

# ARCHIVE EDITION OF IRPS BULLETIN

Volume 21 No 4 December, 2007

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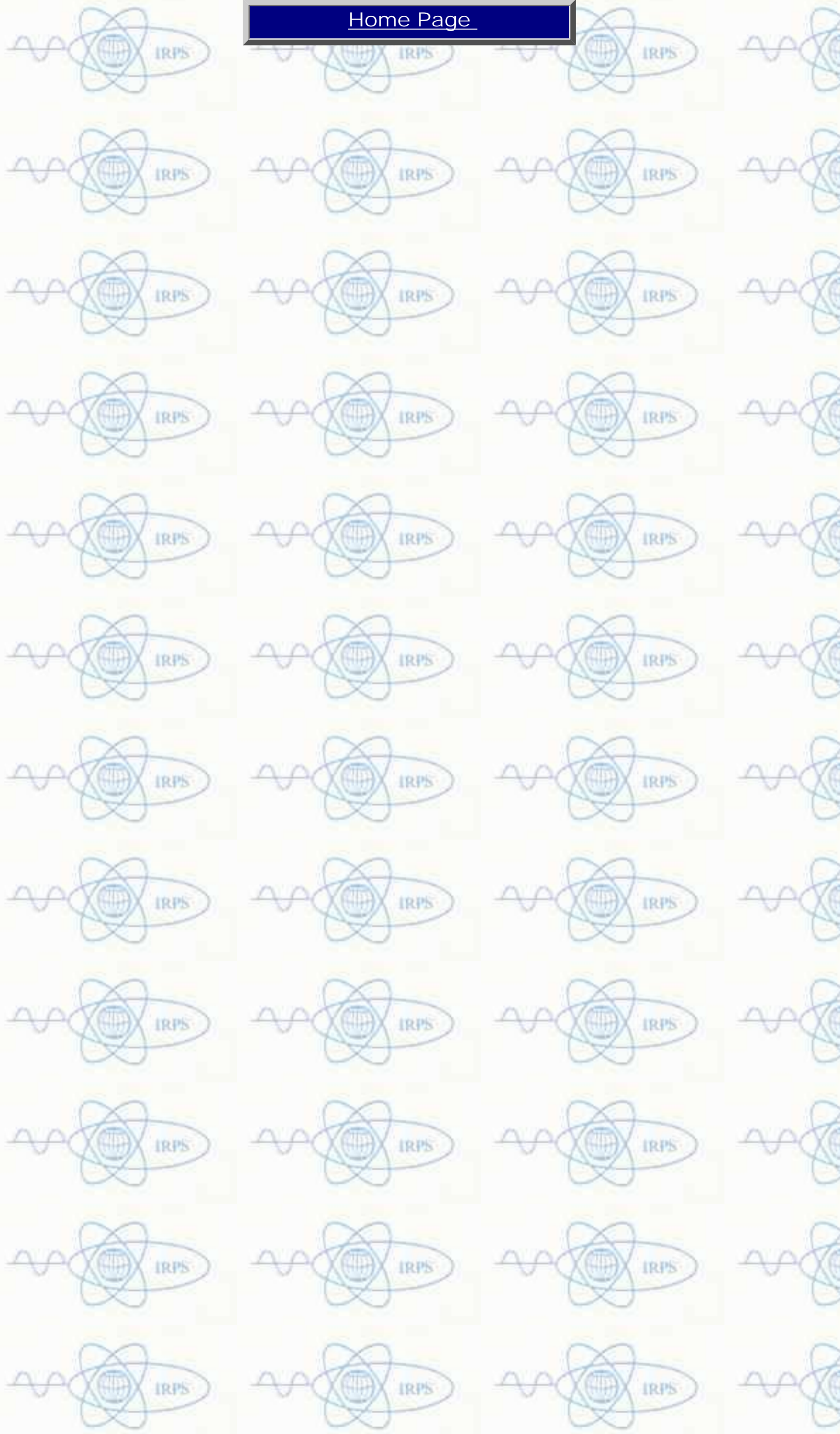
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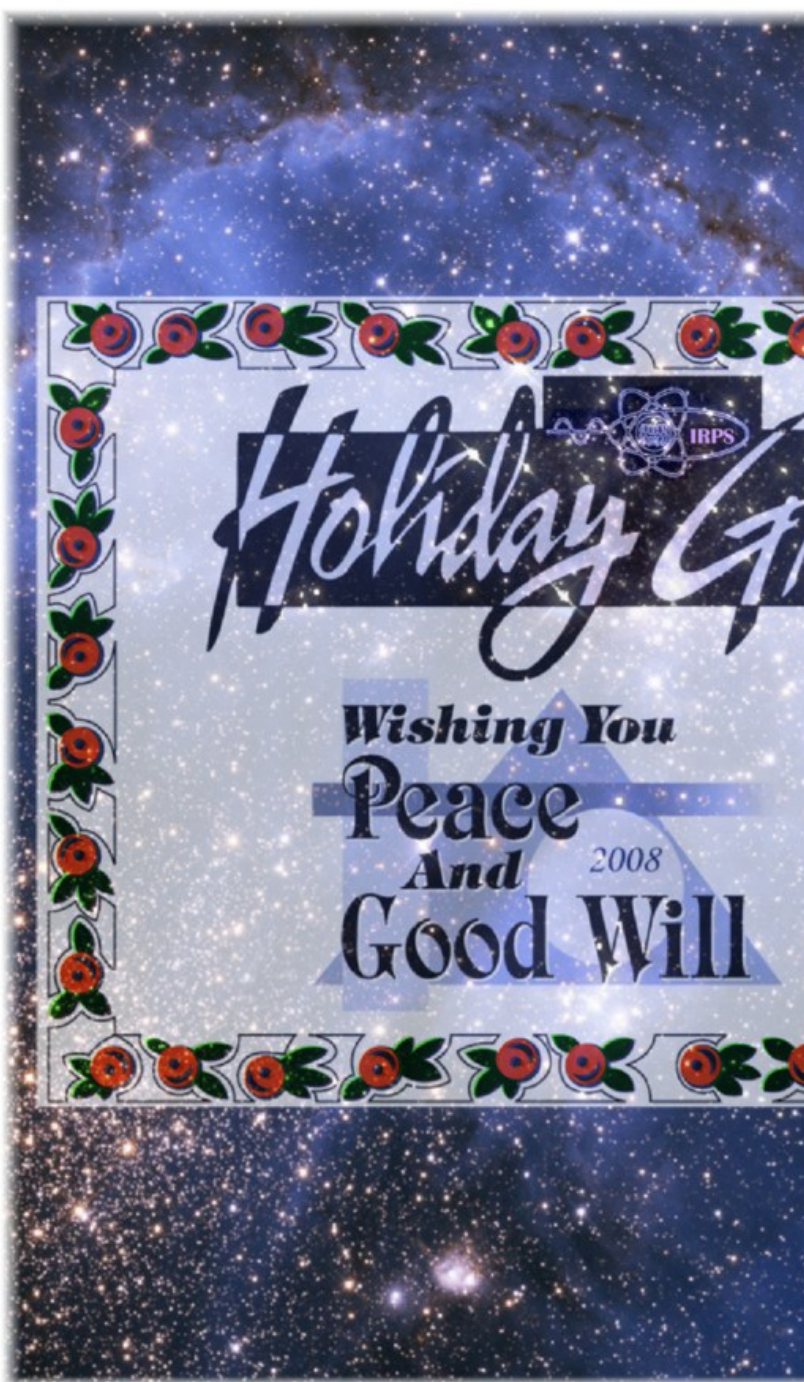
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**EDITORIAL**

