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International Federation for Medical & Biological Engineering

Encouraging research and the application of knowledge, disseminating information, and promoting collaboration in the field of medical, clinical and biological engineering

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BIOMEDICAL ENGINEERING IN CROATIA

1. INTRODUCTION

Research in the field of biomedical engineering started in Croatia in the late fifties of the last century. The background to biomedical engineering was represented by engineering and medical faculties and, later, the medical equipment industry. In the early seventies, lecturing in biomedical engineering was introduced into undergraduate programs (first at the University of Zagreb) and later to undergraduate and postgraduate studies at several universities in Croatia. The Croatian Medical and Biological Engineering Society (CROMBES) had the leading role in the continuing education of engineering staff working in health care facilities. Due to a (generally) small labour market and the unsatisfactory position of engineering staff within the health care system, and particularly the disturbance brought into the civil system by the aggression on Croatia in the last decade of the 20th century, no integrated biomedical engineering program was established jet (until the academic year 2001/02). Recognising the need for harmonising the education programs within Europe, CROMBES initiated the establishment of postgraduate studies in the field of biomedical engineering in 2001. At the same time, moves were made for recognition of the position of biomedical and clinical engineers working in health care facilities.

2. THE NATIONAL SOCIETY

The Croatian Medical and Biological Engineering Society (CROMBES) was founded in 1992, continuing the tradition of the Croatian Section of the former Yugoslav Biomedical Engineering Society (founded in 1984). CROMBES is an interdisciplinary scientific organisation, bringing together those who work in the field of biomedical engineering and medical physics. This is rather unusual for most European countries, but is not an exception (the Institute of Physics and

undergraduate and postgraduate level. However, these do not result in a degree in biomedical engineering, but rather in a diploma (graduate - dipl. ing.; postgraduate - mr. sc. or dr. sc.) in electrical engineering. The undergraduate studies last for 9 semesters.

As an example, a list of subject courses at the Faculty of Electrical Engineering and Computing, University of Zagreb, is presented in Appendix 1. After four semesters, undergraduate students make a choice of program (out of six different programs). Lectures in biomedical engineering are given within the *Industrial Electronics* program.

3.1.1 The Proposed Postgraduate Program Structure

Working on plans and programs for recognition and education of clinical engineering in Croatia for a number of years, the Croatian Medical and Biological Engineering Society has worked out a model (program) which we consider to be the best, given the current state of Croatian society and its health care reforms, including the economical aspects of the reforms. One of the main considerations of this program was the small labour market. The proposed program is a postgraduate program, lasting at least four semesters, having some courses common to biomedical/clinical engineers and medical physicists, with a lot of practical work in the clinical environment and strongly leaning on international collaboration and mobility. For the time being, the diploma would specify the word “specialist” in biomedical/clinical engineering or in medical physics in order to comply with the present health care regulations.

One of the specific points of this program is to provide common basic courses for engineers and physicists, which is not usual in existing programs.

The other question arising from the present situation in Croatia is whether to name the program a clinical engineering or a biomedical engineering program. At the present time, the name “clinical engineer” is more often used in health care facilities.

In building up this postgraduate program, the preliminary assumptions were:

- qualification of students entering the studies – Dipl. Eng. or BSc diploma in engineering (electrical, electronic, mechanical or technology) or physics
- prerequisite knowledge considered as "a minimum requirement" for entering the program (mandatory topics), measurable according to the ECTS
- subjects of the postgraduate studies would consist of subjects mandatory for both profiles (CE and MP), subjects mandatory for one profile only and optional subjects
- such a structure should enable students to build up specific competencies/ specialisation
- subjects intended for both profiles would mostly consist of interdisciplinary topics necessary for both profiles, i.e. selected topics of in anatomy, electrophysiology, biotechnology, etc.
- some of the students may be directed to attend and pass the exam (one or more courses) from the undergraduate engineering or physics programs in order to win the missing credits
- in order to enable the building up of a professional profile for each student, not to restrict him or her to a program offered locally, mobility within European universities should be stressed as one of the most important points of the program
- in addition, students should be encouraged to pursue their education to a higher level, to gain expertise in their profession (these two steps already exists within the European Federation of Organisations for Medical Physics).

We think that such a model could be accepted not only in Croatia, but also in transitional countries that do not have established undergraduate biomedical engineering, clinical engineering and medical physics programs and would be accepted by the international/national bodies for quality control and accreditation of academic programs. That program should be flexible, easily adaptable to the needs of the health care system and the society in general.

