



«ETTORE MAJORANA» FOUNDATION AND CENTRE FOR SCIENTIFIC CULTURE  
TO PAY A PERMANENT TRIBUTE TO GALILEO GALILEI, FOUNDER OF MODERN SCIENCE  
AND TO ENRICO FERMI, THE "ITALIAN NAVIGATOR", FATHER OF THE WEAK FORCES



# INTERNATIONAL SCHOOL OF BIOELECTROMAGNETISM «ALESSANDRO CHIABRERA»

## 5th Course: MEDICAL APPLICATIONS OF ELECTROMAGNETIC FIELDS

ERICE-SICILY: 22 – 29 NOVEMBER 2010

Sponsored by the: • Italian Ministry of Education, University and Research • Sicilian Regional Government  
• European Bioelectromagnetic Association (EBEA)  
• Centro Universitario per lo studio delle Interazioni tra Campi Elettromagnetici e Biosistemi (ICeMB) • Consortium Elettra 2000  
• Verum Foundation • IGEA Clinical Biophysics • World Health Organization (WHO)

### TOPICS AND LECTURERS

#### INTRODUCTION TO THE COURSE

##### General remarks

- F. BERSANI, University of Bologna, IT
- L.M. MIR, CNRS University Paris-Sud, FR
- R. CADOSSÌ, R&D IGEA, Carpi, IT

