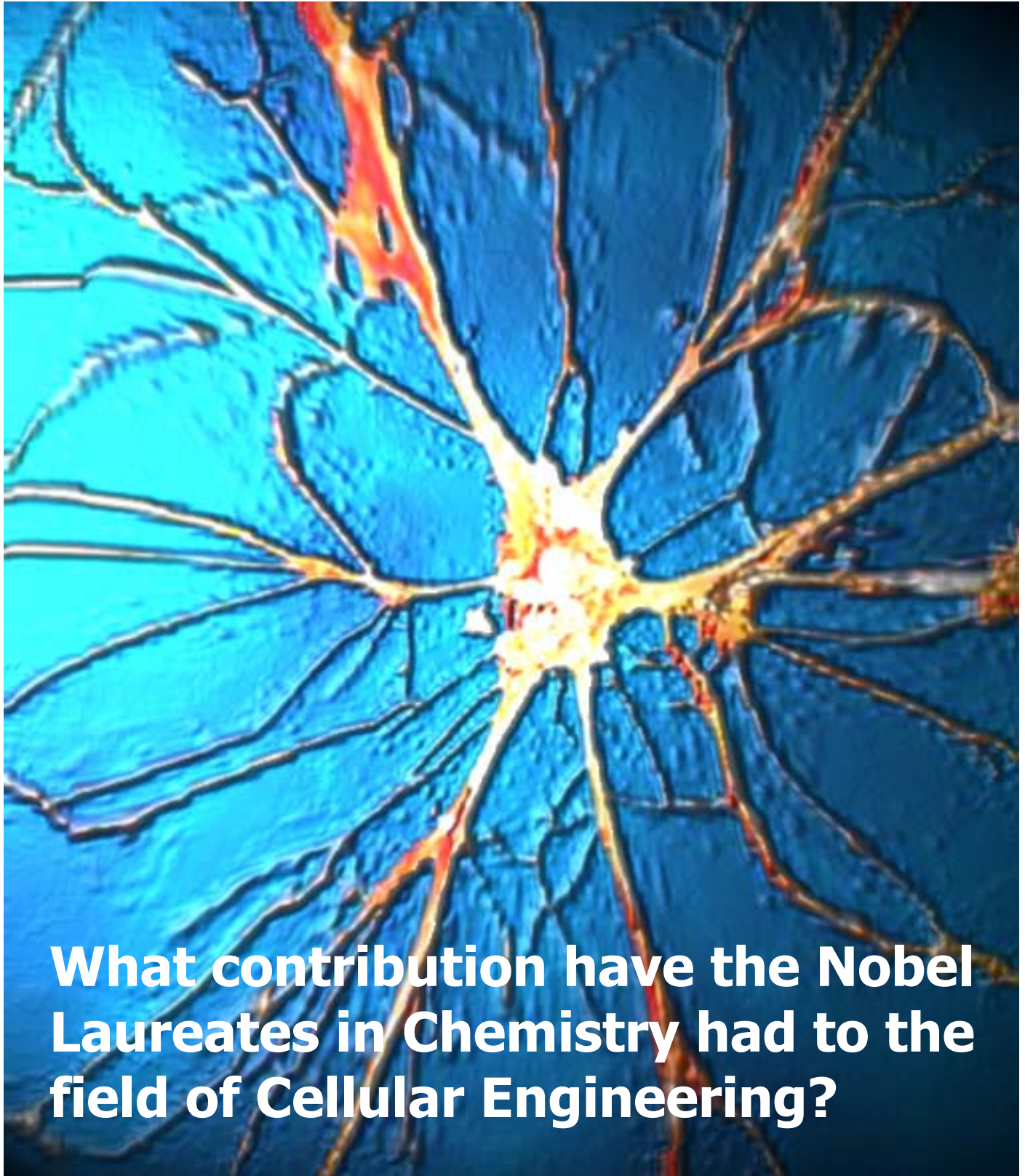


INTERNATIONAL FEDERATION FOR MEDICAL AND BIOLOGICAL ENGINEERING

IFMBE News

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What contribution have the Nobel Laureates in Chemistry had to the field of Cellular Engineering?



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CALENDAR

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Every effort has been made by the publisher to acknowledge organizations and individuals with regard to the supply of written contributions, photographs and illustrations. The publisher apologizes for possible omissions which will be corrected in future editions.

EDITORIAL

Channels to Cellular Engineering

Following the exciting message "*All Science is Interdisciplinary*", elaborated on in the Nobel lecture of **Paul C Lauterbur** - one of the Medicine or Physiology Nobel laureates for 2003 (see also the January 2004 Issue of the IFMBE News), this issue of the News brings comments dedicated to the 2003 Nobel Laureates in Chemistry: **Peter Agre** from John Hopkins Uni-



versity, Baltimore, and **Roderick MacKinnon**, Rockefeller University, New York. In her retrospection, Prof. **Laura Poole-Warren**, from the Graduate School of Biomedical Engineering, University of New South Wales, answers the question "*What contribution have the Nobel Laureates in Chemistry had to the field of Cellular Engineering?*". Indeed, it took several decades from the first proposals to explain the osmotic balance of the cell by water channels in the second half of the 19th century to the first of Agre's publications on the protein relevant for channels, aquaporin, in early 1970's [Science 291, 385, 1992]. The structural studies on how the ion channel works, earned MacKinnon the Nobel Prize. In 1998 he published the first high-resolution picture of an ion channel derived from x-ray crystallography and from this, was able to determine the spatial structure of a potassium channel [Science, 297, pp. 69 and 106, 1998]. Again, with these Nobel laureates, it was thought possible that some may receive a prize for physiology: the explanation of the question of how ion channels achieve their selectivity is critically important for both biology and medicine, but it is actually a matter solved within the field of chemistry [Science, 302, pp. 383-4, 2003].

Mid February saw another jolt in the field of cellular engineering: "*Evidence of a Pluripotent Human Embryonic Stem Cell Line Derived from a Cloned Blastocyst*" [Science, published online February 12, 2004]. Suddenly the news about the first development of a number of cloned human embryos was on the cover of nearly all daily newspapers and in commentaries on television, followed immediately by reviews in many scientific magazines and journals. This surprise came from the Seoul National University where Dr. **Woo Suk Hwang**, (a veterinary surgeon by profession), and his multi-university team succeeded in producing a line of stem cells from cloned embryos. The researchers in Seoul injected genetic material from adult human cells into human eggs that had their own DNA removed. The resulting embryos had the same DNA as their adult donors, making them clones. The researchers then harvested stem cells from these embryos. "*Because these cells carry the nuclear genome of the individual, after differentiation they could be expected to be transplanted without immune rejection for treatment of degenerative disorders*" said Hwang in one of the interviews.

These specially developed cells should, in future, enable curing of serious diseases such as the Parkin-



son's, Alzheimer's, diabetes or spinal cord injury. The work represents "...a major advance in stem cell research. It could help spur a medical revolution as important as antibiotics and vaccines," said Robert Lanza of Advanced Cell Technology (ACT), a company in Worcester, Mass., for Science Online, February 14,



WOO SUK HWANG

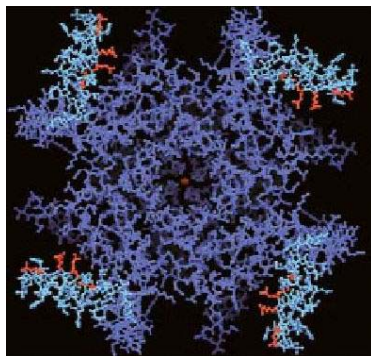
2004. Transplantation medicine will change extensively due to these developments.

The research in the Korean group is considered by themselves as purely therapeutic cloning, i.e. within the frame allowed by the governments of many countries, like Korea, UK or Israel –

countries leading in stem cell research. In contrast to many positive comments to the current medical research, there has also been a serious concern worldwide with voices rising for the cloning to be outlawed. The news from Korea certainly made these voices even more determined. However, Shin Yong Moon, a co-author of the recently published study, said that the work must continue to help fighting threatening illnesses. He also said that a new law passed in Korea would require his and other Korean research groups to get a government licence before proceeding with their research. He also predicted that the medical use of stem cells derived from cloning would require at least another decade of research.

The biomedical engineers have been developing enabling technology for many of the experiments in this field and won't be able to stay away from the discussions with the leading scientists in bioethics on this matter. Nevertheless most of us, when teaching our students, have to deal with these matters.

In this issue, Prof. **Dan Adam**, the new chair of the Federation's Education and Accreditation Committee, writes about the challenges of biomedical engineering education in Israel. We also bring a report on the International Scientific Workshop and Postgraduate Course "Electroporation Based Technologies and Treatments", organised by Prof. **Damijan Miklavcic** and held at the University of Ljubljana,



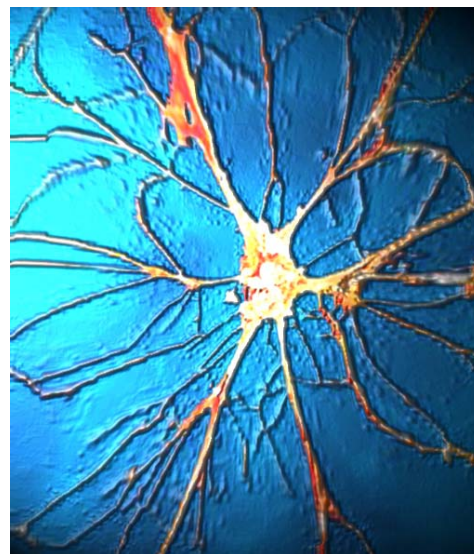
ION CHANNEL

Slovenia, in November 2003. This workshop dealt with electroporation, a process using high-voltage pulses to make cell membranes permeable and to allow the introduction of drugs to the cells eg. to treat cancer or the introduction of new DNA; commonly used in recombinant DNA technology. These aspects of cellular engineering, as well as its current and potential applications of electroporation in medicine, biology, biotechnology and environment were presented by a team of internationally recognized experts.

Postgraduate studies in Europe are increasingly becoming more specific, since the educational space under the same European umbrella is getting reformed and harmonized. Are we going to see more and more of such joint workshops – courses in biomedical education, like the recent one in Ljubljana? Is such teaching about to become dominant? How will the students collect the ECTS points? Will this be adopted by other regions as well?

The future of cellular engineering and its challenges are matters approached regularly in the Federation's Journal, *MBEC*, which also includes *Cellular Engineering*. In 2005, the Federation is going to co-organize the *Third Cellular Engineering Conference* in Seoul, Korea.

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COVER PAGE:

STYLIZED NERVE CELL



FROM IFMBE



EAMBES Council and Executive Board Brussels, March 19-20, 2004

The second meetings of the interim Executive Board and Council of EAMBES took place in Brussels on February 19-20, 2004. Again we were able to make use of the excellent meeting facilities of the Royal Flemish Academy of Belgium for Science and Arts in the centre of Brussels. The attendance was good with only a few of the Council members sending their apologies for not being able to attend.

Contacts with the Commission and Eucomed

The day before the meetings began, some of us met with representatives of the unit "Future and Emerging Technologies" (FET / INFOS) to discuss how EAMBES could facilitate the formulation of the objectives and research themes of the 7th Framework Programme in the area of FET. The conclusion was that EAMBES could support them by:

- ◆ Identifying MBES experts for the FET unit
- ◆ Creating a roadmap of MBES & IST
- ◆ Facilitating in the creation of a thematic MBES network in the FET area.

On Thursday we continued our discussions with Dr. Richard Moore from Eucomed and he agreed to be a speaker of the opening plenary session in the Medicon conference in Ischia, Italy, August 1st.

Registration of EAMBES

We submitted our application to be registered under Belgian law as an international non-profit organisation in late 2003. Jos vander Sloten, our Secretary-General, had received the comments from the Ministry of Justice. The content of our Statutes seems to be OK. What is required, however, is to restructure that content in accordance with the Belgian requirements. Two small task groups were appointed for that work. One will meet with the Belgian officers and the other will revise the statutes. This was decided with the understanding that the required changes are only editorial in nature. The intention is to resubmit as soon as possible in order to have the registration approved by the time we meet in Ischia.

Division of Fellows

Helmut Hutten had worked out an initial draft for

the statutes of the Fellows division. It was agreed that these will be further worked on by the task groups mentioned above and submitted for email balloting before our next Ischia meeting.

Membership applications

Invitations to submit a membership application to EAMBES were sent out in early February to appr. 750 addresses in Europe. These refer to the EAMBES website (www.eambes.org) where applicants can fill in the application form, print and sign it, and then mail it to the EAMBES Secretary-General, Jos vander Sloten. A reminder will be sent out to all in late March also asking when can we expect to receive the application and if any clarifications are needed before an application can be made.

Elections will take place in Ischia

In accordance with the EAMBES Statutes, the elections of the Officers and half of the Council members must take place annually. In connection with the Medicon conference in Ischia, Italy, the Council will be asked to elect the Officers of EAMBES for 2005. There will be four vacant Officer positions to fill, namely President, President-Elect, Secretary-General and Treasurer.

