

# MEDICAL PHYSICS WORLD

Bulletin of the International Organization for Medical Physics

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## President's Message

It has been an honor and privilege to serve as your President for the past three years. Thanks to the hard work and dedication of several of the leaders in our organization, these have been among the most exciting and productive years in our history. I am especially indebted to Secretary General Gary Fullerton for his forward thinking and tireless efforts on our behalf. I have been fortunate that his first three years as Secretary General coincided with my Presidency.

The IOMP has initiated so many new projects during this period that I could not possibly cover them all in this short report. Following are some of the more significant. We have formed several new committees and councils: the International Advisory Council, to coordinate regional activities; the Corporate Advisory Council, to represent our Corporate Affiliates; the Professional Relations Committee (replacing the old Developing Countries Committee), to address topics of importance regarding professional activities and practice of our members and member societies; the Awards and Honors Committee to develop new ways to honor those members who have made outstanding contributions and to administer the first of our IOMP awards—the Marie Curie Award, to be presented at the Chicago World Congress. Charges and Methods for all our committees and councils have also been formulated, and have been posted on the IOMP Home Page ([iomp.org](http://iomp.org)). Our Home Page was first developed by Kwan-Hoong Ng and Larry DeWerd and hosted at the University of Wisconsin, Madison, but it has now been moved to the AAPM Headquarters where most of the recent developments have been made under the direction of Gary Fullerton. Thanks to Gary, our Home Page now contains a wealth of useful information, including our Membership Directory, Statutes, Bylaws, guidelines and application forms for sponsorship or endorsement of regional activities, detailed information about all our committees and councils, and a link to the web site of our World Congress ([wc2000.com](http://wc2000.com)), also developed by Professor Fullerton. We have established “virtual meetings” of our Officers, Councils and Committees, via e-mail. We have initiated development of a Global On-line Medical Physics (GOMP) textbook under the editorship of Larry DeWerd. Probably most exciting of all developments has been the election of our union, the IUPESM, into full membership of ICSU, which would never have happened without the persistence of Immediate Past President Keith Boddy with the able assistance of Gary Fullerton.

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## Secretary-General's Report

Dear IOMP Members,

### IOMP Participation in IUPESM

There are a number of very important issues for the future of the IOMP that will be discussed and decided in Chicago this summer. The first and perhaps most important of these will be the future of the collaboration of the Organization with the IFMBE as a component member of the International Union for Physical and Engineering Sciences in Medicine. As your delegates to the IOMP Council in Nice, France reported, there was significant questioning about the future of the Union and the IUPESM application to become a full member of the International Council for Science (ICSU). The goal of full membership is now achieved and two workshops in Chicago on the future of interchange with ICSU will be held as an IUPESM Workshop on Saturday morning from 8 am to 12 noon, July 22, 2000 with a follow-up session from 8 am to 12 noon Tuesday, July 25, 2000. IUPESM President (and IOMP Past-President), Prof. Keith Boddy, is arranging these sessions and invites the participation of all physics and engineering delegates. This workshop will provide part of the basis of Dr. Boddy's report to the IOMP Council. It appears that Dr. Boddy will recommend to the Council that the IOMP continue participation in the IUPESM. If this action is approved then the 2006 World Congress will continue as a combined meeting of bioengineering and medical physics. IOMP needs your input.

### Update of IOMP Statutes and By-laws

Over the past three years the IOMP Executive has undertaken a modernization of IOMP to use electronic communications and the Internet to achieve IOMP goals. A number of new committees were designed, charged and set to work. These committees include the Awards Committee, the Science Committee and a Professional Relations Committee. All of these committees are now functioning and have implemented programs, which are reported in detail on the IOMP home page (<http://www.iomp.org>). IOMP Executive Committee changes must now be considered, evaluated and approved/disapproved by the Council. These and other matters will be sent to official delegates in the near future. Other members of National Members societies are welcome to participate in these discussions at the IOMP First Council Meeting on Sunday morning, 8 am to 12 noon, July 23, 2000 at the International Headquarters Hotel (Hilton Palmer House Hotel) or at the Council/General Assembly meeting on Wednesday, July 26, 2000 from 1 pm to 5 pm at the Navy Pier Convention Center. The exact times and places are tentative but will be confirmed shortly in announcements on the IOMP and WC2000 home pages.

### Regional Meeting Programs

The IOMP Education and Training Committee, Science Committee and the Professional Relations Committee have embarked on extensive regional programming with the assistance of National Members and/or Regional Chapters. The IOMP Executive Committee has endorsed increased funding of these activities and invites National Members to submit applications for IOMP meeting sponsorship either directly to the Committee Chairpersons or to the Secretary General's office. These efforts are now coordinated through the International Advisory Council, which also includes membership of representative of the WHO, PAHO and IAEA. The Council is assigned the duty of coordinating IOMP programs to minimize date conflicts and optimize impact in the resolution of medical physics problems. These programs now provide a framework in which the waiver of dues for developing countries are evaluated and approved.