##### Clinical Biophysics

- R. CADOSSÌ, R&D IGEA, Carpi, IT

##### Device regulation in Europe and clinical trials level of evidence

- G. RUOCCO, Ministero della Salute, Rome, IT

#### INTERACTION OF ELECTRIC CURRENTS WITH CELLS

##### High fields

- T. VERNIER, University of Southern California, Marina del Rey, CA, US

##### Low fields

- C. McCAIG, University of Aberdeen, UK

#### SEMINAR

##### Overview of medical applications of electromagnetic fields

- P. RAVAZZANI, Consiglio Nazionale delle Ricerche, Milan, IT

#### INTERACTION OF ELECTROMAGNETIC FIELDS WITH CELLS AND TISSUES

##### Interaction of EM fields with cells and tissues

- G. D'INZEO, University of Rome, IT

##### Modelling of the interaction of EM fields with cells and tissues

- M. LIBERTI, University of Rome, IT

#### ELECTRIC CURRENTS IN TISSUE REPAIR

##### Electrical stimulation in tissue repair

- R. NUCCITELLI, BioElectroMed Corp, Burlingame, CA, US

##### Electrical stimulation in tissue regeneration

- A.M. RAJNICEK, University of Aberdeen, UK

#### EFFECTS OF THE EMF EXPOSURE ON LIGAND-RECEPTOR INTERACTIONS

##### Modelling the effects of EMF exposure on ligand-receptor interactions

- F. APOLLONIO, University of Rome, IT

##### Biological effects of exposure to PEMF on ligand-receptor interaction

- K. VARANI, University of Ferrara, IT

#### ELECTROMAGNETIC STIMULATION OF CENTRAL NERVOUS SYSTEM

##### A review of technology and clinical uses of Repetitive Transcranial Magnetic Stimulation

- V. DI LAZZARO, University of Rome, IT

##### Low amplitude electromagnetic stimulation of central nervous system

- F. PRATO, University of Western Ontario, CA

#### ELECTRIC AND ELECTROMAGNETIC STIMULATION OF AND CARTILAGE REPAIR- PART 1

##### *In vitro* electromagnetic stimulation: mesenchymal stem cells, bone cells, chondrocytes

- M. DE MATTEI, University of Ferrara, IT

##### Review of physical approaches to bone repair including ultrasound

- J. KLEIN-NULEND, ACTA-Vrije Universiteit, Amsterdam, NL

##### Electromagnetic stimulation of cartilage

- M. FINI, Istituto Ortopedico Rizzoli, Bologna, IT

#### ELECTRIC AND ELECTROMAGNETIC STIMULATION OF BONE AND CARTILAGE REPAIR - PART 2

##### Electrical stimulation of bone repair, clinical experiences

- R. AARON, Brown Medical School, Providence, RI, US

##### Tissue engineering and biophysical stimulation

- L. FASSINA, F. M. Benazzo, University of Pavia, IT

#### ELECTROPORATION-BASED TRANSFER OF DRUGS AND NUCLEIC ACIDS - PART 1

##### Bases of cell electroporation *in vitro* and *in vivo*

- D. MIKLAVCIC, University of Ljubljana, SL

##### Mechanisms of drug transfer across intact and electroporated cell membranes

- L.M. MIR, CNRS University Paris-Sud, FR

##### Pre-clinical trials on electroporation-based transfer of drugs

##### (electrochemotherapy)

- G. SERSA, Institute of Oncology Ljubljana, SL

#### ELECTROPORATION-BASED TRANSFER OF DRUGS AND NUCLEIC ACIDS - PART 2

##### Clinical data on electrochemotherapy

- J. GEHL, Copenhagen University Hospital Herlev, DK

##### Electroporation-based transfer of nucleic acids: mechanisms and roles of electric pulses

- L.M. MIR, CNRS University Paris-Sud, FR

##### DNA electrotransfer: preclinical and clinical results

- P. HØJMAN, Copenhagen University Hospital Herlev, DK

#### EVENING SEMINAR

##### From a concept to a treatment: the story of electrochemotherapy

- L.M. MIR, CNRS University Paris-Sud, FR

#### PHYSICALLY-BASED TISSUE ABLATION TECHNOLOGIES

##### Ablation by high frequency EMF for cancer treatment, cardiac ablation

- J. LIN, University of Illinois, Chicago, IL, US

##### Irreversible electroporation for tissue ablation

- A. IVORRA, Universitat Pompeu Fabra, Barcelona, ES

##### Nanosecond pulsed electric fields for cancer treatment

- R. NUCCITELLI, BioElectroMed Corp, Burlingame, CA, US

#### PURPOSE OF THE COURSE

The fifth Course is addressed to young researchers and to biologists, engineers and physicians who conduct research on bioelectromagnetics or work in a medical environment. The aim of the Course is to present the most advanced knowledge on the mechanism of action of electromagnetic fields, to identify cellular targets and to discuss the rational basis for the use of electromagnetic fields in clinical practice. The Course is focused on their non-thermal effects. During the Course the results of pre-clinical studies, *in vitro* and *in vivo*, will be presented and their relevance as support to clinical applications discussed. Extensive review will be dedicated to the use in clinical practice of: a) pulsed electromagnetic fields in orthopaedic practice, to enhance bone tissue healing and cartilage repair; b) short and intense electric pulses for cell electroporation (electroporation) and gene and drug uptake (electrotransfer); c) high and low intensity electromagnetic fields on central nervous system. Finally, early experience with irreversible electroporation and nanosecond pulsed electric fields will be reviewed. The aim of the Course is to provide participants with exhaustive information to show the enormous potentiality of the area for both technological improvements and research resulting in the best care for patients.

#### APPLICATIONS

Interested candidates should send an email to the Directors of the Course at the following email address: [school@ebeam.org](mailto:school@ebeam.org)

specifying:

- A short Curriculum Vitae;
- Scientific interest of the candidate;
- For young researchers: letter of recommendation of a senior scientist by e-mail (attached Word or PDF file).

#### PLEASE NOTE

Participants must arrive on November 22, not later than 6 pm.

#### POETIC TOUCH

According to legend, Erice, son of Venus and Neptune, founded a small town on top of a mountain (750 metres above sea level) more than three thousand years ago. The founder of modern history — i.e. the recording of events in a methodic and chronological sequence as they really happened without reference to mythical causes — the great Thucydides (~500 B.C.), writing about events connected with the conquest of Troy (1183 B.C.) said: «After the fall of Troy some Trojans on their escape from the Achaei arrived in Sicily by boat and as they settled near the border with the Sicilians all together they were named Elymi: their towns were Segesta and Erice.» This inspired Virgil to describe the arrival of the Trojan royal family in Erice and the burial of Anchises, by his son Aeneas, on the coast below Erice. Homer (~1000 B.C.), Theocritus (~300 B.C.), Polybius (~200 B.C.), Virgil (~50 B.C.), Horace (~20 B.C.), and others have celebrated this magnificent spot in Sicily in their poems. During seven centuries (XIII-XIX) the town of Erice was under the leadership of a local oligarchy, whose wisdom assured a long period of cultural development and economic prosperity which in turn gave rise to the many churches, monasteries and private palaces which you see today.

In Erice you can admire the Castle of Venus, the Cyclopean Walls (~800 B.C.) and the Gothic Cathedral (~1300 A.D.). Erice is at present a mixture of ancient and medieval architecture. Other masterpieces of ancient civilization are to be found in the neighbourhood: at Motya (Phoenician), Segesta (Elymian), and Selinunte (Greek). On the Aegadian Islands — theatre of the decisive naval battle of the first Punic War (264-241 B.C.) — suggestive neolithic and paleolithic vestiges are still visible: the grottoes of Favignana, the carvings and murals of Levanzo.

Splendid beaches are to be found at San Vito Lo Capo, Scopello, and Cornino, and a wild and rocky coast around Monte Cofano: all at less than one hour's drive from Erice.

More information about the «Ettore Majorana» Foundation and Centre for Scientific Culture can be found on the WWW at the following address:  
<http://www.ccsem.infn.it>