This is the first time regular Officer elections will take place. The procedure was discussed in the Council meeting with the following outcomes:

- ◆ The Nominating Committee is chaired by the current interim President, Niilo Saranummi as he will assume the position of Past-President from 1.1.2005
- ◆ The other four Officer positions (President, President-Elect, Secretary-General and Treasurer) are filled by an election
- ◆ All current Executive Board members are eligible for any of these positions if they consent to be nominated (as they were elected to their respective positions on an interim basis in the inauguration meeting in Frankfurt 2003).
- ◆ The Nominating Committee comprises of a chair and four elected members (elected by the EAMBES Council)



Left to Right, Bottom to Top
J. Vander Sloten, J. Wojcicki, H. Hutten, J. Nagel, L. Roa, M. Viceconti
G. Giminez, D. van Slaaf, J. Barbanel, D. Adam, M. Nyssen, H. Hinrikus, J. Kirkpatrick
N. Maglevaras, J. Holcik, E. Gomez, P. Le Beux, E. Kimmel
N. Saranummi, T. Becks, M. Prado, C. Roux, M. Siebes

All organisations intending to become members of EAMBES have the right to nominate candidates for the election. In selecting nominees, please be sure that they are aware of the objectives and statutes of EAMBES and of the time commitments connected with these positions. The announcement inviting nominations can be found at the EAMBES website.

The elections for the Council positions will take place late in 2004. In Ischia both Divisions will hold their General Meetings and elect their respective Nominating Committees.

Multidivisional committees

Three committees were created in the first Council meeting in mid-October 2003. These reported on their work and actions.

Activities "Science"

- ◆ A position paper on MBES is being written by a small task group. It will be made available for

comments to the Council well before the Ischia meeting. The intent is to finalise it immediately after Ischia.

- ◆ Two proposals for EU funding are being considered. The other one relates to the FET meeting described above and the other to ERA-NET.
- ◆ The 1st European Science Open Forum conference takes place in Stockholm end of August. A proposal was made that EAMBES should be present in it.

Actions "Education"

- ◆ White paper will be published shortly.
- ◆ Two proposals for EU funding are being considered. The other relates to Accreditation and the other to Marie Curie support for conferences.

Actions "Use of Medical Devices"

- ◆ A plenary has been agreed for Ischia.

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FROM THE SOCIETIES



Some highlights from the activities of the Bulgarian Society on Biomedical Physics and Engineering



I. After the 8th National Conference on Biomedical Physics and Engineering with international participation since 2000, the scientific research and its applied aspects are regularly reported at annual and dedicated meetings like:

- ◆ National Spring Colloquium/Workshop on “Physics in man’s protection”- yearly
- ◆ East European Regional Meeting on Electromagnetic Fields (EMF) and WHO Standards Harmonization Meeting 2001
- ◆ National Workshop on Radiation Protection from Medical Exposure 2003
- ◆ 11. National Congress on Radiology 2003
- ◆ Regional and National Seminars on Risk Management, EMF, Mobile Communications, Quality Assurance in Diagnostic Radiology, Radiation Protection in Medicine and others

II. Post-graduate studies and training – organization and lecturers:

- ◆ tutorials – postgraduate and continuing training, also for students
- ◆ National Training Courses – in Q.A. and RP in medicine (with support of the IAEA)

III. Co-laboration and co-operation:

- ◆ with national institutions – with the Union of Physicists in Bulgaria, with the Union of Scientific-medical Societies in Bulgaria, admission to the Union of Scientists in Bulgaria
- ◆ in National Programs – WHO (International Project on EMF), EC (PHARE-MED97 / 43EURATOM), IAEA,...
- ◆ with international organizations – IOMP, IFMBE, EFOMP, EAMBES, VI Scientific Program of the CEC (correspondence, voting, teleconferencing, etc.)

IV. Other work:

- ◆ support of young scientists and researchers/students (literature, contacts, participation in national and international events)
- ◆ publishing of the corresponding proceedings
- ◆ regular officers’ meetings (General Assembly 2003)
- ◆ contacts and correspondence with members countrywide
- ◆ website in progress

- ◆ celebration of outstanding members/veterans and renowned scientists and researchers – Prof. I. Daskalov has been elected as member of the International Academy of BME.

To meet the new century’s challenges of the information society and the national priorities:

- ◆ to strengthen the organization, the role and the significance of the Society internationally and nationally as a forum of experts and as an advisory body
- ◆ to assure methodological support
- ◆ to improve the relations to NGO’s professional formations and other organizations
- ◆ to activate the participation in national and international activities (expertise, teleconferencing, e-voting, propagation and enlargement of the ideas and membership and so on)

and with regard to the forthcoming 9th National Conference with international participation in October 2004, the Administrative Council concentrates all its efforts to realize (to get closer to) the aims:

- ◆ to continue the successful practice in scientific events and training
- ◆ to raise the importance and position of medical physicists and engineers in hospitals, health care units and research centers
- ◆ to install and maintain the Website
- ◆ to update and improve the national data base of BMP&E experts
- ◆ to introduce an accreditation procedure for MP&E in accordance with IOMP’s and IFMBE’s bylaws
- ◆ to propagate ideas and activities of the International Organizations and the National Society on BMPE in order to attract new members (prevailing corporate ones).

Number of members: physicists – 44, engineers - 20

Officers:

President – Michel Israel, graduated physicist, PhD,
V/President – Athanas Slavchev, graduated engineer, PhD,

Past-President – Ventseslav Todorov, graduated physicist, PhD

Athanas Slavchev, Prof.

a.slavchev@ncrrp.org

Third Belgian National Day on Biomedical Engineering



Pascal Verdonck welcoming the attendees in the Marble Room of the Academy

It has now become customary: every fall, about mid-October, the Belgian Society (BSMBEC) and the Belgian National Committee on Biomedical Engineering organize a one day conference under the auspices of the Royal Academy.

In 2003, the conference was held on October 17. After the introduction by President Verdonck, invited speaker Wolfgang Schreiber from the university of Mainz gave a thrilling talk about new applications in magnetic resonance: assessment of the lung's function via nuclear magnetic resonance imaging of gases.

He was followed by local speakers: young researchers highlighting several aspects of the rich and vast field of biomedical engineering: Benoit Macq (UCL) treated the association of biomechanical models and co-registered medical images, Bart Bijmens (KUL) talked about ultrasound and myocardial deformation, Patrick Segers (Ugent) about the integration of cardiovascular mechanics and fluid dynamics via ultrasound imaging and Adrian Munteanu (VUB), about wavelet image coding.

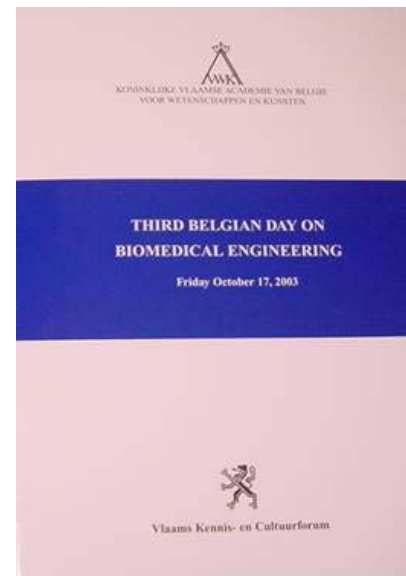
In the afternoon, Nillo Sarannumi explained the creation of the "European Alliance for Medical and Biological Engineering and Science", earlier that year, the structures of the new alliance, its purpose and

its planned actions.

A poster session, comprising a total of thirty five posters in three tracks ("Medical Information Technology", "Clinical-Medical" and "Biomechanics", concluded the day's scientific program. Attendees were guided along the posters by the track session chairpersons, while the authors were given the possibility to highlight their work and to react to questions.

Finally, the 105 attendees enjoyed a drink whilst discussing their work, while promising to meet again next year, look forward to present their progresses and learning about others'.

The proceedings of this National Day were published in the series of the "Flemish forum for knowledge and culture" of the Royal Flemish Academy



of Belgium.

Abstracts can also be consulted on-line via <http://navier.ugent.be/NationalDay>

Many warm thanks go to the Royal Academy, for its support via the National Committee on Biomedical Engineering that could be created after ICSU recognition of our field!

As a "catalyser" this "National Day also drew, along with Nillo Sarannumi, an "international crowd" to Brussels: the European Alliance met on the following Saturday and Sunday in the Academy, in order to define its policies and action plans for the near future.

Marc Nyssen
Secretary BSMBEC
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Guided poster session

GALLETTI AWARD



**American Institute for
Medical and Biological Engineering**

The Pierre Galletti Award was established in 1999 by the AIMBE Board of Directors to honor its Founding Member and Past President. The award is presented to an individual in recognition of his/her contributions to public awareness of medical and biological engineering, and to the promotion of the national interest in science, engineering and education. Nominations are solicited by the AIMBE Awards Committee from the membership and all councils and the college of the organization. The award is presented at the Annual Event of AIMBE.

Robert S. Langer, Ph.D.
2000

John T. Watson, Ph.D.
2001

Robert M. Nerem, Ph.D.
2002

Shu Chien, M.D., Ph.D.
2004

Shu Chien's contributions to the field of medical and biological engineering can be divided into four categories: pioneering research; leadership in building bioengineering at the University of California San Diego (UCSD) into one of the very top programs in the country; his leadership at AIMBE; and his significant influence on the formation of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) at the National Institutes of Health.



SHU CHIEN

Shu has spent a majority of his career bridging the worlds of biology and engineering. From his research he has published 400 articles in peer-reviewed journals. In all areas of his research he has been a pioneer.

At UCSD, he has provided the leadership to propel an already good faculty into a leadership position in the country. He has done this through the creation of the Whitaker Institute for Biomedical Engineering, the achievement of the first leadership/development award, and the establishment of UCSD's department of bioengineering.

His leadership of AIMBE has included being Chair of the College of Fellows (1998-99), President (2000-2001) and current co-chair of AIMBE's fundraising campaign. In each of these positions he has demonstrated his leadership and dedication to AIMBE, always being unselfish and giving generously of his time and resources.

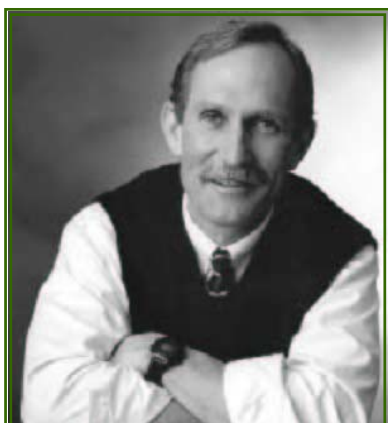
He was a key advisor in the formation of NIBIB. Once Congress passed legislation creating the institute, Shu, more than any individual, represented the bioengineering community in creating this successful venture.

Pierre Galletti was a "man for all seasons." Both as a scholar and a gentleman. Shu Chien mirrors these traits and thus we are honored to name him this year's recipient of the Pierre Galletti Award. ■

BME AROUND THE WORLD

What contribution have the Nobel Laureates in Chemistry had to the field of Cellular Engineering?

It may appear at first glance that the Nobel Laureates in Physiology or Medicine might have had more impact on the Cellular Engineering field than those in the noble (excuse the pun) field of Chemistry. Recent prizes that come to mind include the 2001 prize awarded to Leland Hartwell, Tim Hunt and Paul Nurse for their discoveries of "key regulators of the cell cycle", an area that has obvious significance to quantitative studies of cell functions. Another is the prize in Physiology or Medicine for 1974, awarded jointly to Albert Claude, Christian de Duve and George Palade for their discoveries concerning "the structural and functional organization of the cell". The examples are really too numerous to compile in this short article. Suffice to say that the explosion in our knowledge of cell structure and function, including signalling mechanisms in many cells and tissues, has come to us in part from those eminent recipients of the Nobel Prize in Physiology or Medicine.



PETER AGRE

Chemistry however has given us fundamental knowledge of the building blocks of life and some of the processes that drive our cell functions. A large proportion of the Nobel awards in chemistry go to biochemists, with three out of the past ten years alone directly relating to biochemistry of cells and proteins (2003, 2002 and 1997). Most recently, the prize in 2003 was awarded to two eminent scientists, Peter Agre and Roderick MacKinnon for "discoveries concerning channels in cell membranes". Their discoveries not only clarified how ions and water move through the cell membrane, they contributed fundamental parameters enabling us to model cell membrane function in diverse tissues and organs ranging from nerves to the kidneys. In 1997, half of the prize was awarded to



**RODERICK
MacKINNON**

Paul Boyer and John Walker for "their elucidation of the enzymatic mechanism underlying the synthesis of adenosine triphosphate (ATP)" and the other half to Jens Skou for discovery of an "ion-transporting enzyme, Na^+ , K^+ -ATPase". Discoveries relating to ATP, that all important energy carrier in all plant and animal cells, have had a rich history in the Nobel prizes. The prize in 1997 was one of the latest steps towards the fascinating field of molecular motors, a topic of considerable interest to cellular engineers worldwide.

Finally, those earlier greats of the Chemistry prizes, Svante Arrhenius (1903), Marie Curie (1911), Walther Nernst (1920), Irving Langmuir (1932) and Linus Pauling (1954) (to name just a few) should not go unmentioned for providing us with knowledge critical to our understanding of many atomic and molecular properties and phenomena, essential for describing, modelling and quantifying the complex functions and interactions of cells, tissues, organs and living organisms.

For more info on the Nobel prizes in all branches go to: <http://www.nobel.se>

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Risk evaluation and risk management in the field of ionizing and non-ionizing radiation

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**National Centre of Hygiene, Medical Ecology and Nutrition

Abstract

Medical irradiation with ionizing radiation is the greatest anthropological source of above-background irradiation of the European population (about 90%). Publications of ICRP, EC, Directive 97/43 EURATOM, etc. provide basic guidelines for control of the risk from ionizing radiation. The exposure of the general population to non-ionizing radiation is addressed by different compulsory and recommended standardization documents, such as those issued by ICNIRP, IEEE, etc.

In order to respond to such uncertainties certain agencies and scientists recommend approaches based on concepts like Precautionary Principle, Prudent Avoidance and ALARA.

The problems of ionizing and non-ionizing radiation risk communication and management could be managed by development of national programs with international support.

Introduction

The general population is extremely sensitive to ionizing radiation, particularly where levels are above the norm. Requests for information on the possible health effects of electromagnetic radiation (EMR), addressed by citizens to media and state authorities, are becoming more and more frequent.

The acceptance of exposure limits, depends on the risk perception and risk communication policies. Although the regulations and the exposure limits for adverse effects are based on the best presently proven scientific evidence, yet there are doubts due to uncertainty in the risk assessment process. A

more complex form of uncertainty is associated with the possible existence of risk from long-term (chronic) exposure to low levels. As a principle, it is impossible to prove the absence of such hazards.

A serious problem in risk perception and risk communication emerges from the difference in developing standards for ionizing and non-ionizing radiation – the threshold approach for the non-ionizing, and the hypotheses for non-threshold effect for the others.

The differences in national psychology and culture impede the development of universally applicable programs and methodologies for risk communication and management.

Risk and its subject

In trying to understand people's perception of risk, it is important to distinguish between a health hazard and a health risk. A hazard can be an object or a set of circumstances that can potentially harm a person's health. Risk is the likelihood, or probability, that a person will be harmed by a particular hazard. It incorporates the uncertainty and the seriousness of undesired consequences.

Risk in the general sense of the term includes three main steps: the risk assessment, risk perception and risk management, as is shown in [1]. The **risk assessment** is a complicated process that is not a topic of this paper. The factors that shape **risk perception** of individuals include basic societal values (e.g. traditions, customs) as well as previous experience with technological projects (e.g. dams, power plants). These factors may explain local

concerns, possible biases or hidden assumptions. Careful attention to the social dimensions of any project allows policy makers and managers to make informed decisions as part of a thorough **risk management** program. Ultimately, risk management must take into account both measured and perceived risk to be effective.

The identification of problems and the scientific risk assessment of those problems are key steps to defining a successful risk management program. To respond to that assessment, such programs should incorporate actions and strategies, such as finding options, making decisions, implementing those decisions, and evaluating the process. These components are not independent, nor do they occur in a determined order. Rather, each element is driven by the urgency of the need for a decision, and the availability of information and resources. It is very important to improve management programs depending on the purpose of the problem. Different programs should be developed for a variety of purposes, such as: new technology, public concern, occupational exposures, risk communication programs. One example for such a program is the range of risk management options given by WHO for developing a communication program:

“**Communication programs** can be used to help people understand the issues, become involved in the process and make their own choices about what to do.

◆ **Decision to take no formal action** is an appropriate response in cases where the risk is considered negligible, or the evidence is insufficient to sup-

port formal actions. This response is often combined with **watchful waiting**: continuing to monitor the results of research and measurement and the decisions being made by standard-setters, regulators, and others.

- ◆ **Research** fills gaps in our knowledge, helps to identify problems, and allows for a better assessment of risk in the future.
- ◆ **Cautionary approaches** are policies and actions that individuals, organizations or governments take to minimize or avoid future health or environmental impacts. These can be a decision of an industry or other group to undertake voluntary self-regulation.
- ◆ **Regulations** are formal steps taken by government to limit both the occurrence and consequences of potentially risky events. Numeric standards may be imposed with defined ways to show compliance.
- ◆ **Limiting exposure** or banning the source of exposure all together are options to be used when the degree of certainty of harm is high. The degree of certainty and the severity of harm are two important factors in deciding the type of actions to be taken.
- ◆ **Technical options** can be considered during development of new technology, but should always be transparent for the benefit of the stakeholders. Options may include the consideration of the necessity to optimize for capacity and coverage, as well as the possibility of multiple and smaller sites as opposed to a single large site. Site sharing options should be made available.
- ◆ **Mitigation** involves making physical changes in the system to reduce exposure and, ultimately, risk. Mitigation may mean redesigning the system, installing shielding or introducing protective equipment.
- ◆ **Compensation** is sometimes offered in response to higher

exposures in a workplace or environment. People may be willing to accept something of value in exchange for accepting increased exposure.

Risk management in the case of ionizing radiation

Medical sources of radiation are the greatest anthropogenic factor for the artificial irradiation of the population (in Europe approximately 90%) but also one of the means significantly to reduce the negative effects of and by this, adequately to control (diminish) the risk. Generally seen the risk of the medical exposure to ionizing radiation encompasses the deterministic (with threshold dose values) and the stochastic (probability proportional to the radiation exposure) effects.

The risk degree depends on various factors: kind of radiation, characteristics of the object (tissue) irradiated, patient age (dynamics-variant), condition (physical, somatic, genetic predetermination), milieu (home, work), complexity and duration of the examination, techniques and so on.

Categorized by the International Commission on Radiation Protection (ICRP) in: acceptable, tolerable and unacceptable [2], the risk represents the basis for one of the fundamental postulates - the **justification** of the medical exposure. The justification namely implies the netto/benefit for the patient with reference to:

- ⇒ diagnosis,
- ⇒ care and treatment,
- ⇒ final result for the patient,

and only when all this cannot be achieved by an alternative, patient-friendly method. Special attention is paid to prenatal status, children, pregnant, breast feeding women and others as well as healthy patients in scientific research.

Basic principles for the second postulate - the **optimization** are:

- ⇒ ALARA,
- ⇒ informed consent,
- ⇒ prudent avoidance,

- ⇒ independence (clinical freedom), accountability, decentralization,
- ⇒ preserving good medical traditions.

As a result of the scientific achievements in medicine (risk from ionizing radiation when used for diagnostic and therapeutic purposes) and the rapid progress in the medical technology and information in recent years as well as the deeper consciousness of the interrelation "technology-patient" and the ever increasing attention and care for the health and comfort of the patient, aiming at a steady improvement of the quality of life **criteria/protocols** for justification and realization of good medical practices and standards/norms for image optimization (equipment, protection, methodology, etc.) have been elaborated and then approved by the European Commission and in the form of the Directives 96/29 and 97/43 EURATOM [3] are recommended to be introduced in each Member state, correspondingly adapted to the national law.

These criteria help in guaranteeing an adequate image quality, comparable throughout Europe and also keep the dose of exposure applied reasonably low. In this manner, the subjective impact is expected to be reduced: the radiologist in interpreting the image, the service engineer in repairing and adjusting the apparatus, the medical physicist in performing Q.A. and Q.C. procedures, even the manufacturer is supported in improving his production.

Contrary to this subjective assessment the risk may be quantitatively estimated by measurements and calculations of the amount of radiation the body has absorbed. Important units are: absorbed dose, equivalent dose (on the base of the relative biological effectiveness, including the weighting factors for the different kinds of radiation) and the effective dose, taking into account the different radiosensitivity of various tissues. The current values of these weighting factors are given in the Publication 60 of the

ICRP[4].

The calculation algorithm follows the steps:

- ⇒ measuring the needed data,
- ⇒ calculating the absorbed dose by the concerned organ and correspondingly weighting it for the radiation applied,
- ⇒ calculating the equivalent dose for each organ and weighting the dose by the risk factor,
- ⇒ summing all calculated doses and calculating the effective dose for the whole body.

By means of the specialized measurement and control equipment (harmonizing devices and methods as well) the process of risk estimation may be viewed objectively - for the purposes of determining reference levels, of monitoring the medical exposure of the population, of statistics (comparison between diverse equipment and methods, relation to different tissues, and others). The reference levels should be treated as an aid for optimizing the radiation protection, the other two aspects being:

- ⇒ diagnostic quality of the image achieved and
- ⇒ the choice of the appropriate X-ray technics.

The general risk from the ionizing radiation in medicine should be considered as a part of a multi-facette complex risk: for example an invasive session under x-ray control, or the case of incomplete or incorrect information and as sequence an inappropriate treatment, a new radiopharmaceutic, terminological problems and others...The absence or still insufficient level of information and understanding the nature and the benefit/loss ratio of the ionizing (and non-ionizing) radiation in the broadest strata of the population and the role of the mass-media are one of the most important challenges in the process of the risk management.

The direct risk as a result of a diagnostic investigation in fact is very low: if the procedure is justified and the equipment and protec-

tion - optimized the patient dose will be as low as it is possible from the medical point of view. A further dose reduction could in turn induce an additional risk (see above) to the patient.

In realizing a Project for harmonization with the EC-recommendations diverse activities are interdependently run in the following subject areas:

- ⇒ changes in the national legislature and building-up an appropriate infrastructure,
- ⇒ supply of the necessary equipment for measurement and control,
- ⇒ creation of a national data base to estimate the risk to the population from medical exposure with reference levels,
- ⇒ elaboration of programs for quality assurance and a system for quality control in diagnostic radiology and in radiotherapy,
- ⇒ elaboration of a national program for training of the relevant staff (medical and paramedical),
- ⇒ international seminars on radiation protection and modern approaches for image quality improvement,
- ⇒ public awareness campaign (risk communication) incl. website on the Internet.

An intensive and fruitful collaboration with experts from the EU-Member states contributes to a quicker and more effective implementation of the results in the practice (a pilot study includes some big hospitals, where experienced staff is working and modern technology and methodology are practiced).

Non-Ionizing Radiation

“Risk” is the term moving the research of developing exposure limits for different hazards, especially for electromagnetic fields (EMF). We are not going here to advance the theory of the risk, and to discuss the ways and methods of risk assessment and management. We want only to mention the similarity of the risk of exposure to ionizing and non-ionizing radiation (NIR) – the synonym of a probab-

ity of harmful effect. There are discussed in some Eastern European Countries possibilities to use the same method to develop exposure limits for EMF exposure as that used for ionizing radiation. As a result, some precautionary approaches are used now in certain countries similar to these suitable for ionizing radiation. Concerning the whole range of NIR, the most complicated problem exists with EMF, not with optical radiation, nevertheless if it is irradiated by polychromatic lamps or by lasers. Here, we will take into account only those EMF.

Now, the safety factors used in the standards for EMF, include the uncertainty of both biological evidence and risk assessment, also the gaps of knowledge in the field of the EMF influence on human body. Safety factors of 1:10 and 1:50 to the adverse effect levels are used for establishing exposure limits for electromagnetic radiation. Where is the threshold limit value in this case?

The most important factor in the conception for developing exposure limits for EMF is the threshold conception, which is still in dispute for ionizing radiation. This means that in some standards both Threshold Limit Values (TLVs) and Maximal Permissible Levels (MPEs) are established.

With particular attention to EMF, Prof. Paltsev in [5,6] speaks about three different zones of biological reactions of the organism:

- biological effects;
- a progress of adaptive and cumulative processes as a manifestation of adverse effects on the systems;
- pathology.

The exposure limit for adverse effect should be the border dividing the zones of active adaptation and pathology.

The Subcommittee 4 of IEEE (Institute of Electronic and Electro-technical Engineers) defines the **adverse effect** as follows: “An ad-

verse effect is recognized by the appearance of a harmful change in health and well-being. For example, such changes include organic disease, impaired mental state, behavioral malfunction, reduced longevity, and defective or deficient reproduction.”

Following the publication of Savin, BM [7], the following changes have to be taken into account when assessing the exposure:

1. Qualitative changes in the course of biological processes
2. Quantitative changes in the state of biological processes out of the physiological standard levels and resulting in the decrease of human compensation capacity to respond to environmental hazards or to overcome unusual psycho-physiological conditions.
3. Occurrence of additive effects of exposure with cumulative characteristics, leading at long term exposure to changes in the biological processes exceeding the permissible quantitative indices.

The following classification of

5	Zone of harmful exposure
4	Zone of extreme effects
	Adverse effect threshold
3	Zone of adaptive response
2	Indifferent zone
	Threshold of radio wave sensibility (biological effect)
1	Below threshold-level

the thresholds of electromagnetic radiation exposure by biological indicators is given in the same publication:

Compared with the ionizing radiation, the fundamental dosimetric quantity in radiological protection is the absorbed dose. This is the energy absorbed per unit mass and its unit is the J/kg. The same unit is used for the radiofrequency range of EMF – “specific absorption” (SA, J/kg), and the similar one “specific absorption rate” (SAR,

W/kg), accepted for radiofrequency and microwave radiation exposure.

