«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 CRYSTALLOGRAPHY

56th Course: HIGH PRESSURE CRYSTALLOGRAPHY

ERICE-SICILY: 3 – 11 JUNE 2022

Sponsored by the: • European Crystallographic Association • International Union of Crystallography • • Italian Ministry of Education, University and Scientific Research • Sicilian Regional Government

PROGRAMME AND LECTURERS

Introduction to HP Crystallography
Pharmaceuticals
• E. BOLDYREVA, Novosibirsk State University, RU

Dynamic compression
• G. COLLINS, University of Rochester, US

Theoretical topics in high-pressure
• J. CONTRERAS-GARCIA, CNRS, FR

High pressure microbiology
• I. DANIEL, Université Claude Bernard Lyon 1, FR

Topological Superconductivity
• S. DEEMYAD, University of Utah, US

Pressure and Equations of State
• A. DEWAELE, French Alternative Energies & Atomic Energy Commission (CEA), FR

Phase Transition and Stability, Chemical Stability
Crystallization
• K. DZIUBEK, European Laboratory for Non Linear Spectroscopy (LENS), IT

High magnetic fields
• A. GROCKOWIAK, