



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



President: Antonino Zichichi

Director: Fiorella Ruggiu

International School of Bioelectromagnetism “Alessandro Chiabrera”

Directors of the School:

Ferdinando Bersani (University of Bologna, Italy) and Maria Rosaria Scarfi (CNR-IREA, Naples, Italy)

The Centre for Scientific Culture in Erice (Sicily, Italy) is named after the great Italian scientist Ettore Majorana. Antonino Zichichi, the president of the Centre, has said: “At Erice, those who come in order to follow a certain School are called ‘students’, but actually they are young people who have successfully completed their University studies and who come to Erice in order to learn what the new problems are. However, what is distinctive for Erice is the spirit animating all participants: students no less than teachers. The prime objective is to learn. The student listens to the lectures and after that comes the most amusing part: the discussion session.”

Topics in Bioelectromagnetics have come to Erice many times in the past, especially in the 1980s, with international courses and workshops on non-ionising radiation, and today many participants of those courses contribute greatly to the development of this research field.

Following the request of the European Bioelectromagnetics Association (EBEA) and the Inter-University Centre for the study of the Interaction between Electromagnetic Fields and Biosystems (ICEmB), in 2003 the Ettore Majorana Centre has established a Permanent School of Bioelectromagnetics, named after Alessandro Chiabrera, who is considered as a master by the young scientists of the two organizations.

9th COURSE: “Possible Biomedical Applications of Electromagnetic Fields to cancer: from Biology and *in silico* to clinical perspectives”

Erice (Sicily, Italy): March 24 to March 30, 2019

Sponsored by the: European Bioelectromagnetic Association (EBEA); COST Action A17115: European Network for Advancing Electromagnetic Hyperthermic Medical Technologies (MyWAVE); International Society for Electroporation-Based Technologies and Treatments (ISEBTT); Centro Interuniversitario per lo studio delle Interazioni tra Campi Elettromagnetici e Biosistemi (ICEmB); IGEA Clinical Biophysics; World Health Organization (WHO)

Co-organized with:



the European BioElectromagnetics Association



COST Action A17115: European Network for Advancing Electromagnetic
Hyperthermic Medical Technologies (MyWAVE)

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The relation of EMF with cancer is two-sided: on one hand the International Agency for Research on Cancer has classified them as “possible carcinogens,” though we lack a strong experimental support for that, and, on the other hand, they can be used as a diagnostic and therapeutic tool for certain types of cancers. As often occurs, the situation is far more complex and multidimensional, since the effects of EMFs on biological systems depend on the physical parameters of the field and the type and physiological conditions of the biological system.

Presently, there are well established techniques, like hyperthermia, electrochemotherapy, thermal ablation, etc., that have already entered into clinical use, whereas much remains to be understood regarding the therapeutic use of EMFs themselves for treating cancer. At this time, there are only a small number of studies in cells, animals and humans that could be relevant for cancer therapy, mainly for EMFs in the range of low intensity ELF, intermediate frequencies and RF fields, suggesting possible use as an additional tool for the modulation of cell proliferation and differentiation, or antitumor effects. These studies are still in their infancy and significant work must be done in the future towards this direction. A primary target of the Course will be to shed light on this hot and controversial issue, starting from what is best established in terms of biology and clinical applications, to the analysis of the different theoretical perspectives and future research needs.

After a physical and technical introduction concerning EMF exposure conditions, the biological evidence presently available from *in vitro*, *in vivo* and epidemiological data will be considered, in particular, in the light of the most recent advancements in the understanding of the biological foundations of cancer etiology and the mechanisms underlying both regarding pro- and anti-cancer activity. Also, a survey of the more recent diagnostic and therapeutic applications of EMFs to cancer will be presented and discussed, including mathematical modeling and treatment planning (dose concept, clinical procedures, safety, etc.) for cancer therapy.

In conclusion, the course is intended to present an updated critical and comprehensive analysis of the present state of knowledge in this area and, most importantly, to provide young researchers with the opportunity to discuss the central questions that future researchers must address, in order to improve upon our present understanding and inspire new lines of research.

Award for the best poster presentation

One day will be partially devoted to poster presentations by participants. A Scientific Committee will award the author of the best poster. All posters will be introduced by a 5-minute oral presentation.

Participation fee: € 1300 including food and lodging.

Application: Interested candidates should send an e-mail to the Directors of the Course at the following e-mail address: school@ebeam.org

with the following information:

- A short Curriculum Vitae
- Scientific interest of the candidate
- Students: a letter of recommendation of a Senior Scientist

In case of acceptance the candidate will be informed by e-mail.

The deadline for sending the requests of participation to the School is February 15, 2019.