When the absorbed energy is considered, different methodology for studying the exposure limits of EMF exposure are used, depending on the wavelength:

- With a wavelength essentially exceeding the size of the biological object – frequency up to 30 MHz;
- With a wavelength much less than the size of the body;
- With a wavelength commensurable with the size of the body or with the sizes of different parts or organs – frequency between 30 MHz up to 10 GHz and above.

The exposure limits for adverse effect evaluated on the basis of extrapolation and by numerical methods of calculating the induction currents/absorbed energy in phantoms are better approximation than the direct transfer of data from animals to human body. The uncertainty of such extrapolations could reach to 50-100%, while for animal extrapolation it reaches 1-2 orders. [5,7]

Non-thermal effect exists when it is not observed whole body temperature rise. The heat distribution could be non-uniform, and “hot spots” could be available in field strengths below those causing thermal effect.

Now, the main problem is which definition should be developed for: “windows” and “resonance” effects, long-term and short-term effects, thermal and non-thermal effects, informational effects, adverse effects, biological effects, established effects, etc. The discussion on the terminology leads to different rationales and criteria for developing exposure limits. This is one of the main reasons that the general population doesn’t believe in the proofs from science of exposure to EMF. As a result several countries accepted the “precautionary approach principle” in their legislation, and different societies try to include the “prudent

avoidance” as an international principle to protect the people from EMF exposures.

A general national program for risk perception, risk communication and risk management has been developed and at present is in an implementation stage. This program can be used both for ionizing and non-ionizing radiation.

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African Union of Biomedical Engineering and Sciences (AUBES)

The Working Committee of African Union of Biomedical Engineering and Sciences (AUBES) on the 18th January, 2004 completed the drafting of a constitution for AUBES. This was followed, on the 22nd January, 2004 by the adoption of the draft constitution at the General Meeting of the Union held in the Valley View University, Oyibi-Accra, Ghana.

With this development, AUBES is poised to formally admit national societies of biomedical engineering and sciences all over Africa.

The General Meeting on the 22nd January, 2004 adopted the Working Committee proposals that the Committee as presently constituted be expanded to accommodate the enormous task at hand. The following persons were therefore added to the Working Committee:

1. Placid Nkashama Muyembi, DR Congo
2. Isaac B.K. Arkoh, Ghana
3. Wisdom Kwesi Brown, Ghana
4. Gideon Ihebuzo Ndubuka, Nigeria
5. Isaac Okebalam, Nigeria

Nigeria is to host the Official Inauguration of the African Union of Biomedical Engineering and Sciences (AUBES) in October 2005. This was adopted in the last General Meeting of AUBES held in Ghana on the 22nd January, 2004. It is expected that the Official Inauguration with the 1st African Conference on Biomedical Engineering and Sciences and the 1st General Assembly of AUBES will hold concurrently with the Nigeria's 6th National Biomedical Engineering Conference.

With this development, the tenure of the Working Committee of AUBES was extended by 16 months starting from the initial expiry date of June 2004.

Programme of activities of the African Union of Biomedical Engineering and Sciences for 2004

June 11, 2003 - July 04, 2004 - Awareness Campaign, Ghana

January 18, 2004 - Meeting of the Working Committee, Ghana

January 22, 2004 - General Meeting, Ghana

June 13, 2004 - Meeting of the Working Committee, Ghana

June 16, 2004 - General Meeting, Ghana

July 4, 2004 - Meeting of the Working Committee, Ghana

July 25, 2004 - Meeting of the Working Committee, Ghana



BME EDUCATION

BIOMEDICAL ENGINEERING IN ISRAEL

Israel Society for Medical and Biological Engineering

1. INTRODUCTION

Biomedical Engineering (BME) in Israel has been active for over 30 years, with several graduate-level programs creating quite a large number of M.Sc. and Ph.D. professionals. Industry, though active in these areas, was actually seeking engineers graduating from the more classical disciplines. The huge increase of the high-tech industry during the 90's created a very large demand for people of BME background, and a continuously increasing understanding that BME is a discipline of its own. With the establishment of MBE undergraduate programs in three large academic universities as well as in colleges, the BME discipline and profession are recognized and properly appreciated. The Israel Society for Medical and Biological Engineering (ISMBE), which is the largest and main professional BME society in Israel, has members from universities, BME industry, and hospitals as well as from other BME organizations. It advocates scientific and professional BME activities within Israel, it represents the profession and its members in Israel, and in international organizations.

2. THE NATIONAL SOCIETY

The Israel Society for Medical and Biological Engineering (ISMBE) was established in 1958, actually in the same year that the first IFMBE meeting convened in Paris. One of the founders of the ISMBE, Prof. Joseph Weinman, was also active in establishing the IFMBE and became one of its Honorary Life Members. In 1969 the ISMBE went through another formal registration, as a non-profit society. In 1979 the ISMBE organized and hosted the International Conference of the IFMBE (in association with the International Organization for Medical Physics) in Jerusalem, Israel. The Society also organized and hosted the Mediterranean countries regional conference MECOMBE'92 in Jerusalem.

The ISMBE is the largest body representing the Biomedical Engineers as well as the Clinical Engineers. Additional BME activities are run by the IEEE Israel Section – BME subsection. The Association of Engineers and Architects also has a BME subsection, while the Medical Physics society is working under the umbrella of the Physics Society. Since academic undergraduate programs of Biomedical Engineering opened only in 1999, the majority of members of the ISMBE

and the other sister-societies are engineers in other fields who got a M.Sc. degree in Biomedical Engineering, or have been working in the area for many years and went through Continuing Education courses.

The ISMBE has a name list of over 800 members, but paying membership is fluctuating around 200-300, depending on the activity from year to year (with people tending to pay their dues only at the annual conference – and not pay yearly on a regular basis). The majority of the members are working in R&D in industry or within the universities, with only a minority of about 20% working in service and maintenance within hospitals or outside vendors who provide such services to the hospitals. While there have been some medium sized manufacturers in operation for over 25-30 years, the last 9 years have seen a significant increase of interest and involvement in Biomedical-Medical equipment, in both development and manufacturing. There are currently around 500 start-ups in this area, at different levels of operation.

Thus the classical roles of societies like the ISMBE have become much more important, the roles and goals that have been defined when the Society was established:

- Development and advancement of the medical and biological engineering discipline in Israel.
- Exchange and dissemination of knowledge and information related to the Medical and Biological Engineering discipline within Israel, by organizing conferences, seminars and workshops.
- Encouragement of collegial relationships among members of the Society, advancement of scientific activity and guarding the level of professional ethics. Advancement of professional relationships with local and international organizations and groups of similar interests. Representation of the Israeli Medical and Biological Engineering profession in national and international activities and organizations.

Several additional goals have been added since then:

- Participation in national and international standardization committees, and producing impact by active participation in government organizations responsible for standardization.
- Serving as a vehicle for collaboration among financial

bodies and (start-up) industries.

3. EDUCATION, TRAINING, AND ACCREDITATION

3.1. Education

Graduate level studies in Biomedical Engineering towards M.Sc. and Ph.D. degrees have started in Israel in 1968 (at the Technion). Currently there are such programs in 3 universities, with more than 200 graduate students enrolled, most of them performing a research thesis as part of their studies. Graduate students who excel in their studies usually are financially supported by fellowships.

Undergraduate studies towards a B.Sc. degree in Biomedical Engineering (4 years program) have started in 1999, at 3 universities and one college. Currently a total of about 200 students start each year, and, since the entrance level is extremely high, about 90% are expected to finish. The undergraduate Biomedical Engineering programs consist of mandatory courses and a wide range of electives. During the first two years students take extended courses in Basic Sciences (Mathematics, Physics, Chemistry and Computers), in Life Sciences (Anatomy, Biochemistry, Cell Biology and Physiology), and in Basic Engineering (Mechanics, Electronics, Biomaterials and Transport Phenomena). The last two years include: elective courses; two Biomedical Engineering laboratory courses; two design courses and two project courses in which students implement their engineering knowledge to analyze and provide solutions to biomedical needs. The projects are carried out in cooperation with the Biomedical industry. In the elective courses, students choose, for example, two out of the following three tracks: **(a)** Imaging and Medical Equipment (system engineering and control, non-invasive techniques, principles of imaging, signal processing and processing of medical images, Ultrasound and MRI imaging, interventional ultrasound etc.); **(b)** Movement, Rehabilitation Engineering, Artificial Organs and Implants (research of walking and movement, mechanics of sports, equipment for orthopedic/neurological rehabilitation and aids for the handicapped, surgical implants, bioengineering of cells, tissues and of tissue substitutes, artificial organs); **(c)** Biomaterial, Biotechnology and Tissue Engineering (biochemical engineering, molecular engineering, biosensors, artificial metabolic organs, controlled drug release biological substitutes).

There are also Biomedical Engineering tracks in several classical engineering faculties (like EE, Mechanical Eng. etc.).

3.2. Continuing Education/Training

The various universities offer a wide range of courses as Continuing Education courses – in many cases these are graduate level courses that are open to the public and to engineers willing to get training in a

specific subject. There is no formal requirement for engineers to accumulate Continuing Education courses during their career - though this topic is currently under review.

The ISMBE does organize, though, in addition to its annual national conference (which this year will take place on March 17th, 2004, at the Technion, Haifa), also several workshops, Special Topic Conferences etc. For example – this spring the ISMBE organizes and co-sponsors several one-day Workshops:

- ⇒ ‘Molecular Cardiology’ – the Int’ Society for Heart Research – Israeli Subsection - Faculty of Engineering, Tel-Aviv University, February 26th 2004 (Details: Dr. Miki Sheinovitz) - co-sponsoring.
- ⇒ 7th Israeli Symposium on Computer-Aided Surgery, Medical Robotics, and Medical Imaging (ISRACAS'2004) – May 13th, 2004, co-sponsoring.
- ⇒ Ultrasound and Tissues - Planned for late Spring, Tel-Aviv University,

In these activities - the lecturers are from both academia and industry, and the audience is also similarly mixed. These activities are usually free to the ISMBE members, but non-members are charged.

The annual ISMBE conference is usually a one day meeting, with several sessions which include lecturers from academia, industry and from hospitals. Oral presentations are given as well as posters. For many years this annual meeting was run as part of a national conference that included many of the medical societies. The last 8 years have seen such an increase of interest in the Biomedical Engineering discipline and in the ISMBE annual conference thus it was decided to run this annual conference independently.

Quality assurance, as part of clinical engineering, quality audit and accreditation of hospital laboratories, are carried out by Government bodies and private laboratories which are authorized to perform these operations. Most of the personnel in such institutions are people who went through Quality Assurance Engineering graduate set of courses (usually obtaining M.Sc. in Quality Assurance Engineering).

3.3. Certification/Accreditation

All university (and college) programs and degrees are approved by the Higher Education Council, which is government-supported public entity. Each university department is subject to review (each 3-5 years) by an international committee. There are no national (government or professional) examinations, or certification of an individual; employers accept the university or college grades as valid indication of the professional competence.

An unofficial survey, among BME department heads, faculty, the ISMBE Board of Directors and a large number of ISMBE members, produced a unani-

mous agreement to participate in a future accreditation program – if it is established. There is of course willingness to share the workload and be part of establishing the guidelines and in the future committees and site-visit responsibilities.

4. ADDITIONAL INFORMATION

4.1. Activities in the Field and Contacts with Authorities

The Israel Standardization Institute is responsible for promoting initiation of new standards, controlling the oversight of existing standards etc. Due to Israel's small population (~6M), most standards are adopted from international standards – usually U.S or European standards. The ISMBE had no official policy, and did not participate in these activities. ISMBE members, though, are active in various standardization committees and quality assurance bodies.

In recent years the ISMBE has intensified its activities as promoter of BME activities within the various national funding institutes – in an effort to establish BME as a stand-alone discipline. These efforts must continue, since currently BME is still regarded as “some activity between Biotechnology, Medicine and Engineering...”. This attitude must be changed.

4.2. European and International Activities

The ISMBE has been active in international organizations since it was established. As mentioned above, ISMBE organized and hosted the International Conference of the IFMBE (in association with the International Organization for Medical Physics) in Jerusalem, Israel, in 1979. The Society also organized and hosted the IFMBE Mediterranean countries regional conference MECOMBE'92 in Jerusalem. The Computers in Cardiology International Conference was organized and hosted in Jerusalem in 1989. Many other Medical and Engineering Conferences were held in Israel (but unfortunately this trend was stopped since last year, due to the violence in this region). There are multiple bi-lateral research funding agreements between Israel and various European and other nations.