Gary Fullerton  
Secretary General, IOMP

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## Vice President Report

Since my last report, in the past several months I have been trying to popularize the idea of IOMP activities and the fact of IOMP's joining the ICSU (through the IUPESM, of course). That is why at the Annual Conference of Polish Physicists, September 20-24, 1999, I read a paper the structure and activity of international organisations for medical physics and biomedical engineering, which is to appear in the proceedings of the conference. My presentation was well attended and met with considerable interest although it came at the end of the conference when most people were ready to leave. I have also participated in the preparation of a special session at the conference dedicated to medical physics and biomedical engineering. In the 50-year long tradition of Polish physics meetings, this was the first case of medical physicists' participation and the special attention accorded to medical physics among physicists who are usually mostly concentrated on their own business, that is mathematical and experimental physics.

I have also contributed an article on "FIZYKA MEDYCZNA I BIOINZYNIERIA NA SWIECIE" (Medical Physics and Biomedical Engineering in the World - in Polish) to a book on medical physics and biomedical engineering authored by several Polish medical physicists to be published soon by the Polish Society of Medical Physics and sponsored by the Polish State Committee for Science.

Following the 5-year year tradition I have also prepared the new issue (No. 12) of "Medical Physics and Biomedical Engineering", the IUPESM Bulletin for the developing countries, which will be sent out to our regular recipients in the near future.

I have also started preparations to open a website for the above Bulletin in order to facilitate the distribution and reduce postage costs.

*Oskar A. Chomicki,  
Vice-president, IOMP*

## Letter from the President of IUPESM

Dear Fellow Member of IUPESM and ICSU,

Continuing my analogy of likening these Presidential Letters to a soap opera, this is the final episode in which I shall appear as your President. It has been a great honour to serve you in this capacity and together we have won an historic "Oscar", as scripted in the following paragraph quoted from ICSU's letter:

*"For the record, I take great pleasure in informing you that the 26<sup>th</sup> General Assembly of ICSU held in Cairo, Egypt from 28-30 September 1999 voted to admit the International Union for Physical and Engineering Sciences in Medicine (IUPESM), already an International Scientific Associate of ICSU since 1982, as a Full Scientific Union Member. We are very pleased to welcome you more closely into the ICSU family."*

However, before retiring from this role, there is much remaining to be done in preparing the script for our future. Having achieved the status of a Full member of ICSU, IUPESM is among the elite of International Unions. We must be able to play a full part in establishing our own programmes and collaborating with other members of the ICSU family on projects of global significance.

Viewed from the Presidency, it is essential to our future to revise thoroughly not only the now outdated Constitution and Bylaws of IUPESM but also simultaneously our structure and methods of operation. Our Constituent Organizations, IOMP and IFMBE, are the essence of IUPESM but we must recognize that it is IUPESM which is a Full Member of ICSU and not our individual organizations. Symbiosis of the highest quality is vital if we are to achieve the full potential of our new status.

The Millennium World Congress in Chicago will provide us with an excellent and timely opportunity to address these issues fully and frankly without inhibitions. A "no holds barred" approach will allow us to consider a range of possibilities from, perhaps the most radical (and logical?), of merging IOMP and IFMBE within ICSU to the minimum requirement of much improved collaboration. As the alleged curse says, "May you live in interesting times!"

We must also identify how best to relate to and function within ICSU, to become an influential advocate globally for Medical Physics and Biomedical Engineering. An application has been made to ICSU for grant support of our Key Programme on Public Understanding of Science: Contributions of Science and Engineering in Health Care. The proposal is to establish a well-illustrated "brochure", written in populist language readily understandable by the public and politicians, available on the IUPESM web-site and as a publication. If successful, it should also catalyze relationships and collaboration with other members of the ICSU family. A decision by ICSU should be known in time to be reported at the World Congress. We need to develop our existing Key Programmes and establish others of sufficient prestige to attract resources not only from ICSU but also other international sources of funding.

In concluding this three years long series of soap operas, I wish to applaud, on your behalf also, the other "members of the cast". Any progress during this period has been a team effort. I am extremely grateful to Members of Council and others for their unstinting support but especially the Presidents of IOMP and IFMBE and our energetic and innovative Secretary General for their constant wisdom, encouragement and friendship.

It is with utmost confidence that I will hand over the "Leading Role" of IUPESM to Professor Jean-Pierre Morucci. There could be no better successor.

*Thank you again for the honour of being your President.  
Keith Boddy CBE, DSc, FRSE*

## Report of the Professional Relations Committee (PRC)

The following activities of the PRC are currently in progress.

### 1. Status of Medical Physicist Certification.

We have received responses from 31 countries on the questionnaire. The information gathered will be presented at the Chicago meeting. Thanks to the countries that responded.

### 2. Equipment exchange program.

The equipment exchange program is still active and a separate report on this activity can be found elsewhere in this issue. Mohammed Zaidi is doing great work in this respect!

### 3. Financial assistance to attend World Congress.

The PRC compiled guidelines for the allocation of the limited IOMP funds to assist colleagues (especially from developing countries) to attend the World Congress in Chicago. These guidelines can be found on the IOMP website. Any constructive comments will be appreciated and should be sent to the PRC chairperson.

