (*Science* 10, 1126/science.1198804)

Membership Payments by Credit Card

PayPal is now fully connected !!

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

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

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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.

If you have any queries or problems contact :

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email : m.j.cooper@warwick.ac.uk

New Memberships, Membership Renewals

Membership form for new members, and details for payments by cheque for new and renewing members are on the back page of this journal and information for payment by credit card is given above.

If you are unsure when your renewal is due, contact

Elaine Ryan

email: elaine.ryan@sydney.edu.au

Calendar

2011

June - July, 2011 **26th June - 1st July**

IRRMA - 8

8th International Topical Meeting on

Industrial Radiation and Radioisotope Measurement Applications

Kansas City, Missouri, U.S.A.

Details on page 14

Website : http://www.dce.k-state.edu/conf/irrma/

July, 2011 **28th - 29th July**

4th Workshop on X-ray Fundamental Parameters

National Institute of Standards and Technology
Gaithersburg, MD, USA

This international workshop is the fourth in a series of initiatives dedicated to the improvement in the database of fundamental parameters used in x-ray physics. Reports stemming from the previous workshop were highlighted in Vol. 24 Nos 1 and 2 of the IRPS Bulletin

Local contacts: Terry Jach - *email* terrence.jach@nist.gov
Larry Hudson

Website : http://exsa.pytalhost.net/news/?page_id=198

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 (1SRP-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 will be in Salvador, Brazil in 2012. The IRPS also sponsors regional Radiation Physics Symposia.

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

The IRPS Secretariat is : Prof. M.J. Farquharson, (IRPS Secretary),
Department of Medical Physics and Applied Radiation Sciences
McMaster University, Main Street West, Hamilton, Ontario, Canada.
Phone : 001 905 525 9140 ext 23021 *email:* farquhm@mcmaster.ca

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

INTERNATIONAL RADIATION PHYSICS SOCIETY

Membership Registration Form

1. Name : _____
(First) (Initial) (Last)

2. Date and Place of Birth : _____

3. Business Address : _____

_____
(Post Code) (Country)

Telephone:_____ Email: _____ Fax: _____

4. Current Title or Academic Rank (Please also indicate if Miss, Mrs., or Ms.): _____

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):

_____

../Continued

_____

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**
Developed country $75.00	Developed country $25.00
Developing country$30.00	Developing country $10.00

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 :

International Radiation Physics Society.

(For payments via credit card - http://www.irps.net/registration.html)

[ ] *(in U.S. dollars, drawn on a U.S. bank)*: Send to Dr W.L. Dunn, Dept. Mechanical and Nuclear Engineering, Kansas State University, 346 Rathbone Hall, Manhattan, KS, 66506-5205. U.S.A.

Amount paid (in U.S. dollars) _____

[ ] *(in U.K. pounds):* Send to Prof. Malcolm J. Cooper, (IRPS Treasurer), Physics Dept., University of Warwick, Coventry, CV4 7AL, U.K.. Bank transfer details: Account number: 30330701. Bank and Branch code: Barclays, code 20-23-55. Eurochecks in U.K. pounds, sent to Prof. Cooper, also acceptable.

Amount paid (in U.K. pounds) _____

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

Dr Elaine Ryan
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*