3.2 Training

At present, the Ministry of Health is preparing a new law regarding the organisation and systematisation of the health care system. The Croatian Biomedical Engineering Society has proposed that all those engineers (biomedical or clinical) as well as medical physicists who are in close contact with patients and/or life supporting medical equipment and therefore can significantly influence their health status should seek the professional status of "medical worker". Continuous training (after graduation) in accordance with the (existing) requirements for continuous education for medical professions and clinical practice should be introduced for those engineering professions. During the training, the trainees should be employed within the health care system to ensure their clinical practice. After finishing the training the trainees should pass the state exam (for their profession) to get a licence.

Since this schedule is still in development, an acceptable solution should be found for those engineers who already work in health care facilities and have undergone several additional training courses.

In the opinion of the Croatian Biomedical Engineering Society, the responsibility for organising the training should be in hands of the Society and under the control of the Ministry of Health and the university.

3.3 Accreditation of Education and Training

The degrees or related qualifications offered by universities are authorised by the Ministry of Science and Technology. Faculties seeking permission to run a graduate or postgraduate program have to demonstrate the quality of the program and an adequate system for its implementation to the National Board for Higher Education, a body of the Ministry of Science and Technology that is responsible for higher education quality assurance.

In addition, degrees and programs for professions practising in health care have to be accredited by the Ministry of Health.

Universities are self-governing institutions with full responsibility for the quality of their programs. They also decide on the content, duration and title of degree programs, which leads to notable variations.

Croatia has signed the Bologna Declaration and Croatian universities have started the process of harmonising their programs with the requirements and recommendations of the Declaration. Major changes in the structure of programs are expected in the coming years.

4. ADDITIONAL INFORMATION

At present, a scientific postgraduate program in Medical Physics is running at the Faculty of Nature Sciences, University of Zagreb. Most medical physicists practising in health care facilities have graduated from this program and have been awarded a Master's degree (mr. sc.).

Postgraduate education in medical informatics, oriented towards health information systems, was introduced in 1984 at the Medical School, University of Zagreb. This program has been attended by physicians and others working in health or educational institutions. Graduates obtain a Master's degree.

Appendix 1.

Faculty of Electrical Engineering and Computing

University of Zagreb

Studies in Electrical Engineering

Table 1. Fundamental Courses	Semester	ECTS
Linear algebra	1	6
Mathematical analysis I	1	7
Physics I	1	7
Fundamentals of electrical engineering I	1	7
Computer applications	1	3
Mathematical analysis II	2	7
Physics II	2	7
Fundamentals of electrical engineering II	2	7
Programming	2	6
Graphics and documentation for engineers	2	3
Mathematical analysis III	3	7
Electrical measurements	3 + 4	10
Electronics I	3	7
Fundamentals of power engineering	3	6
Algorithms and data structures	4	4
Electronics II	4	6
Digital electronics	4	7
Network and transmission line theory	4	7
Stochastic mathematics	4	6

Program: Industrial Electronics

Table 2. Program Core Courses	Semester	ECTS
Electronic measurement and components	5	6
Signals and systems	5	7
Digital computers	5	7
Physics of materials	5	4
Elective courses *	5	5
Humanic elective **	5	5
Electronic instrumentation	6	8
Stochastic processes in systems	6	5
Fundamentals of microelectronics	6	4
Filters and filter amplifiers	6	4
Automatic control	6	7
Humanic elective **	6	6
Transmission and telemetry systems	7	6
Microelectronic circuits	7	5
Biomedical electronics	7	5
Digital signal processing	7	5
Embedded system design	7	7
Humanic elective **	7	5
Computerized measurement and control systems	8	5
Design and manufacturing of electronic devices	8	6
Elective courses *	8	2
Economics	8	2

*** see Table 3.**
**** two humanistic elective courses are compulsory**

Table 3. Elective Courses	Semester	ECTS
Semiconductor physics	5	4
Automata, formal languages, and compiler design I	5	6
Radiofrequency electronics	5	6
Telecommunication networks	5	5
Theory of electromagnetic fields	5	4
Operational research	5	4
Fundamentals of power electronics	8	5
Computer graphics	8	4
Advanced electronic circuits	8	4
Design of digital VLSI/ULSI circuits	8	4
Transducers in measurement systems	8	3
Industrial measurement systems	8	3
Switched capacitor circuits	8	3
Digital image processing	8	4
Design of intelligent measurement systems	8	4
Numerical methods	8	6
Discrete mathematics	8	6
Open computing	8	4
Ultrasound and hydroacoustics	9	4
Real-time systems	9	4
Analog integrated circuit design	9	4
Expert systems techniques	9	4
Selected topics of biomedical engineering	9	3
Software design for measurement and control systems	9	3
Process identification	9	3
Radio positioning and navigation	9	3
Radio-frequency amplifier design	9	4
Photonic communication technology***	9	4
Gaas and heterostructure semiconductor devices ***	9	4
Bioelectric systems ***	9	4
Automatized instrumentation***	9	4
Fault diagnosis of analog circuits ***	9	4
Neural networks ***	9	4
Multimedia data transfer and computer networks ***	9	4
Intelligent control systems ***	9	4
Software engineering – selected topics ***	9	4

***** courses common for undergraduate and postgraduate program**

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11th Annual Event of the American Institute for Medical and Biological Engineering New Horizons for Biology-Based Engineering 28 February 2002 – 3 March 2002 The National Academy of Sciences and The Westin Grand Hotel, Washington, DC

A broad, and until recently unconceivable, range of technologies is emerging from the molecular and genomic revolutions in biological science. These biology-based technologies extraordinary potential for addressing many issues facing our nation today, including health care, bioterrorism, and enhancement of the quality of human life.

The Eleventh Annual Event of the American Institute for Medical and Biological Engineering (AIMBE) will focus on the exciting contributions, along with the inherent technical and policy issues, capable of being offered by biological engineering applied to some of the most crucial challenges currently being faced by society.

Will stem cell technologies fulfill their promise for transforming medicine? How can microbial pathogens be detected and neutralized on a large population scale? Are there ways to move beyond animal experimentation for studies of drugs and toxins for therapeutics as well as chemical and biological weapons defense? These timely questions are being addressed by biology-based engineering approaches, and will be addressed in this meeting from the diverse perspectives of fundamental science, applied technology, and public policy considerations.

In addition to the main program at the National Academy of Sciences, AIMBE's four membership groups will host forums addressing the medical and biological community's response to bioterrorism, the future of education and research in a post-Whitaker Foundation world, the future public policy agenda for AIMBE, and the role of AIMBE in addressing issues of importance to industry. As in prior years, the Annual Event program will include a kick-off workshop, co-hosted by AIMBE and the National Science Foundation, on Federal programs in medical and biological engineering.

Thursday, February 28, 2002 - The Westin Grand Hotel

Symposium, Federal Programs in Medical and Biological Engineering Understanding ABET EC2000 - A Workshop for New Programs

Council of Chairs Meeting

Friday, March 1, 2002 - National Academy of Sciences

Session I. Stem Cells & Cell Based Therapeutics

Chair: E. Terry Papoutsakis, Northwestern University

Speakers: C. Eaves, University of British Columbia; P. Ossorio, University of Wisconsin

Session II. Microbial Pathogens: New Challenges, New Solutions

Chair: George Georgiou, University of Texas, Austin

Speakers: S.A. Johnson, University of Texas Southwestern Medical School J. LaMontagne, National Institute of Allergic and Infectious Diseases

Session III. In Vitro Physiological Surrogates for Drug Safety and Efficacy Testing: Opportunities and Impacts

Chair: Linda Griffith, Massachusetts Institute of Technology

Speakers: A. Rudolph, Defense Advanced Research Projects Agency G. Kovacs, Stanford University

Keynote Address: Marvin Cassman Director, National Institute of General Medical Sciences

Induction - AIMBE Fellows, Class of 2002

Reception

Saturday, March 2, 2002 - The Westin Grand Hotel

Forum 1: "Bioterrorism: Medical and Biological Engineering's Response" Hosted by AIMBE's Council of Societies

CHAIRS: Michael Ackerman and Warren Grundfest

AIMBE, through the Council of Societies, can play a positive and constructive role in the dissemination of information and education to the public with regard to technologies to deal with threats from bioterrorism . Each Society has experts in many of the technical fields necessary to combat bioterrorism. These include, but are not limited to: threat identification, detection systems, assessment of public risk, public health measures, and therapeutic options. This forum brings speakers – selected by the Council – to address these issues that are of critical importance in the war against terrorism.