### 4. Twinning program.

The PRC intends to revitalise the twinning program and this matter will be discussed during the general meeting of the PRC in Chicago. All colleagues are invited to give their ideas to PRC members in order to establish a workplan for this type of co-operation. (The program was published in MPW volume 11, no 2 of 1995 and electronic copies can be obtained from the PRC chair).

*Andries van Aswegen, PhD  
Chair, PRC*

## Donation of Used Equipment – (PRC Report)

During this period, the Professional Relations Committee (PRC) shipped a Theratronics Treatment Planning System (TPS) 300 including two monitors, scanner, and plotter to the Assut Medical School, Assut, EGYPT. The TPS was very kindly donated by Penrose Hospital, Colarodo Springs, CO. in February 2000. Jerry White, Medical Physicist of the hospital, helped us to get the equipment donated to IOMP and make the necessary arrangements for handling and shipping. THANKS.

Theratronics - Theraplan 300 Treatment Planning System—donated by Mercy San Juan Radiation Oncology Center being shipped to Jawahar Lal Nehru Cancer Hospital and Research Center, Bhopal, MP, India. Jonathan Bareng and Mary Jo Ramsey, Medical Physicists at the hospital, helped us to get the equipment donated to IOMP and making the necessary arrangements to get it shipped. THANKS.

Two reconditioned Block Cutters have been donated by Huestis—one being shipped to Institute of Radiotherapy and Nuclear Medicine (IRNUM), University of Peshawar, Pakistan and the other to Padhar Hospital, Betul, MP, India. PRC is very thankful to Terry Chwalk for the donation and Gary Shaw helping PRC for their shipment.

The IOMP PRC is thankful to the hospital/institution administration for donation of the equipment posted above.

All these old equipment donated by the IOMP will be used for patient care and training of personnel in a developing country. It cannot be sold or traded with any one else.

Dr. Sher Mohammed Khan, Director of IRNUM, has sent me a picture of the instrument with his physics support staff. It is working and helping the clinic to plan treatments.

Dr. Khan and his staff are thankful to IOMP for the donation of the equipment.

### Used equipment needed:

Co-60 machine, Varian 6/100, Film Dosimeter, Radiation Field Analyzer, Rectal Monitor, Cavity Chamber, Gamma Camera operating in a Spect mode, Harshaw TLD Readers, Ultrasound system with sectorial transducer, surgical aspiration system, gastroscope, cardiocograph and micro-analyzer for blood, urine and biochemistry analysis.

### Used equipment available:

Treatment Planning Systems, ROCS, Theratronic 300 and 400

The equipment mentioned above are in good working condition. The recipient has to pay for shipping and handling in dollars. In case you want to donate to PRC or want some equipment donated to your organization, please contact Mohammed K. Zaidi at 208-526-2132; fax: 208-526-2548, or e-mail zaidimk@id.doe.gov.

## International Scientific Exchange Programs

The Physics of Radiation Therapy  
King Faisal Specialist Hospital and Research Center • Saudi Arabia  
January 6–12, 2001

### Sponsoring Organizations

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## Science Committee Report

The IOMP Science Committee sponsored three regional science conferences in 1999 in Tallin, Estonia; Patras, Greece and Guangzhou, China for which final reports were submitted and posted on the IOMP home page (<http://www.iomp.org>). Presently three conferences are proposed for 2000 with one in Beijing, China, one in Sofia, Bulgaria and the last in Chigago, USA in conjunction with the World Congress. The Chicago program is organized by the Latin American Chapter of IOMP and will give a one-week course on progress in medical physics in Spanish designed by Latin American medical physicists for the use of practicing medical physicists in Latin America. In addition there are preliminary contacts for proposal from EFOMP for a science meeting in Belfast, Ireland and a proposal from Australia for a therapy physics meeting in Brisbane, Australia in 2001. Regional IOMP chapters or groups of National Members are encouraged to contact the Chairperson of the Science Committee to receive Science Committee support and funding.

*Gary D. Fullerton, Ph.D.  
Chairman, Science  
Committee*

## President's Message

*(continued from page 1)*

Finally, we have continued to publish Medical Physics World thanks to Editor Azem Niromand-Rad, to establish new libraries for developing countries, under the care of Curator of Libraries: Marilyn Stovall, and to support the development of nine new Institute of Physics Publishing Medical Science Series books during this period, all supplied free to our libraries. We have also continued to sponsor or endorse workshops and courses, nine presented in the past three years under the guidance of Education and Training Chair Professor Niromand-Rad, and we have continued to expand our membership, with five new member nations joining since our last World Congress. I was fortunate to be able to visit our most recent member Taiwan in March of this year to welcome them to membership personally.

We have made great strides over the past few years and, I am sure, will continue to do so under the leadership of incoming President Oskar Chomicki and his team of Officers. I wish them every success.

*Colin G. Orton,  
IOMP President*

## Report From the Education and Training Committee (ETC)

In the past few months, the Education and Training Committee has endorsed (without financial support) or co-sponsored (with financial support) the following educational programs for 2000:

- A 2-day Medical Physics Workshop: Imaging, Dosimetry, & Radiotherapy, in Kuala Lumpur, Malaysia, April 10 - 11, 2000. (\$0.00)
- A one-week course/workshop in Radiation Therapy Physics at Chulalongkorn University in Bangkok, Thailand, May 29 - June 2, 2000. (\$2500.00). This program is co-sponsored by the American Association of Physicists in Medicine - AAPM (\$2500.00).
- A 3-day seminar: Train-the-Trainer, EMERALD Training in Medical radiation Physics, in Prague, September 3 - 5, 2000. (\$1500.00)

In addition, the ETC has reviewed and approved the proposal for IOMP sponsoring partnership in TEMPERE II - Training and Education for Medical Physics and Engineering Reformation in Europe. This proposal was also approved by the IOMP Officers.

*Azam Niromand-Rad, PhD  
Chair, ETC*

## Status AAPM/IOMP Libraries

We currently have 83 active libraries in 49 countries, including two new libraries established in the past six months. Large donations during the first nine months of 1999 exhausted the funds for shipping costs allotted for the entire year. Therefore, the libraries program was able to accept only two donations during the final quarter; both donors generously paid shipping costs. Since the new budget for postage reimbursement was made available in January, we have initiated five donations to five libraries. In addition, three donations are being matched with an appropriate library.

We continue to work with Brenda Trigg at IOPP to coordinate donations of books to new and existing libraries; all new libraries receive at least five books. We communicate regularly with Kathy Burroughs at AAPM to coordinate donations of Medical Physics Journal subscriptions; at this time 37 members donate their subscriptions to libraries. The Society for Radiological Protection has made two mailings of their quarterly publication, the Journal of Radiological Protection, to all active libraries and the third issue will be mailed soon. We notified all libraries that for one year they have free access to the new electronic journal of the American College of Medical Physics.

We contact all libraries annually, to update their information, and the next questionnaire will be mailed soon.

Anyone wishing to donate materials or establish a library is asked to contact the curator.

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## Report from IOMP Awards and Honors Committee (AHC)

As of January 2000, the newly established IOMP Awards and Honors Committee (AHC) was officially formed under the chairmanship of Professor Fridtjof Nüsslin. Members of this Committee, selected to represent various parts of the world, are:

- Africa: Dr. Wynand Strydom (South Africa)
- Europe: Dr. Slavik Tabakov (UK)
- Far East: Dr. Akira Ito (Japan)
- North America: Dr. Azam Niroomand-Rad (USA)  
Dr. Perry Sprawls (USA)
- South America: Dr. Carlos de Almeida (Brazil)

In the past few months, the AHC reviewed the nominees for the **Marie Skłodowska-Curie Award**. We are pleased to inform you that the IOMP first Madam Curie Award will be presented in the World Congress 2000 in Chicago. This award has been established to honor scientists who have distinguished themselves by their contributions on the:

- 1) education and training of medical physicists, medical students, medical residents, and allied health personnel; and/or
- 2) advancement of medical physics knowledge based upon independent original research and/or development; and/or
- 3) advancement of medical physics profession in the IOMP adhering national and international organizations.

The AHC also plans to have its first (non-electronic) committee meeting in WC 2000 to discuss the possibility of formation of other awards/scholarship for younger medical physicists. Please send your comments / suggestions to Prof. Nüsslin, Chair of AHC: [nuesslin@uni-tuebingen.de](mailto:nuesslin@uni-tuebingen.de)

*Reported by: Azam Niroomand-Rad, PhD  
Member of AHC*

## Report on the Medical Physics Workshop

April 10<sup>th</sup> and 11<sup>th</sup>, 2000 • Kuala Lumpur – Malaysia

This two-day workshop was organised by the Department of Radiology, University of Malaya Medical Centre with the endorsement by the International Organization for Medical Physics (IOMP) and supported by the Malaysian Institute of Physics, Radiation Physics, Biophysics and Medical Physics Subgroup.

The workshop was officially opened by the Dean, Professor Mohd. Amin Jalaludin who also represented the Vice Chancellor, Professor Dato' Anuar Zaini. The Dean commented that this was the first workshop of this nature being held in Malaysia and the organisers were encouraged to conduct more such workshops.

The workshop received very good support from medical physicists, radiographers, medical doctors, biomedical engineers, vendor representatives and students; with an excellent attendance of about 70 participants including a few from the region - India, Indonesia, Myanmar, and Nepal.

The objective of this workshop was to review the status of Medical Physics and its clinical relation to both Diagnostic Radiology and Radiation Therapy. It provided a review of the application of physics, techniques and equipment to each of these major areas. A total of six lecturers with vast experience in their respective fields conducted the workshop. In addition the participants also had the opportunity to learn about clinical applications from a radiologist and a radiation oncologist.

The first day was devoted to Imaging and Dosimetry for Diagnostic Radiology. In addition to the obvious goal of limiting dose in the diagnostic examination, dosimetry is also important to determine how much radiation is necessary to make a good image. The importance of a good image for the radiologist viewing for diagnostic determination was reviewed. Various detectors and their use were reviewed for optimum diagnostic applications. Also reviewed were the measurements necessary in the quest to obtain good clinical images.