Catching one almost by surprise, yet another activity-filled year swiftly draws to a close! It is hoped that your year included scientific discovery and that through IRPS we can together continue to encourage passionate pursuit along lines of excellence in radiation physics.

In this final issue of the IRPS Bulletin for 2007, we begin featuring reports from the regional Vice Presidents of the Society. We expect that these will underscore both our common causes as well as the variety of perspectives and regional activities. Suprakash Roy (*VP for South East Asia*) provides a report from the organiser of the Indian Society for Radiation Physics 17th National Symposium on Radiation Physics. Bill Dunn (*VP for North America*) contributes both a regional report and an overview of the Workshop on Use of Monte Carlo Techniques for Design and Analysis of Radiation Detectors that was held in conjunction with ISRP-10 in September 2006.

A description of the international conference on Nuclear Power for the People, organized by the Bulgarian Nuclear Society has been submitted by Ladislav Musilek. We welcome similar contributions from the membership that summarize advances in the field of radiation physics and offer interesting insight into technical disciplines, regional news, and meetings relevant to IRPS.

This and much more rounds out Volume 21 of the Bulletin.

We will greet you next  
in the new year of possibilities,

***Larry Hudson, Ron Tosh***



**E**ducation. n. intellectual and moral training; systematic instruction; provision of schooling. f L. educare - to lead out.

One of the major factors which cause divisions within our society is ignorance. We are constantly made aware of the need to educate people to bring them from ignorance into a state of enlightenment. For we recognize that in ignorance lies prejudice and the potential for injustice. But how do we best achieve our goal to educate people?

Many of us are educators, associated with universities or colleges. We will have done our best to provide structured courses for our students within the constraints of our several education systems. Yet criticism abounds about how we do our jobs: a classical "us versus them" situation. The simple fact, however, is that such a situation is counterproductive. We are all part of the education system and we must all participate in that system for the good of all: negativity negates progress.

Our society seeks to educate radiation physicists (and by extension all who read this Bulletin) through the Bulletin and its triennial Symposium and associated Workshop. The next Symposium and Workshop will be held in Melbourne, Australia in September, 2009 (see the notice in this Bulletin). To ensure that we all may participate in the education process I encourage you to contact Chris Chantler and his Scientific Advisory Committee with suggestions of possible speakers and topics for the symposium.

To return to the topic of the Bulletin: we encourage members and their students to submit papers, review articles, book reviews, and so on to the editors for publication. Since the Bulletin is an internet asset the more informed and refereed information placed on the internet the better. Topics which might be of great benefit, given the current interest in climate change and mechanisms for militating against it are: nuclear reactors and

the disposal of nuclear waste, thermonuclear fusion, and developments in photovoltaic cell construction. There are many other topics I have not mentioned, of course.

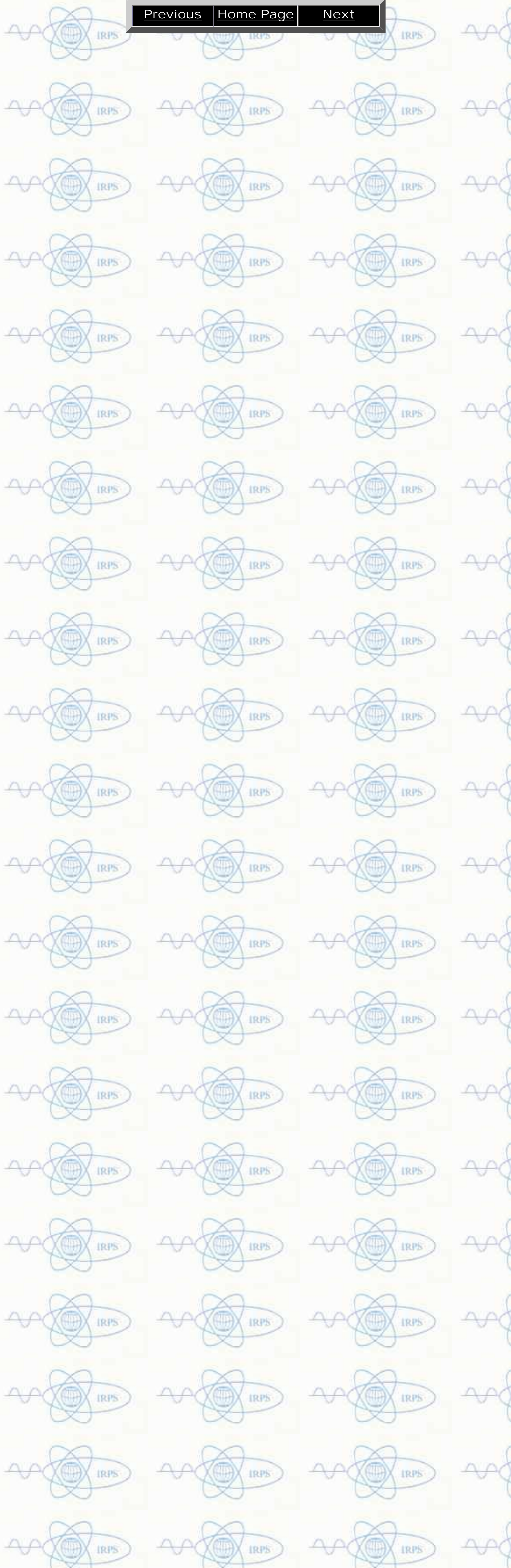
Recently a politician referred to laptop computers as the "toolboxes of the 21st century". As far as education is concerned computers are but tools within a very large tool box. The connection of a computer to the internet cannot provide *in itself* systematic instruction. The greater part of the content of the internet is information, unstructured, unreviewed, and liable to contain matter which will reinforce rather than reduce prejudice and injustice. Only when the content is made rigorously systematic can the internet become an educational tool. We, as scientists, should play an active role in this educational process.

A Council Meeting was held in Rio de Janeiro in October, hosted by Vice President Anselmo Pashoa and Council Member Odair Goncalves. We are indebted to them for their generous hospitality. Amongst the issues discussed were: a review of the (highly successful) I SRP10 and workshop held in Coimbra, the forthcoming I SRP11 meeting to be held in Melbourne, means by which we can offer assistance for students to attend I SRP11, how we may use SKYPE and other internet tools to remain in better contact with one another, and ways by which membership of our society may be increased.

2007 has been a sad year in that two stalwarts of the IRPS have died: John Hubbell and Professor Luo Zhengming. An obituary for John Hubbell was in the last Bulletin: an obituary for Professor Luo is included in this issue.

I wish you all peace and prosperity in the coming year, 2008.

**Dudley Creagh**





William L. Dunn

Vice President, North America

I am delighted to submit my first report as Vice President, North America. This report focuses primarily on happenings in the United States (US), where the Spallation Neutron Source (SNS) has gone operational. The SNS (Fig. 1) produced its first neutrons on 28 April 2006. A photograph taken in the control room on that day is shown in Fig. 2.