Forum 2: "AIMBE's Future Public Policy Agenda"
Hosted by AIMBE's College of Fellows

During its first decade of existence, AIMBE identified and addressed several key public policy issues. These issues – federal support for research, medical device regulation, and biomaterials access – have largely focused on achieving the enactment of selected pieces of legislation by the US Congress. As we enter our second decade, we face a host of legislative, regulatory, and societal issues that impact upon cutting edge research conducted by medical and biological engineers, and the improvement of the quality of life for the ultimate users of the technology we invent. Based on issues raised at the main program yesterday, and through the results of pre-Annual Event polling of the College of Fellows, this forum will address: 1) the range of public policy issues that AIMBE's College of Fellows might address; 2) mechanisms for addressing these public policy issues; and 3) specific measures for including the College of Fellows in addressing selected issues.

Forum 3: "Academic Medical and Biological Engineering in a Post-Whitaker World"

Academic programs for medical and biological engineering have flourished over the past 25 years, supported generously by the Whitaker Foundation and several Federal agencies, most notably the National Institutes of Health (NIH) and the National Science Foundation (NSF). Major changes, however, lurk on the horizon. Most notably, The Whitaker Foundation is entering its final stages of providing support prior to closing in 2006, and the National Institute for Biomedical Imaging and Bioengineering at NIH is in its first year of existence. What is the future of support for cutting edge research in medical and biological engineering? This forum will include presentations from the Whitaker Foundation, NIH, NSF, and a summary of Friday's presentations from Federal agencies conducting support in the field.

Forum 4: Meeting the Needs of Industry Hosted by AIMBE's Industry Council

College of Fellows Meeting

Reception

Annual Banquet

Sunday 3 March 2002 - The Westin Grand Hotel

AIMBE Council of Societies Meeting

AIMBE Academic Council Meeting

AIMBE Industry Council Meeting

AIMBE Board of Directors Meeting

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Conference Announcement
First Venezuelan Congress of Bioengineering
Fifth National Seminar of Electromedicine
Universidad Nacional Experimental Francisco de Miranda
Coro
13-17 May 2002

The First Venezuelan Congress of Bioengineering brings together professionals from the fields of electromedicine, engineering and medicine of the whole country as well as Latin America. The main objective of this event is to stimulate the scientific exchange between the members of the Venezuelan Society of Bioengineering and among all the persons and institutions that are interested in this area. This event has the support of various institutions that stimulate the advancement of science and technology, including IEEE EMBS and CORAL, and Venezuelan universities where there are research groups active in bioengineering.

Pre-congress workshops are planned on the following topics:

- ADVANCED CLINICAL ENGINEERING
- MEDICAL EQUIPMENT OPERATION
- RADIOLOGICAL PROTECTION
- REHABILITATION ENGINEERING
- OPTICS
- CLINICAL LABORATORY TECHNOLOGIES
- HOSPITAL SAFETY
- TELEMEDICINE
- IMAGERY
- ROUND TABLE REGARDING BIOMEDICAL TERMINOLOGY
- MAINTENANCE OF MEDICAL EQUIPMENT

Deadlines

Registration deadline: 12 April 2002.
Deadline for submittal: 31 January 2002.
Notification of acceptance: February 2002.

For more information, please contact:

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First Announcement and Call for Papers MICCAI 2002 Fifth International Conference on Medical Image Computing and Computer Assisted Intervention 25-28 September 2002 Yasuda Hall, The University of Tokyo Tokyo, Japan

MICCAI is the premier international conference in the field of computer-assisted interventions, medical robotics, and image processing. Due to the multi-disciplinary nature of these emerging research fields, the audiences include clinicians, mechanical engineers, and computer scientists. Oral presentations are run as single track, without parallel sessions, while the oral presentations are halted when the poster presentation is on.

Topics to be addressed in MICCAI 2002 include, but are not limited to:

- Clinical applications of computer technologies and systems:
- Tools of minimally invasive surgery
- Novel clinical or biological applications
- Clinical evaluation of systems
- Computer-assisted intervention systems and tobotics
- Robotic manipulators
- Image guided surgical navigation systems
- Medical telepresence and telesurgery
- Surgical simulators
- Image-guided surgery
- Safety issues
- Medical imaging and computing
- Therapy planning
- Image processing and segmentation
- Patient specific planners and simulators
- Virtual and augmented reality
- Image registration and fusion
- Visualisation

Paper submissions

Detailed and up-to-date instructions for paper submissions are available from our conference website http://www.miccai.org. Please check this page periodically to follow the submission guidelines.

Authors are encouraged to submit their papers electronically in PDF (portable document format). A paper should be a maximum of 8 pages in length in either Letter or A4 paper size. Guidelines for the preparation of manuscripts are available from the Information for Authors page (www.springer.de/comp/lncs/authors.html) on our publisher's website. Electronic submission is available through our website. You will be also asked to fill in a questionnaire form along with the manuscript. Again, please check the conference website for the latest submission information.

