



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



INTERNATIONAL SCHOOL OF ATOMIC AND MOLECULAR SPECTROSCOPY

35th Course: QUANTUM NANO-PHOTONICS

A NATO Advanced Study Institute

ERICE-SICILY: 20 JULY – 4 AUGUST 2017

Sponsored by the: • Italian Ministry of University and Scientific-Technological Research • Sicilian Regional Government • Boston College

TOPICS AND LECTURERS

Quantum Plasmonics

• J. AIZPURUA, CSIC/DIPC, San Sebastian, ES

Opto-Mechanics, Fabrication of Nano and Micro-Optic Systems

• S. ARNOLD, Polytechnic Institute of NYU, Brooklyn, NY, US

Spectroscopic Probe of Rare-Earth Distribution in Transparent Nanostructured Glass-Ceramics

• R. BALDA, University of the Basque Country, Bilbao, ES

Nitrogen-Vacancy Centers in Nano-Diamonds as Single-Photon Sources

• O. BENSON, Humboldt Universität Berlin, DE

Quantum Bits Based on Trapped Ions

• R. BLATT, University of Innsbruck, AT

Achievements, Progress and Issues in Laser Ions Doped-Optical Transparent Ceramics

• G. BOULON, Université Claude Bernard, Lyon, FR

Terahertz Nanoscale Science and Technology

• J. BOWEN, The University of Reading, Reading, UK

Semiconductor Nanophotonics

• J. CALDWELL, US Naval Research Lab, Washington, DC, US

Radiationless Processes in Nanocrystals

• J. COLLINS, Wheaton College, Norton, MA, US

Attosecond Science in Solids and Gases

• P. CORKUM, University of Ottawa, Ottawa, CA

A New Nanoscale Bright Light

• B. DI BARTOLO, Boston College, Chestnut Hill, MA, US

Rare Earth-doped Wide Bandgap Tin Oxide Nanocrystals: Pumping Mechanisms and Spectro-temporal Dynamics

• J. FERNANDEZ, University of the Basque Country, Bilbao, ES

Nanophotonics with and without Photons

• S. GAPONENKO, National Academy of Sciences, Minsk, BE

Research on New Rare Earth-doped Cubic Optical Ceramics in Tungstate and Molybdate Matrices

• M. GUZIK, University of Wroclaw, Wroclaw, PL

Integrated Zero Index Nanomaterials

• E. MAZUR, Harvard University, Cambridge, MA, US

Quantum Sensing and Engineering

• L. NOVOTNY, ETH, Zurich, CH

Waveguide Based Superconducting-Nanowire Single-Photon Detectors

• W. PERNICE, University Münster, DE

Casimir Forces: Fundamental Theory, Computation, and Nanodevice Applications

• F. PINTO, Izmir University of Economics, Izmir, TR

Quantum Noise in Lasers

• M. POLLNAU, Royal institute of Technology, Kista, SE

Simulations in Nanophotonics

• L. RAMUNNO, University of Ottawa, Ottawa, CA

Fundamentals and Applications of Nanoplasmonics

• M.I. STOCKMAN, Georgia State University, Atlanta, GA, US

When does Light get Quantum?

• M. WEGENER, Karlsruhe Institute of Technology (KIT), Karlsruhe, DE

Quantum Aspects of Biophotonics

• J.-P. WOLF, Université de Genève, Genève, CH

Colloidal Nanocrystals for Optoelectronics

• V. WOOD, ETH Zurich, CH

PURPOSE OF THE COURSE

Almost all fundamental experiments in quantum optics have relied on macroscopic light sources, detectors, beam splitters, and mirrors on optical tables, where photons are propagating through air or vacuum. In analogy to developments in integrated electronic circuits, miniaturization and scalability will require an integrated approach to someday achieve quantum-optical chips. Recently, early steps in this direction have been taken, e.g., by miniaturizing quantum-optical settings using integrated passive dielectric waveguides on chips. Yet more recently, nano-plasmonics, nanostructured optical metamaterial components and their coupling to light emitters are intensely being investigated in the context of quantum optics.

The general aim of this Course will be to bring together more closely researchers working in the two fields of quantum optics and nano-optics. In this fashion, the Course will foster the goal of integrated quantum-optics on a micro- or nanostructured chip. The Course will, for example, cover single-photon emitters and emitters of entangled photon pairs based on epitaxially grown semiconductor quantum dots, nitrogen vacancy centers in diamond as single-photon emitters, coupled quantum bits based on trapped ions, integrated waveguide superconducting nanowire single-photon detectors, quantum nanoplasmonics, and quantum metamaterials. The lectures shall span the field from pedagogical introductions of the fundamental principles to the current state-of-the-art given by pioneers and leaders in the field.

The Course will introduce the students to the field and provide a comprehensive overview on experiments and theory, basic physics and applications as well as on nanofabrication and optical characterization. It will bring together physicists, chemists, and engineers; it will be in the best tradition of our past Courses, because it will start from the consideration of fundamental principles, and will reach the frontiers of research in a systematic and didactic fashion.

The participants will have the opportunity to interact with each other in a stimulating atmosphere and to present their research work in the form of short seminars or posters.

APPLICATIONS

Interested participants should send a letter to the Director of the School:

- Professor Baldassare DI BARTOLO
Department of Physics, Boston College – Chestnut Hill, MA 02467, US
e-mail: dibartob@bc.edu

Application can be done by e-mail or by regular mail. The applicants should provide the following information: i) Date and place of birth, together with their present nationality; ii) degree and other academic qualifications; iii) present position, place of work, and current research activities; iv) a letter of recommendation from their research group leader or from a seniorscientist active in the field; v) a list of graduate courses attended (if the applicant is a graduate student).

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>

- PLEASE NOTE
Participants must arrive on July 20, not later than 7 pm.

The deadline for applications is June 15, 2017.