In August, 2007, the SNS established a new world for accelerator based neutron sources. A news release stated the following: "The SNS surpassed the previous record of 160 kilowatts for beam power, held by the United Kingdom's ISIS facility, while operating at 183 kilowatts. As the SNS ramps up toward an eventual 1.4 megawatts of power, the beams will produce up to 10 times more neutrons than any existing pulsed neutron source."

The SNS will eventually have 18 beam lines on which researchers can perform materials studies. I am proud to say that my colleagues Drs. Douglas McGregor and Ken Shultis and I at Kansas State University (KSU), are building one of the detectors for neutron scattering experiments at SNS. More detailed information about the SNS can be obtained on-line at [http://neutrons.ornl.gov/facilities/facilities\\_sns.shtml](http://neutrons.ornl.gov/facilities/facilities_sns.shtml).

In other news, nuclear energy is making a tremendous come-back in the US. The US Nuclear Regulatory Commission publicizes that it expects 19 applications from 17 utility companies for 29 new nuclear power-plant units in 15 states by the end of 2008! Even if some of these applications are delayed, this is quite remarkable, given that no new plants have been ordered in the US for over two decades. Nuclear power is not a focus of the International Radiation Physics Society, but resurgence in nuclear power certainly has broader effects.

For instance, nuclear engineering (NE) programs have seen a dramatic increase in enrollments since hitting record lows in the late 1990s. Enrollments in NE at Georgia Institute of Technology and KSU, for example, have tripled in the last decade. The demand for nuclear-trained engineers and scientists is so great that a Nuclear Engineering Distance Education Consortium has been formed within what is called the Big-12 conference of schools. The four Big-12 universities that have NE programs (KSU, University of Missouri-Columbia, Texas A&M University, and University of Texas-Austin) are providing NE courses by distance education for all the Big-12 schools, some of which are establishing Nuclear Option or Minor programs. This collaboration benefits from financial support from both the US Department of Energy (DOE) and the US Department of Education.

Many research reactors in the US were shut down over the last few decades, including the large Ford reactor at the University of Michigan; only about 25 research reactors remained at the beginning of 2007. However, this trend seems to be slowing and even reversing. Our TRIGA research reactor at KSU is about to be licensed to increase power by a factor of five, from 250 kW to 1.25 MW, and at least one other university is making plans to build a new research reactor.

Funding for university programs at Department of Energy is in disarray, however, despite the increase in nuclear power. The Bush administration has proposed a budget that cuts funding for many of the programs operated out of the Department's Office of University Programs. While the US Congress will likely restore some of this funding for this fiscal year, uncertainty abounds as to which programs will be funded and at what levels. Hopefully, this uncertainty will be short-lived and new opportunities for university research will evolve.

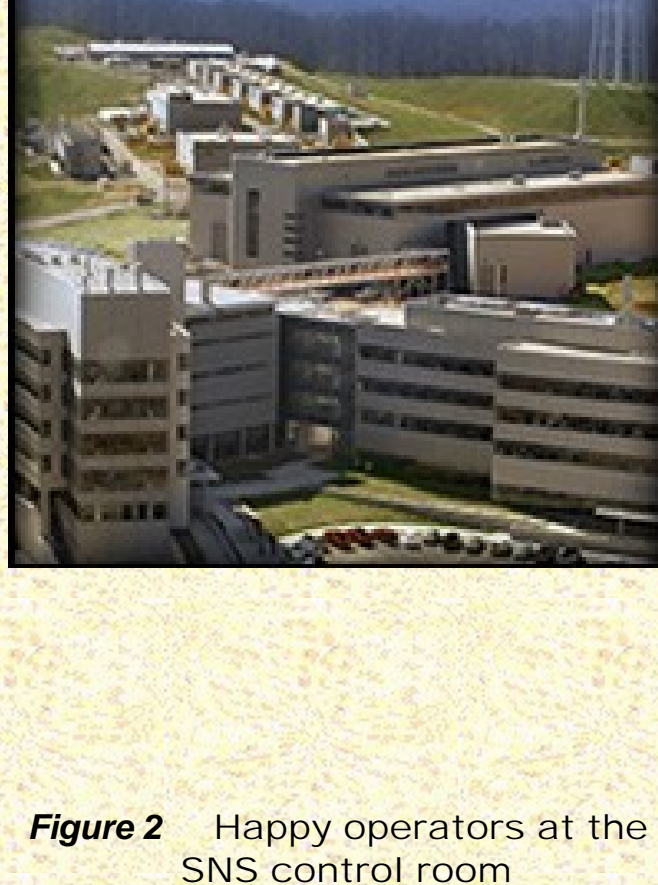


Figure 1 The SNS Center



Figure 2 Happy operators at the SNS control room

From the Conference Organiser, submitted by Suprakash C. Roy

Vice President, South East Asia

The biennial national symposium of the Indian Society for Radiation Physics, (ISRP) "Seventeenth National Symposium on Radiation Physics (NSRP-17)" was held at the Saha Institute of Nuclear Physics, Kolkata, India, during November 14-16, 2007. The symposium was inaugurated by Prof. M. G. K. Menon, Prof. Bikash Sinha, Director, SINP and V.E.C. Centre, Kolkata, welcomed the delegates. Dr. S. M. Lee, President, ISRP, gave a brief overview about the objectives and activities of the Society. Dr. A. R. Reddy, Ex-DRDO and Former President of ISRP was awarded the A. K. Ganguly Memorial (AKGM) award. He delivered the AKGM lecture on "Dosimetry of Internal Emitters".