Important dates

Submission of papers: 1 March 2001
Notification of acceptance: 15 June 2002:
Final camera-ready papers due: 15 July 2002

Registration fees

Early registration fees before July 31 are 40,000 yen for full registration or 25,000 yen for student/residents, which are approximately US$303 and US$190 or 339Euro and 212Euro based on the exchange rate on 8 January 2002.

For further information, contact:

Conference Secretarial Office; MICCAI 2002 Conference; DOC JAPAN, 2-23, Kanda Awaji-cho, Chiyoda-ku; Tokyo 101-0063, Japan. Tel.: +81-3-5289-7717; fax: +81-3-5289-8117; email: doc@apricot.ocn.ne.jp; website: http://www.miccai.org

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Conference Announcement

MEDICON 2004

MEDICON 2004 X Mediterranean Conference on Medical and Biological Engineering

The Italian Association of Medical and Biological Engineering announces MEDICON 2004, the Tenth Mediterranean Conference of the International Federation for Medical and Biological Engineering (IFMBE).

Since the first conference in Sorrento in 1997, MEDICON has been held every three years: 1977 Sorrento, Italy - 1980 Marseille, France - 1983 Portoroz, Slovenia - 1986 Sevilla, Spain - 1989 Patras, Greece - 1992 Capri, Italy - 1995 Jerusalem, Israel – 1998 Lemessos, Cyprus - 2001 Pula, Croatia.

The objective of the conference is to provide the latest scientific and technical information and to present significant developments in the field of biomedical engineering and medical physics. In the new information society, the contribution of these disciplines in healthcare is becoming more and more relevant. The conference program will consist of both invited keynote lectures and submitted papers dealing with latest research, development and technologies in this field.

The conference will enable participants to meet and exchange their experiences. They can share their views with experts and associate with colleagues from all over the world. The aim of this conference is to promote biomedical engineering, to encourage its greater involvement in clinical practice and to give recognition to its importance and relevance in biomedicine and healthcare.

MEDICON 2004 will incorporate also the Second Health Telematics Conference. This second edition, following the HT'95, aims to promote discussion, the exchange of ideas and interaction about the rapidly evolving topics of healthcare telematics and telemedicine.

Authors world-wide are invited to submit papers for MEDICON 2004.

For further information, please contact:

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European Grand Prix for Innovation Awards in Medical and Biological Engineering
MONACO 2001
The 2001 Edition of the European Grand Prix for Innovation

The theme of the year 2001 was "Medical and Biological Engineering". Out of more than 20 applications four were selected for the final round (list of finalists in table below). The finalists were invited to Monaco to attend the prizegiving ceremony, which was held on Saturday 8 December 2001.

The laureates were

- Prof. Pascal LAUGIER and Geneviève BERGER
- Prof. Georges CHARPAK and Dr Pierre MANDRILLON

THE 2001 FINALISTS

Dr Christian DEPEURSINGE. EPFL – Lausanne, Switzerland. Digital holographic microscopy and endoscopy is a new development, based on holographic imaging, which applies purely digital techniques to hologram acquisition and processing. This method can be used for the analysis of materials, for surface inspection in micro-technology, as well as for cellular and tissue diagnosis in biology and medicine.

Prof. Pascal LAUGIER. Laboratoire d'Imagerie Paramétrique – CNRS, Paris, France *Geneviève BERGER* CNRS. Ultrasound bone exploration technique using quantitative imaging in transmission, and backward diffusion to measure bone mineral mass and micro-architecture. The ultrasound bone density gauge allows the assessment of modifications in the bone micro-architecture. This technique is relatively easy to implement and allows the screening of fracture-prone populations and the long-term monitoring of these populations.

Prof. Dr-Ing. Klaus AFFELD. Labor für Biofluidmechanik, Berlin, Germany. Process to form a percutaneous lead around catheters inserted under the skin. A protective sleeve is produced to protect the skin and subcutaneous tissues from infections induced by germs forming around the catheter. The renewal of the sleeve can be continuous or periodical at regular intervals, as it grows from the inside out. This prevents the penetration of germs in the deepest tissues of the body.