The second day was devoted to Radiation Therapy and Brachytherapy applications. In both of these areas, radiation dose delivered to the patients' tumour site becomes of utmost importance. Again, the detectors and their calibration were discussed for both of these applications. Important here is the method of determining the dose absorbed. Both external beams and brachytherapy were considered with regard to the various protocols to calculate the dose from the radiation output of the therapeutic techniques. The clinical requirements and recent advances of radiation therapy applications were also discussed. The report of an intercomparison of cobalt and 6 MV beams performed by mailed TLDs among 11 centers was discussed. An initial review of the results showed that most centers were within 5%.

Overall this workshop has met its objective, i.e. to provide a review of the status of Medical Physics and its clinical relation to both Diagnostic Radiology and Radiation Therapy. The workshop also provided a unique opportunity for interaction among the participants; most of them have benefited from lectures and discussions. Many also requested such type of workshop to be conducted annually and to include more advanced topics.

### Workshop co-directors

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# European Conferences in Medical Physics - Education and Training

The 1989 was a milestone year for Europe. The new political map of the old continent and related expansion of the European Union on East lead to changes in all areas of life. Although relatively small profession Medical Physics had to adapt to these changes. Several topic meetings addressed this problem, but the first large event was the European Conference on Post-graduate Education in Medical Radiation Physics (Budapest, 12-14 November 1994), organised by Dept. Medical Engineering and Physics at King's College London (KCL) with the help of the European Federation of Organisations for Medical Physics (EFOMP). Objectives of the Conference were to establish the status and needs and formulate proposals for the advancement of the Medical Physics Education in Europe, thus strengthening the East/West European co-operation in the field. Representatives of 37 European Universities from 24 countries presented their activities and trends in the development of the profession. Significant differences were found between the educational schemes of the countries and a Network was formed aiming to exchange expertise and facilitate joint activities in the field. A Declaration of Intent was signed between all delegates, stating their dedication to work together for European harmonisation of the professional education and training.

One year after the Conference the teaching programmes, status and needs in Medical Physics of 31 European countries were collected and published in the book *Medical Radiation Physics - A European Perspective* (Editors: C.Roberts, S.Tabakov, C.Lewis), King's College London, 1995, ISBN 1 870722 02 7. The book was the first on the topic and was distributed all over Europe in order to strengthen the collaboration in Medical Physics Education and Training. Based on this book some 10 new post-graduate courses were initiated in various East European countries.

The first initiative of the members of the Network was the Joint European Project ERM, which objective was development of one-year post-graduate course (MSc) in Medical Radiation Physics and Engineering in Bulgaria. The project partners were: King's College London - Contractor and Co-ordinator, University of Florence, University of Dublin and three Bulgarian Universities - Medical University VMI - Plovdiv, Technical University -br. Plovdiv, University of Plovdiv. For 3 years the project established an Inter-University Medical Physics Centre (IUC) in Plovdiv, BG and developed a successful MSc course. The whole education in IUC is in English and modularised in order to facilitate the attendance of eminent lecturers from various Universities. Last year the UK Institute of Physics and En-

gineering in Medicine (IPEM) accredited the course and at the moment a third cohort of students is completing its Medical Physics education at the IUC. More information about this MSc course can be found at [www.kcl.ac.uk/erm](http://www.kcl.ac.uk/erm).

The books with Lecture Notes produced for the MSc course in Plovdiv, Bulgaria were printed by the specially established Foundation for distribution to other countries. Based on the experience from this project another Joint European Project was initiated in 1997 aiming to establish a Joint Baltic MSc courses in Medical Physics and Biomedical Engineering. The partners in this project were University of Linköping, King's College London, Riga Technical University, University of Latvia, Tallinn Technical University, University of Tartu, Kaunas University of Technology. The launch of the project results between the three Baltic states (Estonia, Latvia, Lithuania) is expected late this year. More information about this MSc course can be found at [www.rtu.lv/fakult\\_lapas/mzf/eemti/BaltTemp.html](http://www.rtu.lv/fakult_lapas/mzf/eemti/BaltTemp.html)

The first European Conference in Medical Physics Training was held in ICTP, Trieste, Italy (24-25 September 1998). This event was organised in the framework of the project for European Medical Radiation Learning Development (EMERALD). Senior specialists from 26 countries gathered in this Conference to discuss the common European approach to Medical Physics Training using EMERALD. The feedback from this Conference was used as a background for the final edition of the EMERALD training materials. These materials form three training modules in medical radiation physics (X-ray Diagnostic Radiology, Nuclear Medicine, Radiotherapy). Each Training module incorporates: List of Competencies (based on the IPEM scheme); Student Workbook with tasks (performance of each task leads to certain competency); Structured Timetable (describing the approximate time necessary for each task); CD-ROM with Image database (its organisation follows the chapters in the Workbooks). The suggested time for completion of each of the training modules is 4 months (80 days). The EMERALD Training scheme will be presented at a special session during the WC2000 in Chicago. More information about EMERALD can be found at [www.emerald2.net](http://www.emerald2.net)

The EMERALD Consortium includes partners from King's College London, University of Lund, University of Florence and their University Hospitals, Portuguese Institute of Oncology and ICTP, Trieste. After the Conference new partners from Ireland, Northern Ireland, France, Czech Republic and Bulgaria joined the project with objective to disseminate its results in other countries. In this line several International Seminars on Medical Physics Training have