COST MyWAVE is offering a number of grants to interested trainees. Candidates interested to be supported, can send the requested information by email to lourdes.farrugia@um.edu.mt or Emily.porter@nuigalway.ie and to the School and Course Directors (school@ebeam.org). For more information, visit the School website at: www.eisbhem.eu

PROGRAMME

March 24 – Sunday

Arrival and accommodation

March 25 – Monday

10.00 - 10.30 - Introduction to the Course by the Directors

PHYSICAL PRINCIPLES OF EMF

10.30 – 11.30 - EMF spectrum and general properties– *Ferdinando Bersani (Italy)*

11.30 – 12.30 - ELF generation and dosimetry - *Stefania Romeo (Italy)*

12.30 – 14.30 - Lunch

14.30 – 15.30 - RF generation and dosimetry - *Rita Massa (Italy)*

15.30 – 17.00 - Thermal and non-thermal effects of ELF and RF – *Stefania Romeo (Italy)*

Coffee break - 17.00 -17.30

BIOLOGICAL EFFECTS OF EMF IN RELATION TO CANCER

17.30 – 18.30 - Introduction to biology of cancer - *Maja Cemazar (Slovenia)*

Biological effects in vitro

18.30 – 19.30 - Static and ELF fields – *Mats Olof Mattsson (Sweden)*

March 26 – Tuesday

Biological effects in vitro (cont.)

8.30 - 9.30 - High frequency EMF – *Maria Rosaria Scarfi (Italy)*

Biological effects in vivo

9.30 -10.30 - Static and ELF fields – *Isabelle Lagroye (France)*

Coffee break 10.30 -11.00

11.00 -12.00 - High frequency EMF – *Isabelle Lagroye (France)*

12.00 -13.00 - What is learnt from epidemiology- *Anke Huss (the Netherlands)*

Lunch 13.00 – 15.00

Seminar

15.00 – 16.00 - Dielectric properties of healthy and cancerous tissues – *Charles V. Sammut (Malta)*

Methodological problems in Bioelectromagnetics

16.00 – 17.00 - General criteria for a good experimental practice in Bioelectromagnetics – biology– *Maria Rosaria Scarfi (Italy)*

Coffee break 17.00 - 17.30

17.30 – 18.30 - General criteria for a good experimental practice in Bioelectromagnetics –electromagnetic - *Rita Massa (Italy)*

March 27 – Wednesday

EMFs IN DIAGNOSIS

8.30 - 10.30 - Microwave imaging and its application in cancer diagnosis - *Emily Porter (Ireland)*

Coffee break 10.30 -11.00

11.00 – 12.00 - Imaging with Terahertz and MMW – *Mostafa Shalaby (Switzerland)*

Seminar

12.00 – 13.00 - COST Action "MyWave" *Emily Porter (Ireland)*

Lunch 13.00 – 15.00

THERAPEUTIC APPLICATIONS: RESULTS AND PERSPECTIVES

Thermal effects: therapeutic perspectives

15.00 – 16.00 - Hyperthermia - *Gerard van Rhoon (Rotterdam, The Netherlands)*

16.00 – 17.00 - Thermal ablation – *Luigi Solbiati (Milan, Italy)*

17.00 – 18.30 - Coffee break and Poster session

March 28 – Thursday

THERAPEUTIC APPLICATIONS: RESULTS AND PERSPECTIVES (Cont.)

Electroporation and electrochemotherapy

8.30 – 9.30 - Preclinical and clinical aspects of electrochemotherapy – *Gregor Sersa (Slovenia)*

9.30 – 10.30 - Immunological principles of combined treatment with electrochemotherapy - *Emanuela Signori (Italy)*

Coffee break 10.30 – 11.00

11.00 – 12.00 - New clinical developments in electrochemotherapy – *July Gehl (Denmark)*

12.00 – 14.00 - Lunch

IN SILICO MODELING

Modeling and treatment planning for therapies of cancer

14.00 – 15.00 - Hyperthermia – *Theodoros Samaras (Greece)*

15.00 – 16.00 - Ablative techniques - *Theodoros Samaras (Greece)*

16.00 – 17.00 - Modelling and treatment planning for Electrochemotherapy - *Bor Kos (Slovenia)*

Coffee break 17.00 – 17.30

Seminar

17.30 – 18.30 – Non-thermal EMF therapies of cancer – high frequencies – *Antonio Sarolic (Croatia)*

Social dinner

March 29 – Friday

Touristic tour

March 30 - Saturday

RECENT PERSPECTIVES OF PMF IN RELATION TO CANCER THERAPY

8.30 – 9.30 - PEMF and cancer cells: in vitro effects – *Ruggero Cadossi (Italy)*

9.30 – 10.30 - The long road to validate PEMF use in cancer patients – *Ruggero Cadossi (Italy)*

Coffee break 10.30 – 11.00

11.00 – 12.00 - Devices on the market: a critical overview (seminar)- *Ferdinando Bersani (Italy)*

Round table on Future perspectives in diagnosis and therapy

Conclusions-END (Saturday, about 13.30)