Prof. Georges CHARPAK. Société BIOSPACE, Paris, France *Dr Pierre MANDRILLON* Société AIMA, Nice, France. In the field of radiotherapy, there now exists a newly proposed association: an ionising ray detection system, developed by Prof. Georges Charpak and a source of radiation production in the form of a cyclotron-like compact accelerator, proposed by Dr Pierre Mandrillon. This association optimises the integration of radiation emitting sources in the hospital environment and provides the appropriate methodology to define and express radiation characteristics.

For more information, visit the website at http://www.european-grandprix.com. Microsoft Word documents of these papers can also be downloaded from this month's issue of IFMBE News. Please see the IFMBE News website at http://ifmbe-news.iee.org/

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Descartes Prize 2002 EUR 1,000,000 ? for outstanding scientific achievements

European Commission
Research Directorate-General
Brussels, 19 December 2001

On Saturday 15 December 2001, the European Commission opened the race for next year's Descartes Prize, the top EU science prize, which will close with a deadline on 15 March 2002. The Descartes Prize is open to teams of scientists who have achieved outstanding results in European collaborative research projects. Entries may be submitted from any field of scientific endeavour, including the socio-economic sciences; they are not limited to EU-funded projects. Research collaborations involving teams from outside the EU are also eligible.

Launched in 2000, the 2002 prize will be the third Descartes Prize. The second Descartes Prize was awarded on 27 November 2001 to two projects one on AIDS, lead by the K.U. Leuven (BE) and the other on chemical catalysis lead by Kings College (UK).

The Descartes Prize represents an important opportunity for European researchers to gain the public acclaim they deserve for their groundbreaking results. At the same time the Descartes Prize is one of a number of activities supported with a view to raising public awareness of science and its importance in daily life, as described in DG Research's new action plan on Science and Society. Following the deadline on 15 March 2002, prize entries will be subject to a two step evaluation concluded by a Grand Jury of eminent figures from academia end the public and private sectors.

The Descartes Prize is a part of the Research Directorate General's Improving the Human Research Potential Programme (1998 2002): http://www.cordis.lu/descartes

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MBEC News

The online version of *Medical & Biological Engineering & Computing*, the official journal of the International Federation for Medical & Biological Engineering, can be found by simply following the Fedaration Journal link from the IFMBE homepage, which can be found at www.ifmbe.org. In addition to a guide to authors, the site now features a browsable index of all papers published in *Medical & Biological Engineering & Computing* in 2000 and 2001. Visit the site now to discover the range of papers published in the course of the last year as well as details of recently published papers. Details about how to submit and subscribe to the journal can be found on the back page of this issue.

IEE Launches Healthcare Technologies Professional Network

The IEE professional networks are people-to-people networks that allow engineers to interact with each other in their specialist field. The professional networks can be virtual and/or physical, which differentiates them from other online communities.

The Healthcare Technologies network, which was one of the first to be launched, promises to be a valuable resource for biomedical engineers. Details can be found by visiting http://pn.iee.org/preview/pn_healthtech/

Named in honour of one of Europe's greatest figures of learning René Descartes: mathematician, natural scientist, and philosopher, this prize is awarded to research teams who have obtained exceptional results from European collaborative research. The prize is open to all fields of scientific endeavour. The Descartes Prize aims to raise awareness of the scientific achievements of European scientists, highlighting the benefits of working together and the importance of the results achieved.

Aims and Objectives

Scientific and technological excellence are essential pre-requisites for Europe to succeed in the competitive environment of international research and scientific development. The establishment of the Descartes Prize in 2000 as the major European science prize for outstanding collaborative research in any scientific field reflects this European stance.

The Descartes Prize aims to encourage the best researchers and teams to become involved in and be committed to European research, and to increase the visibility of outstanding research findings produced by European researchers. The prize recognises the collaborative nature of research that is at the heart of any major scientific breakthrough.

Organised via calls for proposals, European/international collaborative research teams submit details of their outstanding research results to the European Commission. Teams must involve at least two mutually independent legal entities established in two different Members States or in a Member State and an Associated State. Provided that these minimum criteria are fulfilled entries may involve teams from outside the European Union.

The prize is awarded via a two step evaluation process. Following evaluation by panels of independent experts, a first shortlist of project finalists is drawn up. The list of finalist projects is then submitted to a Grand Jury, made up of figures of renown, drawn from academia and industry. The Descartes Prize is then announced during a high media-profile award ceremony. Details are posted on this site to find out more click on the section entitled 'The Descartes Prize 2001'.

The Descartes Prize is one of the activities supported under the European Commission's Fifth Framework Improving Human Potential Programme, within the Research Directorate Science and Society.

Finalists in 2001

On 26 November the Grand Jury convened to decide the winners of the 2001 prize. They were announced the following day at a high-profile award ceremony and gala lunch hosted at the Bibliotèque Solvay in Brussels.

The research put forward to enter the 2001 Descartes Prize reflects significant advances on an international scale applying expertise to matters that are of concern to us all. Contained within each project are workable solutions to some of the world's major health, safety, environment and energy issues.

Reining back the scourge of AIDS, conserving our precious ecosystems, maximising train safety, combating the misery of emphysema, harnessing the power of the sun, channelling brain waves to enhance further the lives of disabled people and enabling the pharmaceutical and agrochemical industries to benefit from widespread cost savings.

The shortlist of seven finalist projects involved 32 research teams located in at least 17 different countries. 2001 EU Descartes Prize of 1 million ? was divided between 2 projects; one on AIDS and one on chemical catalysis. One of the finalists, Adaptive Brain Interfaces (ABI), was directly in the area of medical and biological engineering.

Adaptive Brain Interfaces (ABI)

In today's fast paced world, information and communication technologies are dramatically transforming our society. Access to new emerging technologies can be taken for granted. Unfortunately, not everyone can enjoy their benefits on equal terms. People

with severe physical disabilities are practically excluded. But, what if they could communicate their wishes or control electronic appliances merely by thinking? This is promise of the ABI project that aims at augmenting human capabilities by enabling people to interact with computers through conscious control of their thoughts after a short training period.

Over the last years evidence has accumulated to show the possibility to analyse brainwaves on-line to derive information about the subjects' mental state that could then be mapped into some external action such as selecting a letter from a virtual keyboard or driving a robotics device. Both invasive procedures (that implant electrodes in the brain) and sophisticated brain imaging technologies (that require huge and expensive equipment) yield detailed information on the brain activity. An alternative is to measure electroencephalogram (EEG) signals from scalp electrodes that do not require invasive techniques. EEG signals, however, are hard to analyse on-line as the phenomena of interest are hidden in the background brain activity. This is particularly the case with spontaneous mental activity, where subjects make self-paced decisions (what mental task to concentrate on, how to accomplish it, and when to switch to the next) without having to wait for, or respond to, external cues. The challenge is to recognise, using a portable system, what the subject's mental state from on-line spontaneous EEG signals.

The core of ABI is a particular neural network classifier that analyses continuous variations of EEG rhythms over several cortical areas of the brain. The ABI project seeks to develop individual brain interfaces. The same system is not suitable for everybody, as no two people are identical, either physically or psychologically. The approach is based on a mutual learning process where the user and the brain interface are coupled together and adapt to each other. The neural network learns user-specific EEG patterns that describe the mental tasks desired, while the subject learns to think in a manner that enables the personal interface to better understand them. As a consequence, subjects master their personal ABI rapidly: they only need a few hours of training. Analysis of learned EEG patterns confirms that for a subject to operate satisfactorily his/her personal ABI, the latter must fit the individual features of the former. The user can concentrate on a wide range of mental states, from motor-related (e.g., imagination of limb movements) to cognitive tasks (e.g., completing mental operations involving awareness and judgement). Each mental state is associated to a simple command such as "select right item". This enables people to communicate using their brain activity, as the interface only requires users to be conscious of their thoughts and to concentrate sufficiently on the mental expression of the commands required to carry out the desired task. So, by composing command sequences (thoughts), the user can write messages, interact with games turn on appliances, or even guide a wheelchair. The brain-operated virtual keyboard and computer game have been shown publicly on different workshops and IT exhibitions. In the case of the virtual keyboard, during the live demonstrations the subject writes words or sentences suggested by the public. In some cases, several visitors have tried ABI and achieved good performances in less than 1 hour of training. This confirms the adaptive capabilities of ABI. These experiences demonstrate the excellent performance of our technology in rather extreme conditions as found in an exhibition area - that includes electromagnetic fields, ambient noise and people moving and talking in the vicinity.

The above-mentioned demonstrators illustrate the wide range of systems ABI can be linked to. Although the immediate application of ABI is to help physically impaired people by increasing their independence and facilitating access to the Information Society, the benefits of such a kind of interface are extensive even for able-bodied people. Independently of the concrete applications of brain interfaces (e.g., safety, health, education, virtual reality, etc.), ultimately they will lead to the development of truly adaptive interactive systems that, on the one side, augment human capabilities by

giving the brain the possibility to develop new skills and, on the other side, make computer systems fit the pace and individual features of their owners rather than people conform to technology.