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# In Defence of Radioactivity

This commentary is in defense of radioactivity—perhaps the most important discovery in the history of science. It led to our understanding of the nucleus and its hidden store of energy. Radioactivity was scientifically a more important discovery than x-rays. Many scientists contributed to our understanding of radioactivity. Becquerel discovered the powerful radiation coming from uranium ore in March 1896 but did not realize its importance. Scientists in general did not rush to investigate it. It was nearly two years before Marie Sklodowska Curie decided to study Becquerel rays for her Ph.D. thesis. She and her husband Pierre Curie discovered polonium and radium in 1898. Radium really put radioactivity on the map. It is about a million times more radioactive than uranium. Marie Curie coined the word radioactivity. Pierre measured the temperature rise of radium from the nuclear energy released by its radioactivity. In 1912 Ernest Rutherford discovered the structure of the atom with its tiny, heavy nucleus. He deserved a second Nobel Prize for this discovery.

Unfortunately, radioactivity has acquired a bad name and is feared by the public. The words “deadly radioactivity” appear often in news articles. The attitude of the public toward radioactivity is basically negative. No other form of energy has been so maligned. Several times in the recent years I have read articles unrelated to radiation or physics where “radioactivity” was used as a derogatory adjective. The centennial of the discovery of radioactivity in 1996 was largely ignored by the world. France did declare a two year celebration (1996-98) for the discoveries by Becquerel and the Curies but it was hardly noticed, even in France.. In June of 1997 I was in Narbonne, near the end of the Canal du Midi in Southern France. I saw a poster advertising a traveling exhibit about the discovery of radioactivity and radium.. It was to open the next day in a building shared with the public library. I was disappointed to find that the exhibit did not open as promised. Not even the librarian knew about it.

I visited the wonderful new Science Museum in Paris a few days later and asked if they had an exhibit related to radioactivity or radium. They had none. In the museum book store I found a new anti-nuclear book with a picture of a mushroom cloud on the cover. On the positive side, during a visit to the Presses Universitaires, the publisher of the *Que Sais Je* series of topical books written for the public on a many topics. The series was started during World War II and now has several thousand books in the series. Each book in the series is exactly 128 pages long, (This size is the most efficient to use paper efficiently). I found a new edition of their 1943 book on radium and radioactivity published for the centennial.

In Paris I visited the Curie Museum the Natural History Museum where Becquerel made his discovery. The latter had a special radioactivity exhibit. In both museums, I was one of the few visitors. In the Natural History Museum there was an exhibit of various types of ore that contained uranium. I was disappointed that the museum felt that this radiation may be dangerous to the health of the viewers. The ore was viewed by mirrors behind five cm of lead shielding. It shows how far the radiation scare has gone. The radiation to the viewer of uranium ore would receive much less radiation than anyone flying in a jet plane or a person who takes a skiing holiday in the mountains.

The medical usefulness of x-rays was apparent, even to the public, shortly after its discovery by Roentgen in 1895. The medical usefulness of radium took many decades to be recognized. New discoveries are still in progress.. Becquerel’s discovery of radiation from uranium ore was a scientific curiosity—how could old rocks containing uranium give off powerful radiation for millions of years? The amount of energy released in this process is significant. It is estimated that the power released by the decay of natural radioactivity in the earth is roughly 2700 gigawatts. Equivalent to the electrical power of about 2700 large nuclear power plants. This heat is not uniformly distributed in the earth—it is apparently mostly in the mantle. It plays a large role in some geological phenomena, such as earth quakes, volcanoes and movement of the continents. (Radioactivity was an “earth shaking” discovery.)

It is ironic that the first practical application of radium was as a light source. The idea of mixing radium with a fluorescent paint to produce a continuous source of light was patented in 1903. It was not used extensively until 1913 when it was first painted on the hands and dials of watches and clocks to make them visible in the dark. World War I with its need for dials that could be read in the dark was a stimulus to the radium dial industry. World War II also increased the demand. The industry died about 1960. However, modern passenger aircraft still use the same principle on their EXIT signs. They are illuminated with energy from tritium. A large airplane, such as the 747 may have several curies of tritium.

We think of radium dial painters as victims of radium poisoning. This is true. About 85 radium dial painters (about one percent of the total workers) died from bone cancer induced by radium in their skeleton. The health risks from radium were probably no worse than most occupational risks in the early part of the twentieth century. This risk was reduced to zero in 1925, while the high risks to coal miners continue into the present century.

In the early 1920s some dial painters sued their employers because of health problems. In 1925 the radium dial

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## Radioactivity

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industry made a rule that luminizer shall not touch the paint brush to their mouth. No dial painter who started work after 1925 has ever been found to have radium induced bone cancer. This industrial safety rule, made for financial reasons, was probably the most effective radiation protection action taken during the last century.

