



«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 QUANTUM ELECTRONICS

## 62nd Course:

# THE FRONTIERS OF ATTOSECOND AND ULTRAFAST X-RAY SCIENCE

ERICE-SICILY: 10 - 16 MARCH 2019

Sponsored by the: • Italian Ministry of Education, University and Scientific Research • Sicilian Regional Government

### PROGRAMME AND LECTURERS

#### ATOMIC PHYSICS

*Atomic physics with attosecond pulses (theory and experiments)*

- A. L'HUILLIER, Lund University, SE

*Strong-field atomic physics*

- L. DiMAURO, The Ohio State University, Columbus, OH, US

*Strong-field physics*

- O. ŠMIRNOVA, Max Born Institut, Berlin, DE

#### MOLECULAR PHYSICS

*Fundamentals of high-order harmonic generation and attosecond metrology. Molecular physics with attosecond pulses (experiments)*

- M. NISOLI, Politecnico di Milano, IT

*Molecular physics with attosecond pulses (theory)*

- F. MARTÍN, Universidad Autónoma de Madrid, ES

#### SOLID STATE PHYSICS

*Transient absorption/reflectivity attosecond spectroscopy*

- R. BAKER, Ohio State University, Columbus, OH, US

*High-order harmonic generation in solids / NL x-ray physics*

- D. REIS, Stanford University, CA, US

#### EXPERIMENTAL TECHNIQUES

*High-order harmonic spectroscopy; In-situ attosecond techniques*

- Y. MAIRESSE, CELIA, Bordeaux, FR

*Nonlinear optics in the XUV*

- D. CHARALAMBIDIS, FORTH, Heraklion, GR

#### TECHNOLOGY

*XUV optics for attosecond technology*

- L. POLETTI, IFN-CNR, Padova, IT

*Free Electron Lasers and attosecond pulses*

- P. BUCKSBAUM, Stanford University, CA, US

*Attosecond metrology: RABBITT, Rainbow RABBITT, attosecond streaking, molecular tomography*

- P. SALIERES, CEA, Saclay, FR

#### PURPOSE OF THE COURSE

The new millennium witnessed two revolutionary breakthroughs in ultrafast x-ray science. In 2001, two independent groups reported the formation of attosecond pulses of XUV radiation. Since that time the field of attosecond science has grown exponentially and new attosecond laboratories have emerged throughout the world. Similarly in 2009 the world's first x-ray free-electron laser, XFEL, known as LCLS, became operational at SLAC in the USA. The LCLS has produced unprecedented coherent x-ray pulses with femtosecond brevity and gigawatt peak power. These x-ray devices impact is far reaching encompassing applications in fundamental physics to the biological sciences. Since the operation of the LCLS a number of XFELs have or will become operational in the near future. The tremendous growth in these two related areas will require the training of young scientists who will push the technology and applications. The primary objective of this new school is to educate the next generation of scientists who will impact the future of attosecond and ultrafast x-ray science. We anticipate that the school will meet on a regular basis every two years and become a foundation for the ultrafast community. Consequently, the main topics of the course are the following: (i) attosecond science and technology, devoted to the generation and application of attosecond pulses to the investigation of electronic dynamics in atoms, molecules, nanostructures and condensed phases; (ii) fundamentals, methods and applications of free electron lasers, synchrotron radiation, ion collisions in atomic and molecular science.

#### APPLICATIONS

Persons wishing to attend the Course should apply in writing to the Director of the Course:

Professor M. NISOLI  
Politecnico di Milano, IT  
email: [mauro.nisoli@polimi.it](mailto:mauro.nisoli@polimi.it)

Please include the following information in your application: i) Full name(s), age, gender, citizenship; ii) Postal address, phone, fax, electronic mail; iii) Your present academic position and scientific interests; iv) The title or abstract of a scientific contribution to the poster session(s) which might be included in the programme.

#### 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 methodical 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

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 in Erice no later than 7 p.m. on 10th March 2019.