The focal theme of the Symposium was "Radiation Physics in Advanced Technology" and the deliberations included topics related to Lasers, Accelerator Driven Systems (ADS), Synchrotron radiation sources (SRS), and Biomedical Sciences. Other topics discussed were Basic Radiation Processes, Radiation Transport, Reactor Physics and Shielding, Accelerator-based Radiation Physics, Radiation Effects and Dosimetry, Radiation Detection, Measurement and Applications, Radioactivity Transport in the Natural Environment, and Regulatory Aspects in Advanced Technologies.

There were 24 invited talks which involved 12 scientists from abroad and covered a vast spectrum in the field of radiation physics theory and applications. About 130 contributed papers were presented as posters and five were selected for excellent poster presentation awards.

The invited talks covered an extensive range of topics related to modern trends in research connected to radiation physics with major emphasis on advanced technologies. The fundamental aspects of radiation physics were also covered in a talk by R.H. Pratt, University of Pittsburgh, USA discussing new developments in the theory of photon and electron interactions with atoms. The lecture demonstrated the need for modifying standard text book descriptions at high energies. The anisotropy in measured Compton profiles to determine the momentum densities and band structure of metals and alloys were discussed by B.L. Ahuja of M.L.S. University, Udaipur, India. The problems in high energy neutron and photon dosimetry, missing links in muon dosimetry and radiography and application of neutrinos to real life problems were elaborated by M.R. Iyer, India.

There were five talks related to the radiation physics aspects of particle accelerators such as use of accelerators for hadron therapy by R.K. Bhandari, VECC, India; regulatory requirements of accelerators by Om Pal Singh, AERB, India; description of the RIKEN radioisotope beam factory that consists of a heavy ion injector linac, an injector cyclotron, four ring cyclotrons, projectile-fragment separators and experimental facilities along with its radiation safety aspects were given by Y. Uwamino, RIKEN, Japan. Adolfo Esposito, INFN-LNF, Italy talked about neutron spectrometry and dosimetry around high energy particle accelerators using the Bonner sphere spectrometer and reported neutron spectra and ambient dose equivalent results measured around the DAFNE accelerator complex and at the GSI heavy ion accelerator. Nisy Ipe, Consultant, USA gave an overview of the shielding design considerations for medical particle accelerators.

The fusion technology aspects were covered by two lectures, one by Paola Batistoni, EURATOM-ENEA, Italy where she mentioned about the need to validate and verify nuclear data used for neutronics calculations prior to use in finalising the ITER design.

The second talk was by A.N.S. Iyengar, SINP, India where he presented the results of investigations of hard and soft X-rays to determine the plasma parameters such as electron temperature, density and characteristics of impurities etc. in the SINP tokamak plasma.

There were two talks related to radiation detectors: the fundamentals and application of liquid xenon detectors by Isabel Lopes, University of Coimbra, Portugal while P.K. Bhatnagar, DLJ, India discussed the present and future of radiation sensors.

The biological effects of radiation were covered in two lectures namely, influence of DNA repair gene polymorphisms on DNA repair capacity in humans by K. Satyamoorthy, Manipal University, India and by A.R. Thakur, WBUT, India who talked on correlating the effect of metal accumulation and gamma irradiation on extracellular protease production in microbes.

The reactor physics aspects were dealt with by R. Indira, IGCAR, India who emphasized the need of benchmarks in reactor shield designs where combination of materials are used, and by Toru Obara, Tokyo Institute of Technology, Japan who addressed the polonium issue in lead-bismuth eutectic cooled reactors describing a polonium contamination removal experiment and polonium release experiments carried out by his group.

Computational techniques used in radiation physics research were the subject of two presentations viz, application of a new unfolding code in workplane monitoring by R. Bedogni, INFN-LNF, Italy and a discussion on Monte Carlo techniques by K.P.N. Murthy, University of Hyderabad, India. David Bradley, University of Surrey, U.K. gave an in-depth overview of phase contrast imaging.

Bhaskar Mukherjee, DESY, Germany described the current research associated with the estimation of the radiation environment produced by a high energy electron linac driving a free electron laser. Recent advancement in brachytherapy for the treatment of cancer was described by R.K. Das, University of Wisconsin, USA. P. Bhattacharjee, SINP, India deliberated on cosmic radiation processes as probes of the high energy universe. Mohini Gupta, Manipal University, India dealt with the subject of super-heavy elements with the speculative debate on island of stability around neutron number 184 where the necessary balance between the nuclear and Coulomb forces can only be achieved by shell stabilization.

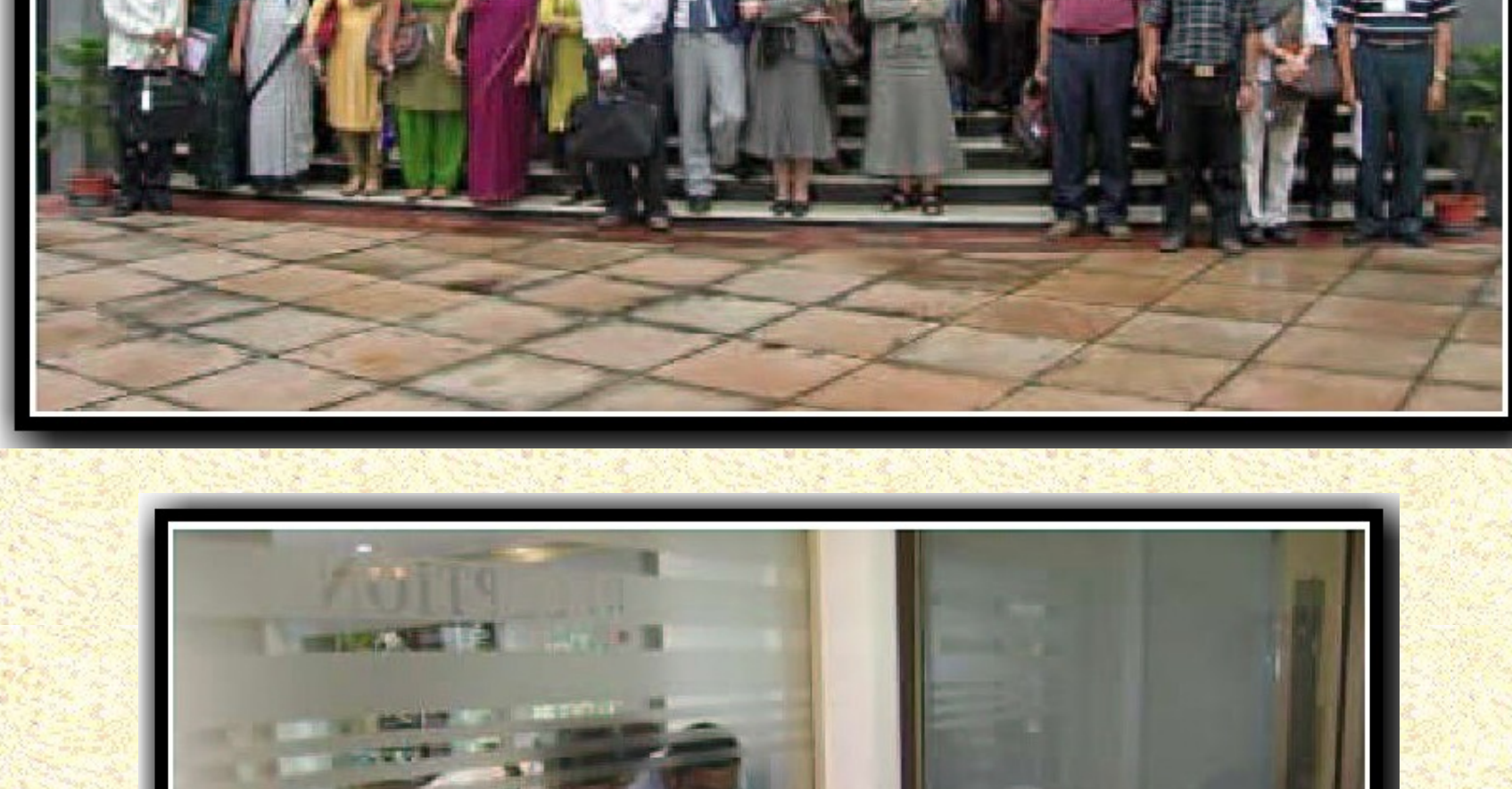
Among nearly 130 contributed papers that were presented as posters, five got selected for awards. They are:

- (i) "Dose rates on irradiated zircaloy-2 pressure tubes of Madras Atomic power station (MAPS) I & II by P. Pravin Kumar et al;
- (ii) "The super-heavy elements: Status and prospects" by M. Gupta et al;
- (iii) "Scattering of muons transmitted through slabs of iron and uranium" by M. Sengupta Mitra et al;
- (iv) "Discoloration of Brilliant Blue and Congo red in aqueous medium by gamma radiation" by A. Shanbhag et al;
- (v) "Development and standardization of direct Radon/Thoron progeny sensors" by Rosaline Mishra et al.

About 190 delegates from India and abroad participated in the symposium. Intensive interaction between senior scientists and students marked the academic outcome of the symposium.

Proposals were made to involve universities in much deeper and wider ways in radiation physics research in collaboration with national laboratories. Several collaborations between different national laboratories and with foreign laboratories have been proposed which need to be taken up for further action.

Some photographs from the NSRP-17 Symposium :



# MEMBERS' REPORTS

Nuclear Conference in Bulgaria 2006 Coimbra  
Workshop

## Nuclear Conference in Bulgaria

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The Bulgarian Nuclear Society organised an international conference on Nuclear Power for the People, with the subtitle Scientific Support for Nuclear Energy and Medical Radiology (Plovdiv, 14 - 17 November 2007). In reality, the conference covered more than the two topics expressed by the subtitle. Considerable attention was also paid to education and training of staff for nuclear power plants and other workplaces dealing with nuclear sciences and technologies, to regulatory considerations and public relations. The key introductory lecture by Abel J. Gonzalez was devoted to new UN estimates of the health effects of radiation exposure.

The education and training session showed that Bulgaria has shared in the common European problems of teaching and training nuclear engineers. The problems summarised in the paper by M. Giot (Belgium), who placed the topic into a wider European context, were very similar to those brought up in the papers of Bulgarian colleagues, and also to those which the author of this report meets at his own university. They can be expressed under three headings: small numbers of students seeking a career in the nuclear sciences, low scientific knowledge of candidates from secondary schools, and lack of money for extending study programmes and for modernising laboratories. However, this situation can change when potential students recognise that there are good working and salary opportunities in nuclear institutions and in medical radiology.

Bulgaria is one of the European countries that did not reject nuclear power. It has an operating NPP at Kozloduj and is preparing to construct a new NPP at Belene. The state of the Belene project was one of the important topics of discussion. Another important step regarding nuclear reactors in Bulgaria, perhaps the most important from the point of view of radiation physicists, is the ongoing reconstruction of the IRT-2000 research reactor at the Institute for Nuclear Research and Nuclear Energy in Sofia. The reconstructed reactor will have a thermal power of 200 kW; fuel enriched below 20 % of  $^{235}\text{U}$  to meet current security requirements; and ten vertical and seven horizontal experimental channels with: a maximum flux of fast neutrons of about  $3.10^{12} \text{ cm}^{-2} \text{ s}^{-1}$ , thermal neutrons of about  $8.10^{12} \text{ cm}^{-2} \text{ s}^{-1}$ , and a special channel with epithermal neutron flux of about  $5.10^9 \text{ cm}^{-2} \text{ s}^{-1}$  for boron neutron capture therapy. The small family of European research reactors will be valuably extended by this project.

One more feature made itself felt at the conference - the great importance that is attributed to medical applications of ionizing radiation in Bulgaria, both for diagnostics and for therapy, and to the teaching and training of specialists in this field. Plovdiv is a major Bulgarian centre for these topics, thanks to the inter-university centre established in 1997 with the participation of the University of Plovdiv, the Medical University of Plovdiv, the Technical University of Sofia - Plovdiv branch, and the Central Laboratory of Biomedical Engineering of the Bulgarian Academy of Sciences in Plovdiv.

The conference was held in the very impressive rooms of the Trimontium Princess Hotel, right in the city centre, and provided a good overview of activities in the field of applied nuclear and radiation sciences in Bulgaria. However, the Proceedings of the conference have been a somewhat under-exploited opportunity. The conference was bilingual, in English and Bulgarian, with simultaneous translation from one language to the other. The Proceedings are also bilingual, split approximately half-to-half between English and Bulgarian, but without translation, and many papers are not included (i.e., not submitted by the authors). This conference provided an interesting view of the state of the art in Bulgaria, which joined the European Union only months ago, in January 2007. Bulgaria is clearly ready to take an active part in international collaboration in all fields of science, including radiation physics.



## 2006 Coimbra Workshop

William Dunn

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The *Workshop on Use of Monte Carlo Techniques for Design and Analysis of Radiation Detectors* was held at the University of Coimbra from 15-17 September 2006. This three-day Workshop immediately preceded the Tenth International Symposium on Radiation Physics. The Physics Department at the University did a magnificent job of hosting the event. The Workshop was attended by 136 people from a variety of countries; this represented a larger contingent than was originally anticipated, but the facilities accommodated the large group excellently.

This Workshop was organized in such a way that all oral presentations were invited. This allowed the organizers both to present a cohesive program and to assure high quality for every session. The following topics were addressed on the first day:

- Past, present, and future of radiation detectors (Glenn Knoll)
- Micro-pattern gaseous detectors (Fabio Sauli)
- Inorganic scintillators (Carel van Eijk)
- Semiconductor detectors (Antonio Longoni)
- Novel photo detectors (Jaroslav Va'vra)
- Neutron detectors (Douglas McGreer)
- Detectors in medicine (Roberto Pani)

The second day featured talks on the following topics:

- Overview of Monte Carlo methods (William Dunn)
- Electron transport simulation (Francesc Salvat)
- Photon transport simulation (Jorge Fernandez)
- Neutron transport simulation (Pedro Vaz)
- The MCNP code (Avneet Sood)
- The MCSHAPE code (Jorge Fernandez)
- The PENLOPE code (José Fernandez-Varea)
- The GEANT4 toolkit (Vladimir I vantchenko)
- The EGSnrc system (Iwan Kawrakow)
- The FLUKA code (Alfredo Ferrari)

The lovely banquet on Saturday evening was preceded by a banquet lecture on the Monte Carlo - library least-squares approach, given by Robin Gardner.

The last day involved parallel sessions allowing attendees to work with the code of their choice among the six alternative codes discussed on the previous day. The hands-on sessions were so popular that many of them extended past their scheduled ending times.

A special issue of *Radiation Physics and Chemistry* will be devoted to both a partial glimpse of the state-of-the-art of Monte Carlo as it applies to radiation detectors and an indication of the high quality of the presentations.

Special thanks are richly deserved by Isabel Lopes (pictured below, with Jorge Fernández) and Margarida Costa of the Physics Department at University of Coimbra. They were ably supported by staff and students too numerous to acknowledge individually. Those who were able to attend enjoyed, I think, a tremendous experience. I know that I did.



Tabulation of Participants at Coimbra Workshop by Country

SYMPOSIUM		WORKSHOP	
Country	No. of Participants	Country	No. of Participants
Argentina	1	Argentina	1
Australia	4	Australia	1
Austria	2	Austria	2
Belgium	8	Belgium	4
Botswana	1	Botswana	
Brasil	40	Brasil	9
Bulgaria	1	Bulgaria	1
Canada	5	Canada	4
China	5	China	
Croatia	14	Croatia	3
Czech Republic	5	Czech Republic	1
Denmark	5	Denmark	1
Estonia	1	Estonia	5
Finland	1	Finland	1
France	9	France	5
Germany	7	Germany	10
Greece	12	Greece	2
Hungary	2	Hungary	2
India	7	India	2
Iran	4	Iran	2
Ireland	1	Ireland	
Israel	3	Israel	2
Italy	20	Italy	11*
Japan	9	Japan	1
Kuwait	1	Kuwait	
Latvia	2	Latvia	
Lithuania	1	Lithuania	1
Mexico	3	Mexico	1
Morocco	2	Morocco	
Namibia	1	Namibia	
Netherlands	3	Netherlands	2
Norway	3	Norway	3
Poland	8	Poland	2
Portugal	44	Portugal	24**
Republic of Korea	9	Republic of Korea	2
Romania	7	Romania	
Serbia and Montenegro	1	Serbia and Montenegro	
Slovenia	3	Slovenia	1
South Africa	3	South Africa	2
Spain	22	Spain	15***
Sudan	1	Sudan	
Sweden	1	Sweden	
Switzerland	1	Switzerland	2
Syria	1	Syria	1
Taiwan	5	Taiwan	
Tunisia	1	Tunisia	
Turkey	1	Turkey	
Ukraine	1	Ukraine	
United Kingdom	17	United Kingdom	6
U.S.A.	17	U.S.A.	12****

\* 7 were lecturers; \*\* 4 were lecturers; \*\*\* 4 were lecturers; \*\*\*\*6 were lecturers

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# OBITUARY



## Luo Zhengming

Born November, 1940, Chengdu, Sichuan, China



Luo Zhengming, age 67, professor of Sichuan University, China, passed away at Chengdu, China, on November 21, 2007, due to a heart attack.

He was born November 16, 1940, at Chengdu, in the Sichuan province of China. He graduated from the Department of Engineering Physics of Tsinghua University, China, in 1963, majoring in Experimental Nuclear Physics. He is survived by his wife, Xiaoqing Hou, and his daughter, Wenjie Luo.

He had been an industrious and creative scientist. From 1963 to 1972, he worked in the Institute of Radiation Protection, TaiYuan, China. During this period, he creatively advanced a cavity ionization theory and the bipartition model for charged particle transport. Afterward, he moved to the Southwest Institute of Physics, LeShan, China, and worked there until 1981. During this period, he had worked on the theories related to plasma hydrodynamics and also on inverse problems that arise in experimental data analysis. In 1981, he returned to the Institute of Radiation Protection. In 1984 to 1986, supported by Alexander von Humboldt Foundation, he visited the Würzburg University and the München University of Technology, in Germany. He moved to Sichuan University in 1987. Since then, he devoted his attentions to applying his theory for radiation transport to problems in charged particle surface interactions, radiation therapy, and experimental measurements of atomic inner-shell ionization cross sections by electron impact. In the last few years of his life, he directed the development of a treatment-planning system for radiotherapy that has been successfully commercialized.

Luo had been the Director of the Key Laboratory of Radiation Physics and Technology, Education Ministry of China and the Vice-Chairman of the International Radiation Physics Society. He was zealous in scientific international intercommunication. He nurtured various international collaborations and was a supporter of science as a cooperative venture without geographical boundaries. He will be missed by his family, colleagues and friends.

*From Dr. Zhu An, Institute of Nuclear Science and Technology,  
Sichuan University, Chengdu, China*

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