Israel is one of the non-EU countries that participated in the earlier Framework Programs, and currently participates in the 6th Framework Program covering research, technological development and demonstration activities. The ISMBE also participated in the efforts of creating the European Alliance for Medical and Biological Engineering & Science (EAMBES), and its representatives are actively participating in the Alliance activities.

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Dan R. Adam

Education & Accreditation Committee Chair



DAN R. ADAM

Dan Adam, born in Israel, received his B.Sc. and M.Sc. (Electrical Engineering) and D.Sc. (Biomedical Engineering) from the Technion in 1968, 1973 and 1977, respectively. He joined the Technion Faculty in 1977. He was at Tufts University, Boston, (1978-1980). He joined MIT in 1980 as Assistant Professor, teaching at the Harvard-MIT Health Sciences and Technology Program. He has been with the Technion since 1983, in Biomedical and Electrical Engineering. During 1992-1993 he held a visiting appointment at NIH, Bethesda, MD. He has been an IEEE member since 1964. He has also been active in Computers in Cardiology since 1970, organized its Annual International conference (1989), elected to its Board (1990-1999), serving as Secretary. He served as Member-at-large of the Administrative Committee, IEEE Engineering in Medicine and Biology Society, (1999-2002). He currently serves as the President of the Israel Society for Medical and Biological Engineering, and as a member of the Interim Council, the European Alliance for Medical and Biological Engineering and Science (EAMBES) (2003-2004), and as Chair, Educational Committee, the International Federation for Medical and Biological Engineering (IFMBE) (2003-2005). His research interests have been in cardiovascular signals understanding and processing: body surface potential mapping; the inverse problem in electrocardiography; 2-D and 3-D subcellular processes generating arrhythmias and alternans; cardiac electro-mechanical and mechano-electrical interactions; non-linear processes. He has been increasingly involved in biological signal processing and image processing of echo ultrasound data; Multi-transducer phased array design, Ultrasound RF processing, perfusion measurements using Contrast Agents, Pressure estimation using Contrast Agents, ultrasound control of thermotherapy; Doppler measurement & mapping; pulsatility gradient as an index of placenta/uterus/kidney patency; position/orientation registration of probes for 3D quantification; Image guided therapy/surgery. ■

SCIENTIFIC EVENTS

Appropriate Medical Technology for Developing Countries



In association with the IEE Healthcare Technologies Professional Network, and supported by AIME, the Association of British Healthcare Industries and the IEEE EMB Society (UKRI Chapter), the Seminar was held on 4 February 2004, at the IEE's offices in Savoy Place, London, UK

The World Health Organisation (WHO) has estimated that 40 - 60% of medical equipment in the developing world is unserviceable and that there is a serious shortage of resources and trained personnel. WHO has developed guidelines in this area which national bodies are implementing, particularly in the area of inappropriate donations of medical equipment.

This seminar, which was the third in the series, addressed key needs and problems and took up the challenge of identifying future strategies and solutions. The event provided an excellent opportunity for sharing experiences and knowledge and enabled everyone present to network face to face with key people.

This was an exclusive opportunity to update the knowledge of the issues surrounding healthcare provision in the developing world. During a day of presentations and interactive displays, the focus was on the following:

- Achieve a greater understanding of the healthcare situation in the developing world
- Identify the resources available to produce best practice solutions
- Discuss concerns and solutions in a global context with your peers from around the world

Whether you were a medical practitioner, a biomedical engineer or technician, or worked for a healthcare related administrative body or agency, you could find this event of interest and relevant to your day to day working life. Programme of the Seminar:

Chairman's Welcome and opening announcements

Len Cornish, Global Healthcare Projects

Introduction to the IEE Healthcare Technologies Professional Network

Emmanuel Ifeakor, University of Plymouth and Chairman of the Professional Network

Managing Healthcare Technology (Session Chairman : Len Cornish, Global Healthcare Projects)

Keynote Address: Management of Healthcare Technology in Developing Countries. Case Study: The Republic of Vanuatu

Juliette Cook, OsteoTec Ltd, UK

Application of the EHTP Methodology to plan Primary Health Care Services in Mozambique

Enrico Nunziata and Humberto Cossa, Ministry of Health of Mozambique, Mozambique

Peter Heimann, WHO Collaborating Centre for Essential Technology in Healthcare, South Africa

Update on the Global Harmonisation Process for Medical-Devices Regulation, and on progress with the Global Medical Device Nomenclature

Maurice Freeman, consultant

Health Care Provision in The Gambia: The Impact of Training and Technological Transfer

Lawrence Yamuah, Abdul Roudsari and Ewart Carson, City University, UK

The Role Of Intervention Complexity For The Feasibility Of Scaling-Up Health Interventions In Low and Middle-Income Countries

Christian Gericke, Technische Universität Berlin, Germany

C Kurowski, World Bank, USA

M K Ranson and A Mills, London School of Hygiene and Tropical Medicine, UK

The cup's half full - Working with limitations to achieve Appropriate Healthcare Technology Management

P Joshi, Andrew Gammie, R Hudson and W Seeger, Technical Assistance Programme, INF, Nepal

Poster Presentations:

Deploying Resources to Work for People: A Relevant Model for Informatics and Knowledge Management in the Saudi Health Organisations

A Sabbagh, A James, R Bali and S Amin, Coventry University, UK

Feasibility Study for the Initiation of an in-house Clinical Engineering Department in a Medium Sized Hospital

S K Hasnain, National University of Science & Technology, Pakistan

Sobia Hasnain, Dow Medical College Karachi, Pakistan

Three-phase double-arc plasma for spectrochemical analysis of biological samples

Moustafa M Mohamed, Alexandria University, Egypt

Modified Laser Viscometer Technique To Measure Blood Viscosity

Moustafa M Mohamed, A M Nashaat, H M Sharshira and M A Elbelbese, Alexandria University, Egypt

Appropriate Medical Technology Transfer For Developing Countries

K I Nkuma-Udah, Nigerian Institute for Biomedical Engineering, Nigeria

Alternative Funding Mechanisms For The Maintenance Of Medical Devices In Developing Countries

Andre Mboule, Centre for Health Technology (CHT), Cameroon

Benchmarking Biomedical Equipment Maintenance in Hospital Authority (HA)

Marco Lo, Hong Kong Hospital Authority, Hong Kong

Formulating Equipment Maintenance Strategy in Hospital Authority (HA)

Marco Lo, Kong Kong Hospital Authority, Hong Kong

Management of Medical Technology - Hong Kong's Experience

K K Chan, Hong Kong Hospital Authority, Hong Kong

Real-Time Telemedicine System for Multimedia Transmission over Fixed and Mobile Communication Networks

Vasileios Zarimpas and Bahram Honary, Lancaster University, UK

Low-Cost Iontophoresis Device For Transdermal Drug Delivery

Congo Tak-Shing Ching, University of Strathclyde, UK

High Quality PC-Based Nuclear Medicine Image Acquisition System

Milos Petrovic, V Artiko, V Obradovic, V Bosnjakovic and D B Popovic, University of Belgrade, Serbia

Development of the Safe Powered Wheelchair Controller

Bing-Yuh Lu and Hi-Wuh Lee, Tung-Nan Institute of Technology, Taiwan

Fok-Ching Chong, Yao Ou-Yang, Jer-Junn Luh, Heng-Yin Chen, Jin-Shin Lai and Te-Son Kuo, National Taiwan University, Taiwan

Design and implementation of a low-cost communication panel

R Bravo and Antonio Salazar, Universidad Simón Bolívar, Venezuela

Design and Development of Interactive Modules for Language Therapy Rehabilitation

J Pea, Antonio Salazar and R Bravo, Universidad Simón Bolívar, Venezuela

T Martínez, Instituto Nacional de Rehabilitacion, Venezuela

Equipments and supplies for Hospitals in developing Countries

Remy Toko, CH Baragwanath Hospital, South Africa

Waste Disposal At The St-Joseph Hospital In Kinshasa, DR-Congo

Mizwa Matanga, The National Programme for the Eye Health and the Vision, Democratic Republic of Congo

A poster to present a 2-pronged concept relating to appropriate healthcare technology for the developing world

Patricia Coyle, Royal Prince Alfred Hospital, Australia

The use of mobile telephone networks and wireless internet technology for monitoring patients remotely

Bryan Woodward, M F A Rasid and Z Lu, Loughborough University, UK

Medical Refrigeration in Developing countries

Herbert Onuoha, Rural Health Foundation, Nigeria

The IMAMTA (Integrated Management of Appropriate Medical Technology for Africa) Approach

Danlami Michael, Ahmadu Bello University Zaria, Nigeria

The Role of Portable Field Kits In Improved Veterinary Diagnosis in the Tropics

John Cooper, University of the West Indies, Trinidad

Appropriate Medical Laboratory Technology for Developing Countries
Elisee Ndam Medard CMS-CAMRAIL Douala, Cameroon

Devices and Systems (Session Chairman: Howard Clarke, Morgan Automation Ltd)

Experience with the Glostavent Anaesthetic Machine
Roger Eltringham, Gloucestershire Royal Hospital, UK
Fan Qiu Wei, University of Shanghai, China William Thomas, India

Incinerator Emissions
D J Picken and M C Bennett, De Montfort University, UK

Treatment Options For Clinical Waste In Developing Countries
Malcolm Holliday, Newcastle upon Tyne Hospitals NHS Trust, UK

Innovations and Numeracy
David Morley, University of London

An easy and low cost method of producing a socket for trans-tibial amputees
N A Abu Osman, W D Spence and S E Solomonidis, University Of Strathclyde, UK A M Weir, Westmarc, Southern General Hospital Glasgow, UK

Novel cost-efficient Techniques for Treatment and Fixation of Upper Limbs Fractures
J González and G García, Hospital Victorino Santaella, Venezuela E Suárez, Hospital Periferico de Coche, Venezuela Antonio Salazar and R Bravo, Universidad Simón Bolívar, Venezuela

Some medical applications of rural internet radio access
H F Rashvand, University of Applied Sciences, Magdeburg, Germany

Programme ended with an interesting Panel Discussion. ■

28th Canadian Medical and Biological Engineering Conference September 9-11, 2004 - Delta Hotel Québec

CALL FOR PAPERS

Organised by the Canadian Medical and Biological Engineering Society, Inc.
La Société canadienne de génie biomédical, Inc.

CMBEC28 is the premier event for biomedical engineering professionals in Canada. It offers a national forum for information exchange amongst researchers and clinicians working in medical and biomedical engineering. The theme in 2004 is Cardiovascular Engineering. CMBEC28 will be run in parallel with a two-day Interventional Cardiology and Engineering Symposium. These parallel events will bring together physicians, engineers, scientists, technicians and technologists with the objective of improving communication among health care professionals through the presentation and discussion of new research.

Québec City is one of the country's most popular visitor destinations. Conference events, such as meetings, courses, exhibits, and technical sessions, as well as

accommodations for the conference will be at the Delta Hotel, which is located in the heart of Le Vieux-Québec. See www.old-quebec.com for tourist information. The conference will open with Plenary Sessions, followed by concurrent streams of scientific and technical papers that will be presented over a three-day period.

Scientific and Technical Papers and Posters are invited from biomedical engineers, technologists, technicians, medical physicists, clinicians and other researchers for inclusion in the scientific and technical program. Students are also encouraged to participate in this exchange of scientific information. CMBES Student Members are eligible to compete in the Student Paper Competition.

Scientific and Technical Contributions are welcome in the following areas:

Bioinformatics, Medical Informatics and Telehealth
 Biomaterials
 Biomechanics
 Biomedical Imaging and Image Processing
 Biosignal Processing and Biosystem Modeling
 Cardiovascular and Pulmonary Systems
 Clinical Engineering
 Ethics and Regulations
 Human Performance Engineering
 Neural and Rehabilitation Engineering
 Prosthetic Devices and Artificial Organs
 Sensors and Instrumentation
 Tissue and Cellular Engineering

Cardiology Symposium: The two-day Cardiology Symposium will discuss stent design, catheter design, balloon design, biomechanics, vulnerable plaque, numerical modeling, smart devices, animal investigations and human trials.

Exhibits: The Delta Hotel has excellent facilities for exhibits. Manufacturers of medical devices, instrumentation and technology are invited to showcase the latest emerging innovations and equipment. In addition, private sector service providers and regulatory bodies are invited to present the most recent developments in health care management, safety standards and regulations.

Continuing Education Program: As in previous years, a series of instructional courses will be run in parallel with the conference. Courses geared towards the needs of biomedical professionals will be offered on a variety of topics. A list of courses will be posted on the CMBES Web site.

Submissions: To assist the Organizing Committee with the development of the Preliminary Program, authors are asked to send a brief abstract (250 words) by e-mail prior to submission of their final paper. All final papers must be two to four pages in length, written in English or French; all papers will be subject to a critical review process. The format for the final paper must follow specific guidelines, which are posted on the CMBES Web site.

IMPORTANT DATES

E-mail abstract submission – 31 March 2004
 Final Paper submission – 30 April 2004

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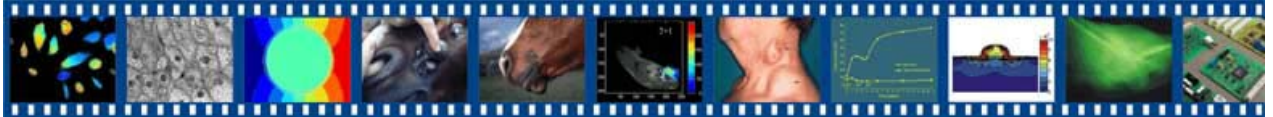
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Electroporation based Technologies and Treatments

**International Scientific Workshop
and Postgraduate Course
at the University of Ljubljana
November 19-22, 2003, Ljubljana,**



From November 19 to 22, 2004 an International Workshop and Postgraduate Course on Electroporation based Technologies and Treatments was organized in Ljubljana, Slovenia. Course faculty members Lluís M. Mir from CNRS and Institut Gustave Roussy, Villejuif, France and Damijan Miklavčič from the Faculty of Electrical Engineering, University of Ljubljana who were also Co-Directors of the Scientific Workshop, together with Eberhard Neumann (Germany), Veronique Preat (Belgium), Gregor Serša (Slovenia) and Justin Teissie (France) prepared exciting course on electroporation and its current and potential applications in biology, biotechnology, environment and medicine. It was the first time that top European researchers in the field of electroporation research were brought together to provide the most up-to-date information on applied research. In addition to the faculty members Maja Čemažar and Tadej Kotnik (both from Slovenia) and Igor Lacković (Croatia) gave comprehensive lectures on tumor biology, cells and tissues in electric fields. The course covered different aspects of electroporation. From the basic level of electroporation on lipid bilayers, through to the cell electroporation in vitro and in vivo. Applications of electroporation like gene transfection, electrochemotherapy of tumors and transdermal drug delivery were presented. In addition, the course program was enriched by three invited lectures. The imaging techniques were presented by Bruno Gabriel (France), Srdjan Novaković (Slovenia) was presenting a lecture on Current status of tumor vaccines, and E-Learning as a possible technological option for the next course was presented by Matevž Pustišek (Slovenia).

The important part of each scientific event is also getting to know each other and finding differences in different countries. Social events were thus an important part of the program. On the first day we had a get-together party at the local inn Žabar, tasting the excellent Slovenian wine. On Thursday afternoon participants visited the famous Karst Postojna cave.

The course was attended by 71 participants from 10 different European countries (Belgium, France, Ireland, Romania, Croatia, Germany, Lithuania, Italy, Bulgaria, and Slovenia).

The Postgraduate Course will be repeated every two years. You can obtain more information as well as the proceedings of the course from the www.cliniporator.com/ect or damiijan@svarun.fe.uni-lj.si. The event was supported by the Bioelectrochemistry Society and IGEA, s.r.l.

Peter Kramar
University of Ljubljana
Faculty of Electrical Engineering



STUDENT ACTIVITIES

Fábio José Ayres

Winner of the 2nd Prize Award at the 25th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Cancún, Mexico

Education

- 2002 – present: Ph.D. student, Electrical and Computer Engineering Department, University of Calgary.
- 1999 – 2001: M.Sc. in Electrical Engineering, Polytechnic School of the University of São Paulo, São Paulo, São Paulo, Brazil. Thesis: “*Segmentation and Estimation of the Histological Composition of the Tumor Mass in CT Images of Neuroblastoma*” (in Portuguese). Obtained the highest grade of ‘A’ in all of the courses taken in the M.Sc. program.
- 1994 – 1998: Electrical Engineering 1st Degree, Polytechnic School of the University of São Paulo, São Paulo, São Paulo, Brazil. Ranked 11th among 141 students in Electrical Engineering, and 36th among 556 students of all engineering programs.

Scholarships

- July 1999 – July 2001: M.Sc. scholarship from FAPESP – Fundação de Amparo à Pesquisa do Estado de São Paulo (São Paulo State Foundation for Research Support), São Paulo, Brazil.
- January 1999 – June 1999: M.Sc. scholarship from CNPq – Conselho Nacional de Desenvolvimento Científico e Tecnológico (National Council of Scientific and Technological Development), Brazil.
- January 1998 – December 1998: Undergraduate research scholarship from FAPESP.
- January 1997 – December 1997: Undergraduate research scholarship from CNPq.

Fábio José Ayres
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FÁBIO JOSÉ AYRES

"Characterization of Architectural Distortion in Mammograms"

Fabio J. Ayres and Rangaraj M. Rangayyan

Abstract:

We present a technique to characterize architectural distortion in mammograms based upon oriented texture analysis. The local texture orientation is computed for all pixels in a region of interest (ROI), thus obtaining the corresponding orientation field. The orientation fields are then analyzed using phase portraits. Six features are extracted from the phase portraits, and a quadratic discriminate classifier is used to classify the ROIs as a site of architectural distortion or other breast parenchymal pattern. The methods were tested with 37 ROIs: 15 with architectural distortion, eight with speculated malignant tumors, two with malignant calcifications, and 12 with normal parenchymal patterns. The results obtained indicated a sensitivity of 80%, a specificity of 80%, and area under the receiver operating characteristics curve of 0.86."

ESEM Student Awards for 2004



ESEM, the European Society for Engineering and Medicine will run a young members paper competition during MEDICON'04. There will be a single prize of 500 euro and all eligible competitors will receive free membership to ESEM for 12 months.

The prize is open to all Ph.D. students (proof of status required) and the clinical relevance and applicability is a major criterion, together with scientific excellence.

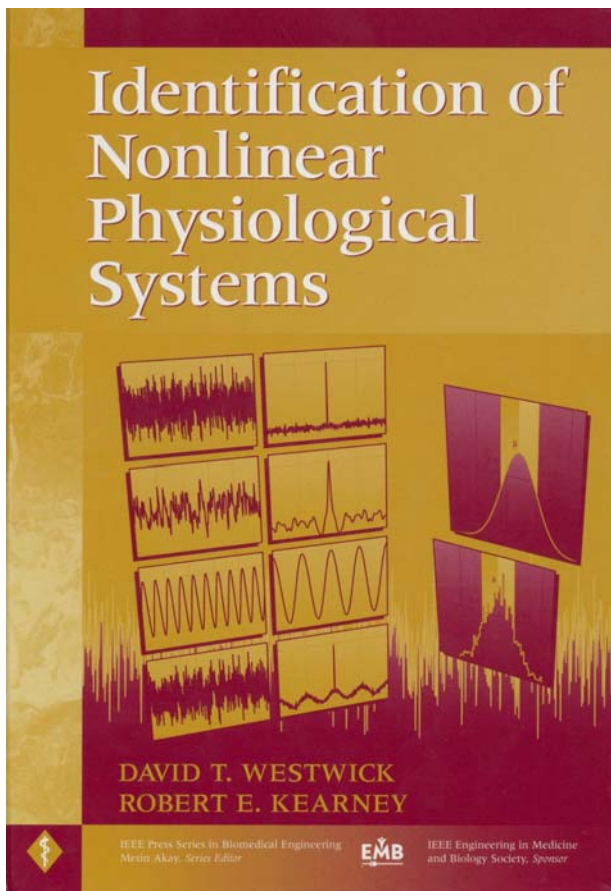
Applications should be sent to Prof. J. Vander Sloten, Division of Biomechanics and Engineering Design, Katholieke Universiteit Leuven, Belgium.

Prof. Dr. ir. Jos VANDER SLOTEN
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BOOK REVIEWS

Identification of Nonlinear Physiological Systems

David T Westwick and Robert E Kearney
(IEEE Press 2003 ISBN 0-471-27456-9)



This book has been produced as a successor to the classic text by Marmarelis and Marmarelis on the theme of *Advanced Methods in Physiological Modeling: the White Noise Approach*, which was published in 1978. Since that time, much has occurred in relation to the field of nonlinear identification particularly as a consequence of advances in computational methods.

Before commenting further, however, a caveat is needed in relation to the title of this work by Westwick and Kearney. The focus of this new text, as was the case with that of Marmarelis and Marmarelis, is on signals which are to be interpreted in terms of black box models, for instance those occurring in electrophysiology. It does not specifically address the problem of identifying systems represented by physico-chemical models, for example metabolic, endocrine and physiological organ systems; models in which the parameters correspond explicitly to physical or chemical properties of the dynamic processes being considered. There is a large distinctive literature for this separate class of problem. Readers wishing to pursue this field would be well advised to consult the writings of long-standing experts such as Cobelli, DiStefano and Godfrey; leading-edge researchers of today, just as they were thirty years ago.

Returning to this new work by Westwick and Kearney, the authors assume that the readership will have a basic grounding in linear signals and systems. Background material beyond this level is summarised and

there is an excellent set of references to further reading. Each chapter includes both a number of simple problems as well as more extensive computational exercises, designed to be tackled using MATLAB and the nonlinear system identification toolbox (NLID) developed by the authors. The style of writing is very accessible with many illustrations drawn from physiological systems.

After some relevant background material, there are basic chapters on models of linear and nonlinear systems, with the latter embracing Volterra and Wiener series, block structures, parallel cascades and the Wiener-Bose model. This is followed by a chapter on the identification of linear systems. This is designed to lay the foundations for the more elaborate treatment of the nonlinear identification problem, rather than to provide a comprehensive review of all available methods.

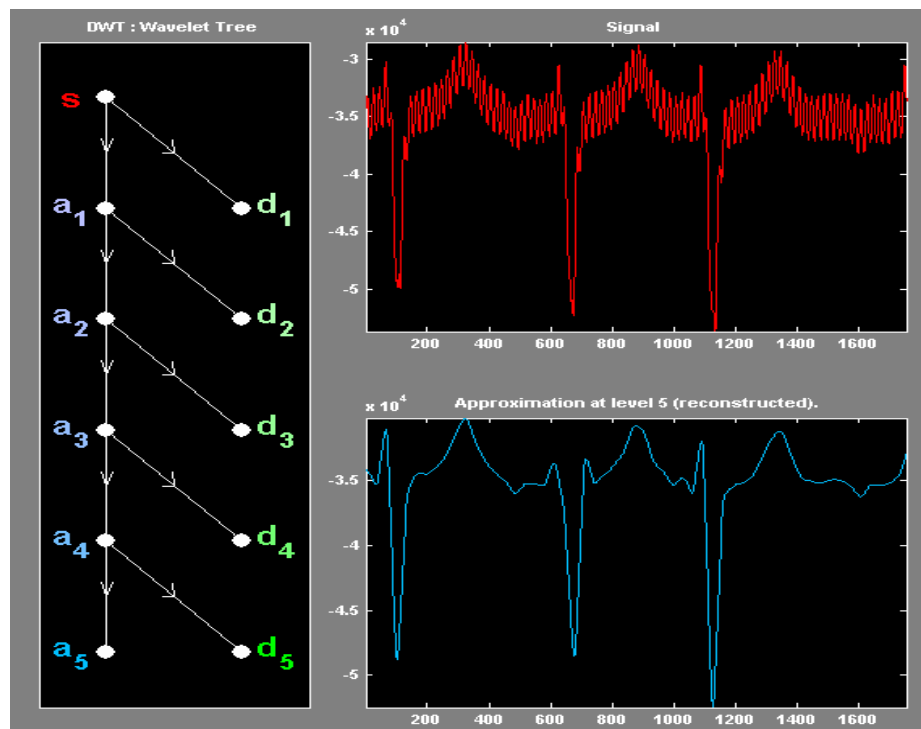
There then follows the final three substantive chapters which focus on issues and techniques relating to nonlinear identification. The first of these deals with correlation methods. Although superior methods are now largely available, they still find widespread adoption. Moreover, an appreciation of them is helpful as a precursor to the discussion of more recent approaches.

This is followed by a treatment of explicit least-squares methods. These include orthogonal algorithms, expansion bases and principal dynamic modes. These methods are appropriate where model structures are linear in their parameters, such as Wiener or Volterra series, and offer substantial improvements in model accuracy as compared to correlation methods. However, they are computationally expensive and, of course, are limited to cases where linearity in the parameters exists.

These limitations provide a logical lead in to the final chapter which features iterative least-squares methods. These can be used to tackle the real nonlinear problem, namely that where models have structures whose outputs are nonlinear functions of some or all of their parameters. The chapter begins with treatments of the full range of gradient-based optimisation methods. This is followed by consideration of the more recent parallel cascade methods. Full details of the mathematical treatments are presented in a lucid manner and the chapter ends with a case study demonstrating the power of such methods when applied to a model of the visual processing occurring in the light-adapted fly retina.

As one who many years ago reviewed that earlier text by Marmarelis and Marmarelis, I am happy to declare that this new work by Westwick and Kearney is indeed a worthy successor. The authors communicate their ideas in a clear and logical manner, covering both the underlying principles and the computational issues which need to be addressed in moving towards problem solution. It is a volume that deserves to be on the bookshelf of all researchers involved in this increasingly important interface between signals and systems theory on the one hand and physiology and medicine on the other.

Ewart Carson
February 2004
sd395@soi.city.ac.uk



Wavelet decomposition of ECG signal

ANNOUNCEMENTS



International Congress on Medical and Care Compunetics NCC, The Hague June 2-4, 2004

The Leading International Event on ICT in Medicine and Care
<http://www.icmcc.com>

Goal

The ICMCC is the central meeting place for exchanging information between IT specialists (academic as well as industrial), clinicians, pharmacologists, management, care practitioners, patients and policy makers. Our aim is to enable crosslinks between users, implementers, creators and developers but also between the various fields, as there are many common denominators amongst the various disciplines addressed at the ICMCC. To facilitate the ICMCC participant we will try to seek out a way or system to guide him/her in his search for information and contact during and after the event.

General

ICMCC covers a broad field of subjects, in an attempt to keep abreast of developments in the various areas and to cover the spectacular growth of IT in these fields. These subjects will not be considered separate streams within the event, as many aspects of ICT in health and care deal with several of those subjects simultaneously.

We will also try to achieve some kind of focus on the political policies both national and international.

From theoretical science to patient-oriented applications, all these aspects should find an equal treatment during this congress. The ICMCC therefore aims to provide an overall long-term steering and alignment of scientific and technical objectives, ideals and results towards a common society of advanced services and products.

Chairs



Event chair
Drs Lodewijk Bos
President of EFSICT
The Netherlands



Scientific chair
Prof. Swamy Laxminarayan
Institute of Rural Health
Idaho State University
USA



International chair
Prof. Dr Peter Sloot
Universiteit van Amsterdam
The Netherlands



Compunetics chair
Dr Andy Marsh
VMW Solutions
UK

XXXI. Congress of the European Society for Artificial Organs

September, 8th - 11th, 2004

Warsaw - POLAND

TOWARDS MEDICAL TECHNOLOGY OF THE FUTURE

The Congress will be held at the premises of the Institute of Biocybernetics and Biomedical Engineering and the International Centre of Biocybernetics, Polish Academy of Sciences, the biggest biomedical engineering research center in Poland. The scenery of the Congress venue should help to create a unique scientific atmosphere for the Congress. We hope that our meeting in Warsaw will result in many presentations of new and realistic ideas, which will give not only a hope but will lead to efficient substitution or regeneration of the lost functions of the organism.

The Congress will consist of three days of scientific meetings under the Congress Theme: **Toward Medical Technology of the Future**. The scientific program will include plenary lectures, symposia organized by ESAO Working Groups, sponsored symposia and regular oral and poster sessions.



The Second Announcement, which includes: detailed information on registration procedure, (fees, hotel accommodation, travel information, scientific and social programs), call for papers, as well as registration forms (abstract submission and hotel accommodation) is now available on the web site: www.ibib.waw.pl/esao2004.



For further information please contact:

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Institute of Biocybernetics and Biomedical Engineering,
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10th Anniversary Meeting of the Society in Europe for Simulation Applied to Medicine

<http://www.sesam2004.se>

Medical Simulation: From Training of manual Skills to Training of high Performance Teams



SESAME's Annual Meeting is designed for health care professionals, educators, scientists, and representatives of administration and industry with a common interest in new advancements in medical simulation for the benefit of increased patient safety.

The host for the meeting this year, the Centre for Advanced Medical Simulation at Huddinge University Hospital, is a multi-professional co-venture for (among others) orthopaedic surgeons, general surgeons, anaesthetists, internal medicine physicians, engineers, psychologists and students. Using our experience, we hope that the 10th Annual Meeting will be a meeting place for a wide range of medical disciplines. We therefore welcome representatives for all modalities of simulation applied in the medical field. We believe that the interaction between participants using full-scale simulation and participants using part-task trainers will elucidate new aspects of training techniques, learning psychology, and evaluation methods.

Meeting Objectives

- Provide an educational and research forum for the medical simulator community
- Provide opportunities for hands-on learning using various models of simulators
- Provide a forum on learning psychology as base for simulation training
- Provide a forum on evaluation methods applicable in the wide field of medical simulation
- Present current research in use of simulation for medical education of health care professionals

The meeting will benefit any health care educator interested in learning psychology and the future application of simulation in the medical curriculum.

Workshop sessions are planned to allow small group access to a variety of simulators and to participate in discussions on simulator model scenarios currently being used by medical educators.

**Organizing committee**

Carl-Johan Wallin, Li Tsai, Torsten Wredmark, Ann Kjellin, Ann-Charlott Nordström, Monika Dovrin, Hans Hjelmqvist, Kai Mäkinen, Lars Särnå.

Information:



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carl-johan.wallin@cfss.ki.se

Congressbureau Art Event Stockholm
Sanna Evers
sanna.evers@royalfestivals.se

ISBME2004

International Symposium on Biomedical Engineering 2004, Thailand

November 16-18, 2004, Bangkok, Thailand



After hosting a national meeting on Biomedical Engineering for 3 consecutive years in Thailand, Thai Biomedical Engineering Societies (Thai BMES) are now ready to launch the first international Symposium on Biomedical Engineering (ISBME2004). (Thanks go to the IFMBE for their continuing support). The venue of ISBME2004 focuses on new research and development in Biomedical Application including craniofacial and bone mechanics, reconstruction of cranio-maxillofacial surgery technique, modeling and response of tissue and material, cellular biomechanics and computational cell biology, medical image and signal processing, tissue engineering and other related biomedical engineering. ISBME2004 will be held in Bangkok Thailand on November 16-18, 2004. Please visit <http://www.isbme2004.com/> for details.

(Continued from page 31)

This international symposium offers an opportunity for professional interaction in all biomedical engineering areas relating to applications in dentistry and medicine. This symposium has goals (1) to introduce biomedical engineering to medical and dental fields, (2) to encourage the collaboration between clinicians and biomedical engineers, and (3) to promote biomedical engineering research and developments in Thailand and international. The organizing committee is pleased to invite all the researchers and clinicians in the field of Biomedical Engineering to submit technical papers and join the ISBME The ISBME 2004 is sponsored by Biomedical Engineering Society of Thailand, National Science and Technology Development Agency, Thailand (NSTDA), and Thai Association of Oral and Maxillofacial Surgeons.

Conference Topics

The conference will focus on research and development in biomedical engineering applications including:

- Craniofacial and bone mechanics
- Reconstruction of craniomaxillofacial surgery techniques
- Modeling and response of tissue and materials
- Cellular biomechanics and computational cell biology
- Medical image and signal processing
- Dental biomechanics and material
- Tissue engineering
- Other related biomedical engineering applications

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Biomedical Engineering Society of Thailand

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Special Issue on Vascular Imaging

Alejandro Frangi, Amir Amini, Elizabeth Bullitt

Guest Editors



IEEE TRANSACTIONS ON
MEDICAL IMAGING

CALL FOR PAPERS

Current advances in imaging technologies and contrast media are conveying increasingly richer information on functional and anatomical aspects of the

vasculature both in healthy and diseased state. Computerized post-processing techniques to extract quantitative information from vascular images as well as to fuse multimodality information of the vessel anatomy and function are thus becoming very popular. Images, for example, can be processed directly to yield information on intravascular pressure and shear stress. There is also a trend to develop image-based modeling and simulation techniques that facilitate virtual exploration of biomechanical indices of function. Such methods can be useful not only to assess the extent of vascular disease but also to help in determining the suitability of a particular intervention or in optimization of the design of medical devices.

We invite submission of papers describing new techniques for vascular imaging as well as for any aspect related to multimodal fusion of vascular information, quantification of vascular morphology and function, image-based modeling and simulation of hemodynamics and vascular mechanics. The special issue will give particular attention to contributions describing methods with a thorough clinical evaluation. Suggested topics include but are not restricted to:

- Novel vascular image acquisition techniques and contrast media
- Coronary imaging and image analysis
- 3-D vessel reconstruction from multiple projections
- 3-D MRA/CTA/US image analysis and quantification tools
- Registration of vascular images from different modalities (3-D/3-D, 2-D/3-D, X-ray/IVUS)
- Tools for planning (endo)vascular interventions and aneurysm repair
- Novel vessel visualization and display techniques, and navigation tools (e.g. vessel fly-through)
- Image-based flow measurement techniques from MRI, X-ray, ultrasound, etc.
- Atherosclerotic plaque imaging and characterization
- Endothelial function characterization

- Subject-specific modeling and simulation of hemodynamics, vascular remodeling, thrombo- and atherogenesis

T-MI seeks high quality research papers for this special issue. This special issue will welcome both full-paper and short-communication submissions. Authors should submit their manuscripts electronically through the IEEE Manuscript Central Office (<http://tmi-ieee.manuscriptcentral.com>) following the T-MI Instructions and indicating in the *Comments to the Editor-in-chief* that the manuscript is submitted for the special issue on *vascular imaging*. Authors intending to submit articles are encouraged to discuss their submissions with the Guest Editors to determine suitability for this special issue.

Guest Editors:

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Aragon Institute of Engineering Research
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Schedule:

Submission of manuscripts: 1st May 2004
Acceptance/rejection notification: 1st August 2004
Revised manuscripts due: 1st October 2004
Publication: March 2005



MIMS Center Summer Workshop

**Modeling Cellular Metabolic Dynamics
in Tissue-Organ Systems**
MIMS Center Summer Workshop
June 9-11, 2004



This workshop deals with mathematical modeling and computer simulation for quantitative analysis of cellular metabolism in relation to physiological transport processes with tissue, organ and whole-body systems. It is intended for researchers at universities, medical centres, and commercial entities who desire quantitative understanding and prediction of normal and abnormal function. This workshop is appropriate for graduate students as well as senior researchers in the field. The workshop will include sessions dealing with cellular metabolic pathways, modeling methods for complex kinetics and transport processes, simulation of current models in a computer lab, and experimental methods for model validation. Participants will receive free computer codes for model simulation.

Location: Case Western Reserve University; Cleveland, OH

Sponsor: MIMS Center

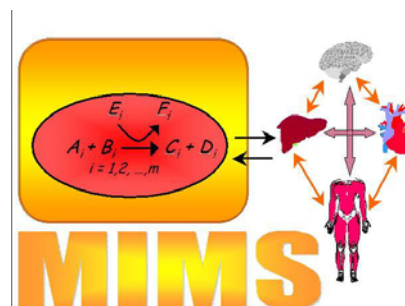
<http://www.csuohio.edu/mims/>

Contact

Dr. Gerald Saidel

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Phone: +1-216-368-4066





Stockholm, August 25-28, 2004

<http://www.esof2004.org/>

The Euroscience Open Forum (ESOF2004) is a groundbreaking initiative. It is the first pan-European scientific meeting ever staged to provide an interdisciplinary forum for open dialogue, debate and discussion on science and technology in society. ESOF2004 will be held at Stockholm City Conference Centre in Stockholm, Sweden, 25-28 August 2004.



Its objective is to bring scientists from all fields, and people interested in science and technology, from all over Europe to one meeting. The participants will be academics, policy makers, politicians and representatives from media and the science based industries.

This project, initiated by Euroscience, involves many important European organisations.

ESOF2004 - Highlighting Science, Technology & Innovation in Europe

The science & technology field is increasingly important and it interests, concerns and affects people. It is not always well understood or perceived in the media or by the public. Since it is, to a large extent, funded by the public better communication with society is necessary.

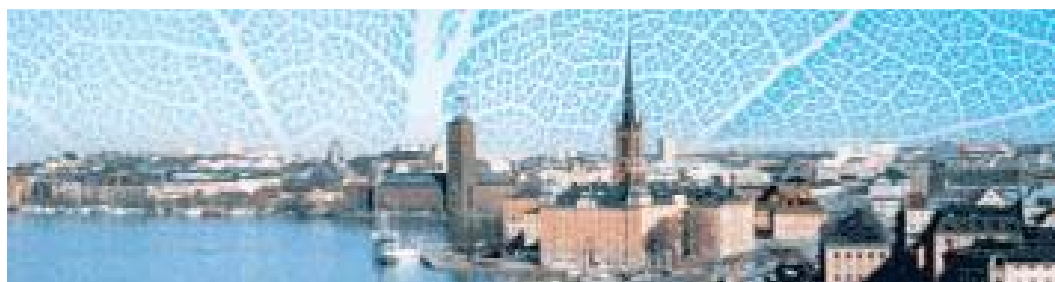
EuroScience Open Forum 2004 (ESOF2004) will be open to scientists from all fields, the public, policy makers, politicians, media, industry, teachers and students.



Main aims

The main aim is to bring people interested in science & technology from all over Europe to ONE meeting and to respond to the challenges and begin to provide solutions to the major problems the world faces today. Other aims at ESOF2004 are to:

- present science and the humanities at the cutting-edge
- stimulate scientific awareness
- foster debate on science and society
- offer cross-disciplinary interaction and communication between the public, politicians, policy makers and the media on current trends and future roads for the sciences





2nd International Conference On Smart homes and health Telematics (ICOST'2004)



September 15 - 17, 2004, Singapore



<http://icost2004.i2r.a-star.edu.sg>

Organizer

Institute for Infocomm Research, Singapore

Co-organizer

Institut National des Télécommunications, Paris, France

CALL FOR PAPERS

With the success of ICOST'2003 in Paris, we are honored to welcome you to the 2nd International Conference On Smart homes and health Telematics (ICOST' 2004), Singapore.

Recent years have witnessed rapid advances in the enabling technologies such as the broadband access, smart sensors/actuators, wirelesses and home networks. Smart home has become a hot area for research and development in both academia and industry. Enhancing lifestyle for residents and maintaining independent living for elderly and disabled people are the goals we all hope to be able to attain. Residents use intelligent systems to achieve security, energy saving, convenience and a better lifestyle. In particular, elderly and disabled people rely on assistive technology to carry out daily living activities, socialize, and enjoy entertainment and leisure activities. Consequently, users are confronted with heterogeneous systems and applications, imposing diverse user interfaces, providing complementary functionalities, and forming a whole automated environment that we describe as a smart home. Smart home techniques are not necessarily limited to home environment, but can also be deployed into other environments such as hospitals, offices, schools, or train stations.

This conference will present the latest approaches and technical solutions in the area of smart home, health telematics, and enabling technologies such as middleware, networks, and novel applications and services. In combination with presentations, posters, exhibits and technology demonstrations, you are most welcome to organize special sessions in any related fields to tackle the new technical challenges.

Technical topics of interest include, but are not limited to:

- Intelligent Environments / Smart Homes
- Human-Machine Interface / Ambient Intelligence
- Middleware Support for Smart Home and Health Telematics Services
- Tele-Assistance and Tele-Rehabilitation
- Context Awareness / Autonomous Computing
- Wearable Sensors / Home Health Monitoring
- Medical Data Collection and Processing
- Modeling of Physical and Conceptual Information in Intelligent Environments
- Vision / Hearing / Cognitive Devices
- Personal Robotics and Smart Wheelchairs
- Home Networks / Residential Gateways
- Social / Privacy / Security Issues

Paper Submission

For ICOST'2004 authors are required to submit an abstract of 800 words by 30 April 2004. All submissions will be peer-reviewed by the international Program Committee. Authors will be notified of the review outcome by 15 June 2004. Authors of accepted abstracts are requested to submit their final, camera-ready papers by 10 July 2004. Special session proposals with at least 4 different speakers should be submitted by 5 May 2004. All the abstracts and proposals should be submitted to icost2004@i2r.a-star.edu.sg. You may direct any inquiry to the conference chair Dr. Daqing Zhang at: daqing@i2r.a-star.edu.sg



McMaster University seeks applications for Professorships in Biomedical Engineering

McMaster University and its Department of Electrical and Computer Engineering have embarked on a major initiative to develop a strong biomedical engineering program both at undergraduate and graduate level. This program will link the existing strength in electrical and computer engineering with biomedical research in medical imaging, medical telerobotics, telemedicine, signal processing, microelectronics and optoelectronics as well as the health sciences. Biomedical engineering bridges the historical separation between the biological and medical sciences and the engineering and physical sciences, thereby spanning interdisciplinary boundaries. Our goal is to attract top notch undergraduate and graduate students, and to educate a new generation of engineers and prepare them for the health care profession and industry. In order to facilitate this, we are seeking a leader at the associate or full professor rank for a tenured or tenure-track position, who will help lead and develop this new biomedical initiative in Electrical and Computer Engineering and participate in the formation of a new McMaster School of Bioengineering. Truly outstanding candidates will be considered for a Tier I Canada Research Chair (CRC). Further details on the CRC Program can be viewed at: <http://www.chairs.gc.ca/english/about/factsheet/index.html>.

Qualified candidates will have a strong commitment to research and teaching with the ability to establish or maintain a dynamic research program in their fields of expertise. They will also have strong communication skills and will be able to impart their knowledge and expertise to both undergraduate and graduate students.

McMaster University has an outstanding research environment and is well known for its innovation in teach-

ing and program development, and offers attractive start-up packages to outstanding candidates.

CRC offers will be made in keeping with the immigration requirements associated with the Canada Research Chair program-no restrictions are imposed with regard to nationality or country of residence. Canada Research Chairs are subject to review and approval by the CRC Secretariat. All other qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority.

McMaster is strongly committed to employment equity within its community, and to recruiting a diverse faculty and staff. The University encourages applications from all qualified candidates, including women, members of visible minorities, Aboriginal persons, members of sexual minorities, and persons with disabilities. Salary is commensurate with qualifications and experience.

Further information on the department is available from <http://www.ece.mcmaster.ca>.

Applications should be sent to the address below, and will be accepted until this position has been filled. Please ensure all applications are complete with a curriculum vitae and the names of three references.

Search Committee
Department of Electrical and Computer Engineering
McMaster University
1280 Main Street West
Hamilton, Ontario, Canada L8S 4L7
Telephone: 905-525-9140, ext. 23315
Fax: 905-523-4407
Email: ferracu@mcmaster.ca



Latest update on the Kuala Lumpur International Conference on Biomedical Engineering 2004 (BioMed 2004)

**September 2-4, 2004
Hilton Petaling Jaya, Kuala Lumpur, Malaysia**

Plenary speakers:

- Prof. Joachim Nagel (President of IFMBE) - Biological effects of low frequency ultrasound: Health hazards and medical applications
- Prof. Colin Orton (President of IUPESM) - Review of new technological developments in the radiotherapeutic treatment of cancer
- Prof. John G. Webster (University of Wisconsin, Madison, USA) - Tissue ablation: devices and procedures
- Prof. Dan L. Bader (Queen Mary University of London, UK) - Biomechanical conditioning of chondrocyte-seeded constructs: Tuning for success
- Prof. Dr. Gert Pfurtscheller (Graz University of Technology, Austria) - Direct brain-computer communication

Pre-conference workshop September 1, 2004.

- Bioinstrumentation - JG Webster (University of Wisconsin, Madison, USA)
- Tissue Engineering - DL Bader (Queen Mary University of London, UK)
- Image Processing - M Bister (Nottingham University, Malaysia Campus)

Deadline extension April 30, 2004.

To keep yourself updated with the latest information on BioMed 2004, please visit the official website:
<http://www.um.edu.my/conf/biomed2004>

Looking forward to seeing you in Kuala Lumpur.

Warmest regards

Nahrizul Adib Kadri (Mr.)
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Web: <http://www.um.edu.my/conf/biomed2004>
<http://www.um.edu.my>



CALENDAR

2004

COMPAHEC 2004 – Computer Applications in Health Care Annual ACM Symposium on Applied Computing

March 14 - 17, 2004, Nicosia, Cyprus

<http://webepcc.unex.es/vmasero/compahec/compahec04>

ICMDTP – Second International Conference on Medical Diagnostic Techniques and Procedures
April 1 – 3, 2004 Indian Institute of Technology Madras, India

<http://apm.iitm.ac.in/icmdtp.html>

II EFOMP Mediterranean Conference on Medical Physics
“The Analogue to Digital Migration of the Hospital Working Environment”
April 28 – 30, 2004, Mediterranean Hotel, Limassol, Cyprus

<http://www.campbe.org/efomp2004>

MBE2004

The 43rd Annual Conference of Japanese Society for Medical and Biological Engineering
“Partnership in Medicine and Engineering – *Towards Healthier and Happier Society*”

May 19 – 21, 2004, Ishikawa Kousei Nenkin Kaikan Hall, Kanazawa, Japan

<http://web.kanazawa-u.ac.jp/~me2004/index.htm>

ICMCC - International Congress on Medical and Care Compunetics

June 2 – 4, 2004, The Hague, The Netherlands

<http://www.icmcc.com>

SESAM - 10th Anniversary Meeting of the Society in Europe for Simulation Applied to Medicine
“Medical Simulation: From Training of manual Skills to Training of high Performance Teams”

June 17 – 19, 2004, Stockholm, Sweden

<http://www.sesam2004.se/>

ICTSS 04 – 2nd International Summer School “Applications of ICT in Biomedicine”

June 28 – July 3, 2004, Dubrovnik, Croatia

<http://www.crombes.hr/ICTSS04/index.htm>

MEDICON 2004 - 10th Mediterranean Conference on Medical and Biological Engineering
“Health in the Information Society”

July 31 – August 5, 2004, Island of Ischia, Naples, Italy

<http://www.medicon2004.unina.it>

BIOMED2004 – Kuala Lumpur International Conference on Biomedical Engineering

September 2 – 4, 2004, Kuala Lumpur, Malaysia

<http://www.um.edu.my/conf/biomed2004/>

ESAO 2004 - XXXI. Congress of the European Society for Artificial Organs
Towards Medical Technology of the Future
September 8 – 11, 2004. Warsaw, Poland
<http://hrabia.ibib.waw.pl/esao2004/>

28th Canadian Medical and Biological Engineering Conference
September 9-11, 2004 - Delta Hotel Québec, Canada
Final Paper submission – 30 April 2004
<http://www.cmbes.ca>

ICOST'2004 - 2nd International Conference On Smart homes and health Telematics
September 15 -17, 2004, Singapore
<http://icost2004.i2r.a-star.edu.sg>

CLAEB 2004 – III Latin American Congress on Biomedical Engineering
XIX Brazilian Congress on Biomedical Engineering
September 22 – 25, 2004, Tropical Hotel Tambaú, João Pessoa, Pb, Brazil
<http://www.claeb2004.org.br>

3rd International Workshop "Biological Effects of ElectroMagnetic Fields"
October 4-8, 2004, Kipriotis Village Hotel Kos, Greece
<http://imm.demokritos.gr/bioeffects>, <http://www.telecomlab.gr/bioeffects>

ISBME2004 International Symposium on Biomedical Engineering: Application in Dentistry and
Medicine, November 16-18, 2004, Bangkok, Thailand
<http://www.isbme2004.com/>

2005

Third International Conference on Ethical Issues in Biomedical Engineering
June 4-6, 2005, Alfred, New York
<http://www.nyscc.alfred.edu/conferences>

NBC '05 – 13th Nordic-Baltic Conference on Biomedical Engineering & Medical Physics
June 13 – 17, 2005, Umeå, Sweden
<http://www.umu.se/conference/nbc2005>

2006

WC 2006 – World Congress on Biomedical Engineering and Medical Physics
August 27 - September 1, 2006, Seoul, Korea
<http://www.wc2006-seoul.org>



International Federation for Medical and Biological Engineering

IFMBE Secretary-General: Prof. Dr. Ratko Magjarevic, Faculty of Electrical Engineering and Computing University of Zagreb Unska 3 HR-10000 Zagreb Croatia +385-1-6129-938 (phone) +385-1-6129-652 (fax) ratko.magjarevic@fer.hr

Sustainable excellence in BME

The International Federation for Medical and Biological Engineering, IFMBE is a federation of national and transnational organizations.

These organizations represent national interests in medical and biological engineering.

The objectives of the IFMBE are scientific, technological, literary, and educational. Within the field of medical, clinical and biological engineering IFMBE's aims are to encourage research and the application of knowledge, and to disseminate information and promote collaboration.



IFMBE is affiliated with the International Union for Physical and Engineering Sciences in Medicine

IFMBE News is the newsletter of the International Federation for Medical & Biological Engineering. It is published bimonthly.

IFMBE News is a fully electronic newsletter, which contains information on the activities of the Federation and its national affiliates, on forthcoming scientific meetings and on features on new developments within the field. The newsletter appears on the web page http://ifmbe-news.iee.org/. The News is also available in downloadable PDF format using the free Adobe Acrobat Reader.

Articles and news for IFMBE News should be sent to Prof. Ratko Magjarevic, Faculty of Electrical Engineering & Computing, University of Zagreb, Unska 3, HR-10000 Zagreb, CROATIA, Phone: +385 1 6129 938, Fax: +385 1 6129 652, E-mail: ratko.magjarevic@fer.hr

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- IFMBE Proceedings WC2003 "World Congress on Medical Physics and Biomedical Engineering", Vol. 4, 2003, Sydney, Australia
IFMBE Proceedings EMBEC'02 "2nd European Medical and Biological Engineering Conference", Vol. 3, Parts 1 & 2, 2002, H. Hutten and P. Kroesl (Eds.), Vienna, Austria, more than 800 papers on more than 1700 pages, including content, keywords and authors index.
IFMBE Proceedings 12NBC "12th Nordic Baltic Conference on Biomedical Engineering and Medical Physics", Vol. 2, 2002, Stefan Sigurdsson (Ed.) Reykjavik, Iceland, more than 120 papers on more than 250 pages, including content and authors index.
IFMBE Proceedings MEDICON 2001 - "IX Mediterranean Conference on Medical Engineering and Computing", Vol. 1, Parts 1 & 2, 2001, R. Magjarevic, S. Tonkovic, V. Bilas, I. Lackovic (Eds.), Pula, Croatia, more than 300 papers on more than 1300 pages, including content and authors index.



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DEADLINES FOR SUBMITTING CONTRIBUTIONS:

- May issue: April 15, 2004
July issue: June 15, 2004
September issue: September 05, 2004
November issue: October 15, 2004