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For further information:

The Descartes Prize: http://www.cordis.lu/descartes
Adaptive Brain Interfaces (ABI): http://sta.jrc.it/abi

Following feedback from several readers, IFMBE News is now available in both colour and black and white. Both versions can be downloaded from the IFMBE News website at http://ifmbe-news.iee.org/

SCIDEV.NET A NEW WEB SITE ON SCIENCE, TECHNOLOGY AND THE DEVELOPING WORLD

I am pleased to inform you of the launch of SciDev.Net, a free-access global web site providing news, views and information on science, technology and development. The web site covers issues ranging from climate change and AIDS to human cloning and intellectual property.

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SciDev.Net is backed by the journals Nature and Science, both of which are providing free access to selected articles every week, as well as the Third World Academy of Sciences.

David Dickson, Director
SciDev.Net
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IOC Olympic Prize 2002

Professor Bengt Saltin M.D., Drs.h.c.

On 12 December, the president of the International Olympic Committee, Dr Jacques Rogge, announced that-Professor Bengt Saltin, M.D., was selected as winner of the 2002 IOC Olympic Prize on Sport Sciences, the highest honour in the field of movement, exercise and sport sciences (MES). Endowed by Pfizer, the $500,000 prize is officially presented to Professor Saltin at the 2002 Olympic Winter Games in Salt Lake City – along with an Olympic medal. The announcement noted Professor Saltin's outstanding contributions in exercise physiology, including his path-breaking research that proved the benefits of physical activity in health recovery. His research explores the valuable question of "to exercise or not" in prevention of and recovery from diseases.

Professor Saltin's work epitomizes what this award is all about – helping people live active lives," said Prince Alexandre de Merode, Chairman, IOC Medical Commission. "The IOC Olympic Prize is a catalyst for scientific discoveries that will benefit athletes and recreational enthusiasts of all ages and abilities. Together, the IOC and Pfizer are committed to improving research and sharing scientific knowledge in this field."

The impact of Professor Saltin's research can be felt throughout society – in the medical field and in the everyday lives of people, from the promotion of basic physical health to the enhancement of elite performance.

Through research studying the effects that inactivity has on the body, which was commissioned in part by NASA, Saltin confirmed that exercise, not bed rest, should be a part of recovery after experiencing illness/injury. This marked a major shift in how patients were treated following injury or illness.

"Years ago, it was thought that rest and relaxation were the best ways to recuperate from an injury or illness, but my research proved that, in fact, it's the opposite," said Saltin. "People should work with their doctor to create an active recuperation plan following any injury or illness, cardiovascular or athletic."

Professor Saltin's findings also contributed to the concept that regular exercise is important for health and well-being. In addition, his study of elite athletes while exercising and training has led to a better understanding of the importance of oxygen flow to the muscles (as well as availability of nutrients) in exercise and overall health. He has used these findings to study other areas such as anemia and the overall positive effects of exercise, focusing on the use of exercise to maintain and regain health.

"Pfizer is committed to furthering scientific research that underscores the importance of exercise and physical activity in cardiovascular and other disease treatment. This research is crucial to improving human movement, providing preventative care, and better managing disease states for people who seek to live a healthy lifestyle," said Randall Kaye, MD, Director of Olympic Affairs for Pfizer, Inc.

In addition to the $500,000 and an Olympic Medal, Saltin will receive a diploma of excellence for his contributions to science. The Olympic Winter Games in Salt Lake City will mark the fourth time this coveted prize has been awarded.

The IOC Medical Commission and Pfizer believe the IOC Olympic Prize heightens the recognition for research of movement and mobility, and thus attracts brilliant scientific minds to study and further human performance.

To ensure that the IOC Olympic Prize reflects scientific work of the highest degree, a Selection Committee composed of worldwide renowned scientists and thought leaders evaluated peer nominations of candidates from multiple fields of science. Rigorous criteria guide the selection of a scientist whose contributions to movement, exercise, and sport sciences have a significant impact on science and/or society.

Although the IOC Olympic Prize on Sports Sciences is the main focus of the Pfizer/IOC Medical Commission partnership, Pfizer also endows three other major IOC Medical Commission initiatives including: IOC Olympic World Congress on Sport Sciences, IOC Olympic Academy on Sports Sciences, and Pfizer/IOC Olympic Research on Sport Sciences. For further information about the IOC Olympic Programs visit www.olympic.org or www.pfizer.com.

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