Studies of radium dial painters gave the first definitive information about the biological effects of internal radiation on human health. Unfortunately, the lessons learned have been largely ignored. Prof. Robley Evans<sup>(2)</sup> showed that radium produced no bone cancer until the skeletal dose was over 1,000 rads (10 Gy or 200 Sv). Even more remarkable was the fact that at 20 Gy and higher, the incidence of bone cancer was essentially constant with dose-(28 “6)%. (See Fig. 1) It was on the basis the large threshold that Robley Evans was able to recommend a safe body burden of 0.1  $\mu$ g radium during World War II. This was a factor of one hundred lower than the lowest body burden known to cause bone cancer. Prof. Evans considered this body burden safe for his mother or daughter. This value has never been lowered even though the maximum permissible occupational exposure recommended by the ICRP of 0.2 r/day in 1934 has been reduced to 20 mSv/y in 1990-a reduction by a factor of 73.

A recent book<sup>(3)</sup> points out that despite these huge doses to the bones, radium dial painters had no increase in leukemia, presumably the most radiation sensitive cancer. One must certainly question the large tissue weighting factor for bone marrow and the dose rate effectiveness factor of 2 to 10. These important findings from the radium dial painters have been ignored by the ICRP.

In view of these contradictory results of cancer induction by radium, it is hard to understand why the ICRP adopted the linear, no-threshold (LNT) model of radiation risk in 1977. Data of bone cancer among the dial painters in Figure 1 strongly contradict both the assumption of no-threshold and the proportionality of risk to dose-two basic aspects of the LNT assumption. Figure 1 has never appeared in any publication of the ICRP or the NCRP. If the ICRP had adopted a threshold model of radiation risk based on Figure 1 it is unlikely that the present world wide radiation phobia would have developed.

While bone cancer deaths among the luminizers were sad, at the same time radium played a major role in treating and often curing cancer. I am sure that radium saved many more lives than the 85 known deaths caused by it. Radioactivity has played a large role in medicine-initially, in radiation therapy and later, an even larger role in diagnosis and medical research. Many Noble Prizes involve the use of radioactivity.

It took about three decades to solve the technical problems for using radium in the treatment of cancer. It was not until the early 30s that the radium centers for the treatment of cancer were started in England. Pioneering work in this field was done in France where it was and still is known as Curie therapy. Until the advent of megavoltage therapy in the 1950s, radium was by far the most important tool in the radiation treatment of cancer. Radium centers in the UK required a physicist to be a member of the team, thus radium can be credited with stimulating the birth of medical physics. Many of the pioneering medical physicists of the 1930s and 1940s-Duane, Paterson, Parker and Quimby were involved with applications of radium in the treatment of cancer. While radium is now a rarity in brachytherapy, it should still be honored for its pioneering role in the field.

Most people have no idea how radioactive their body is. A typical 70 kg person contains about 9 kBq of natural radioactivity-about 4 kBq from potassium-40 and about 3 kBq from carbon 14. Other radionuclides include thorium, radium and uranium. Your excrement in a year contains about 30 kBq-sewers are low level waste repositories. If all of the 9 kBq in your body were collected and held near a Geiger Counter, it would produce a very fast count rate. If it could all be detected, it would be over a half million disintegrations per minute. In an hour over 30 million radioactive disintegrations bombard the cells of your body. During one day, billions of your cells are struck by this radiation. In one year, essentially each of the trillions of cells in your body has been hit. There is no evidence that this is harmful. On the contrary, it appears to be beneficial.

Recent studies show that areas with high radon levels have less lung cancer than areas with low radon levels.<sup>(3)</sup> The radon levels in three mountain states in the U.S. are about six times greater than in three U.S. Gulf States. Lung cancer death rates are 40% lower in the mountain states. This suggests that radon progeny in the lungs prevents some lung cancers caused by smoking. Cigarette smokers have lung doses of over 8,000 millirem/year from alpha emitters carried into their lungs on smoke particles. (Why aren't cigarette packages required to have a radioactive label?) Perhaps lung cancer would be even more common if cigarettes didn't include this therapeutic radiation!

### References:

1. Robley Evans. Radium in Man (Health Physics Nov. 1974 pp. 495-510)
2. R.E. Rowlan, Radium in Humans published by Argonne National Laboratory 1996
3. J. Jagger. (Health Physics Oct. 1998)

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## Nominations for the ICRU Gray Medal Invited

The International Commission on Radiation Units and Measurements (ICRU) is seeking nominations for the ninth award of the *ICRU Gray Medal*. The Gray Medal was established by the ICRU in 1967. It is awarded for outstanding contributions to basic or applied radiation science of interest to the ICRU and honors the late Louis Harold Gray, former member and Vice-Chairman of the Commission.

The first award of the medal was made to Dr. Lewis V. Spencer in 1969. Subsequent recipients have been Dr. John W. Boag, Dr. Mortimer M. Elkind, Professor Mauriee Tubiana, Dr. Harald H. Rossi, Dr. Dietrich Sehulte-Frohlinde and Dr. H. Rodney Withers. The eighth award was presented in 1999 to Dr. Paul Lauterbur.

The ninth award of the ICRU Gray Medal will be made at the annual meeting of the American Society of Therapeutic Radiology and Oncology (ASTRO) in San Francisco, November 2001. In selecting the ninth medalist, the ICRU has decided that preference will be given to individuals who have made major contributions to basic or applied science related to radiation oncology.

