



«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 ON COMPLEXITY

## 6th Course: COMPLEX OPTICS IN MESOSCOPIC MATERIALS C.O.M.Ma.07 – Satellite Statphys23

ERICE–SICILY: 3 – 8 JULY 2007

Sponsored by the: • Italian Ministry of Education, University and Scientific Research • Sicilian Regional Government  
• IUPAP • ISC-CNR, Rome, Italy • LENS, Florence, Italy

### TOPICS AND LECTURERS

*Complexity, information loss and model building from neuro- to cognitive dynamics*

• F.T. ARECCHI, Università di Firenze, I

*Use and abuse of the effective index of refraction in colloidal systems*

R. BARRERA, Universidad Nacional Autonoma de Mexico, MX

*Atomic current across an optical lattice*

• A. BUCHLEITNER, Max-Planck-Institute, Dresden, D

*Photonic quasicrystals: Experimental results*

• P.M. CHAIKIN, Princeton University, NJ, USA

*New aspects of microscopic nonlocal theory: Resonant process in a structured matrix and a new derivation of macroscopic Maxwell equations*

• K. CHO, Toyota Physical and Chemical Research Institute, Nagakute, Aichi, J

*Excitability mediated by localized structures in nonlinear optical cavities*

• P. COLET, Mediterranean Institute for Advanced Studies, Palma de Mallorca, SP

*Composite bosons: Novel approach to their many-body physics*

M. COMBESCOT, Institut des NanoSciences, Paris, F

*Energy landscape and complexity in nonlinear optical processes*

• C. CONTI, Università "La Sapienza", Roma, I

*From photonic crystals to photonic metamaterials: A general mean field theory*

• P. HALEVI, Instituto de Astrofísica, Óptica y Electrónica, Puebla, MX

*Experiments with disordered Bose Einstein condensates*

• M. INGUSCIO, Università di Firenze, I

*Resonant photonic crystals*

• E. IVCHENKO, Ioffe Institute, St. Petersburg, RU

*Cold atoms in an electromagnetic mean field: Phase transitions, spontaneous ordering and instabilities*

• J. JAVALOYES, Mediterranean Institute for Advanced Studies, Palma de Mallorca, SP

*Disorder vs localization in amorphous photonics*

• S. JOHN, University of Toronto, CDN

*Scattering and localization of light in dense media: Experimental investigations in cold atoms*

• R. KAISER, INLN – CNRS, Nice, F

*Polariton lasing and superfluidity*

• A. KAVOKIN, University of Southampton, UK

*Anderson localization in systems with correlated potentials: Applications to DNA molecules*

• A.A. KROKIN, University of North Texas, Denton, TX, USA

*Low dimensional models for wave propagation in thin structures*

• P. KUCHMENT, Texas A&M University, College Station, TX, USA

*Statistical regimes of random laser fluctuations*

• S. LEPRI, CNR, Roma, I

*Localization in BEC and nonlinear optical devices with intra-cavity photonic crystals*

• G. OPPO, Strathclyde University, Glasgow, UK

*Lateral effects in disordered polaritonic crystals: Green function method*

• L. PILOZZI, CNR, Roma, I

*Complex patterns in a new optical oscillator driven by a giant photorefractive effect*

• S. RESIDORI, INLN – CNRS, Nice, F

*Fluctuations and correlations in wave transport through disordered media*

• J.J. SAENZ, Universidad Autonoma de Madrid, SP

*Transport and fluctuations in strongly scattering colloidal assemblies*

• F. SCHEFFOLD, University of Fribourg, CH

*Physics and applications of cavity solitons*

• J.R. TREDICCE, INLN – CNRS, Nice, F

### PURPOSE OF THE COURSE

It is well known that self-organized spatio-temporal structures (patterns) may arise from the competition between local non-linear dynamics and diffusive/diffractive processes. The onset of localized structures is both a beautiful example for understanding how the two mechanisms operate together and a challenge towards the development of new nonlinear techniques for a nonlinear information manipulation. The underlying physics becomes even more interesting at smaller spatial scales when dielectric functions show spatial variations roughly of the order of light wavelength, giving rise to mesoscopic optical superstructures.

It was recently pointed out that photonic crystals, with strong dielectric contrast, can be considered a prototype of systems where electromagnetic wave propagation undergoes a transition from regular (low energy dispersion curves) to chaotic behaviour (Lorentz gas) by reaching the classical limit (high energy dispersion curves). In systems with partial disorder, on the other hand, the interplay between diffusion and the reduced density of states of a periodic system can lead to fascinating transport phenomena, like anomalous diffusion and Anderson localization. These examples show that optics in mesoscopic systems is a very promising field of research regarding the science of complexity.

The aim of the Course is to bring together a number of established scientists, coming from different scientific area (engineering, physics, chemistry, mathematics...), in order to discuss theoretical and experimental aspects of statistical and complex optics in material science. Participants are deeply encouraged to present their activity in the Poster Section.

### APPLICATIONS

Persons wishing to attend the Course should write to the Co-Director of the Course:

- Dr. Andrea D'ANDREA  
Istituto dei Sistemi Complessi, CNR, Roma  
Tel +39.06.90672899 – Fax +39.06.90672227  
e-mail: [comma07@isc.cnr.it](mailto:comma07@isc.cnr.it) – Web: [www.isc.cnr.it/comma07](http://www.isc.cnr.it/comma07)

specifying:

- full name(s), address, age, nationality;
- academic qualifications, present position and affiliation and/or a short CV;
- title and abstract of the contribution.

### 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 Sicanians 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 Anchise, by his son Enea, 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.csem.infn.it>

- PLEASE NOTE

Participants must arrive on July 3, not later than 7 pm.