Nominations for the medal may be made by any person or organization. They must include a complete biographical sketch (*curriculum vitae*) of the nominee, selected reprints or records which show the significant contributions made by the nominee, and letters of support evaluating the importance of the contributions. Nominations should be directed to the Chairman of the ICRU, Suite 800, 7910 Woodmont Avenue, Bethesda, Maryland, USA 20814 and must be received by the ICRU no later than 15 September 2000.

For additional information contact: W. Roger Ney, Chief Operating Officer 7910 Woodmont Avenue, Suite 800, Bethesda, MD, USA 20814-3095; voice: (301) 657-2652; fax: (301) 907-8768 • e-mail: [icru@icru.org](mailto:icru@icru.org)

### Mould Room Mailing List

This mailing list has been set up to exchange information and advice, and to offer mutual support to the Health Care Professional working in the Mould Room or Pre-Treatments areas of Oncology Centres, Radiotherapy and Medical Physics Departments etc. Details are given on the web page:

<http://www.onelist.com/community/MouldRoom>

Subscribe on the web page or send a blank e-mail to:

[MouldRoom-subscribe@onelist.com](mailto:MouldRoom-subscribe@onelist.com)

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### European Conferences

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been planned with venues in Dublin, Lille, Prague, Lund, Lisbon, London. The Seminar in September 2000 (venue - Prague, Czech Republic) is co-sponsored by IOMP aiming to facilitate the development of the professional Medical Physics training in Eastern Europe.

Although developed in Europe the results from the above activities are not intended to be limited in this geographical region only. This was underlined in several papers (including a joint paper of IOMP and EFOMP) presented at the Nordic-Baltic Conference in Tallinn, Estonia last year. Later the same year the TEMPERE project Symposium (satellite to the International Conference on Medical Physics in Patras, Greece) confirmed the wish of colleagues from many countries to work together for strengthening the international collaboration in Medical Physics Education and Training.

*Slavik Tabakov, Ph.D.*

*Member, IOMP ETC*

# Calendar of Events

## 23–28 JULY 2000

**World Congress on Medical Physics and Biomedical Engineering,** Chicago, IL, USA. WC2000. Secretariat: Gary D. Fullerton, UTHSC Radiology Dept., San Antonio, TX 782847800, USA  
Tel: + 01 210-567-5550; Fax: + 01 210-567-5549  
e-mail fullerton@uthscsa.edu

## 4–8 SEPTEMBER 2000

**ICR-2000: 21st International Congress of Radiology;** Buenos Aires, Argentina. Congress Secretariat, Tecuman 2075, (1050) Buenos Aires, Argentina, Fax: (54-1) 374 6487-4651-4952  
e-mail: info@icr2000.org

## 4–8 SEPTEMBER 2000

**ICR-2000: 21st Int'l Congress of Radiology;** Buenos Aires, Argentina  
e-mail: info@icr2000.org.ar

## 19–23 SEPTEMBER 2000

**19th Annual ESTRO Meeting;** Istanbul, Turkey  
e-mail: info@estro.be; URL: www.estro.be

## 2–6 OCT 2000

**9th Int'l Symposium on BNCT;** Osaka, Japan  
URL: www.rrl.kyoto-u.ac.jp/9THNCT/index.html

## 15–20 OCTOBER 2000

**IEEE Nuclear Science Symposium and Medical Imaging Conference;** Lyon, France  
URL: http://NSS2000.in2p3.fr  
e-mail: ieee2000@hep.saclay cea.fr

## 23–26 OCTOBER 2000

**Monte Carlo 2000 - Advanced Monte Carlo for Radiation Physics, Particle Transport Simulation and Applications;** Lisbon, Portugal  
e-mail: vaz@nea.fr  
URLs: www.itn.pt/Meetings/MC2000 and www.lip.pVmc2000

## 5–9 NOVEMBER 2000

**Fifth Radiation Physics Conference;** Cairo, Egypt  
e-mail: ruatom@rusys.EG.net

## 27 NOV–1 DEC 2000

**4th Int'l Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing;** Hong Kong  
e-mail: mcqmc2000@www.mcqmc.org;  
URL: www.mcqmc.org/MCQMC2000.html

## 28 MAY–1 JUNE 2001

**13th Symposium on Microdosimetry;** Stresa, Italy  
URL: sunlnl.lnl.infn.it/-microsOI/MICROS-2001.html

## 2–6 JULY 2001

**13th Int'l Conference on Solid State Dosimetry;** Jerusalem, Israel  
e-mail: info@ssd12001.org  
URL: www.ssd2001.org/

## 21–25 OCTOBER 2001

**6th Congress of the Asian Federation for Ultrasound in Medicine and Biology (AFSUMB'01);** Kuala Lumpur, Malaysia  
e-mail: basrij@medicine.med.um.edu.my

## 24–29 AUGUST 2003

**World Congress on Medical Physics and Biomedical Engineering (WC2003),** Sydney, Australia (Gary D Fullerton, UTHSC Radiology Dept., San Antonio, TX 78284-7800 USA,  
Tel: + 0 1 2 10-567-5550; Fax: +01 210-567-5549  
e-mail: fullerton@uthscsa.edu

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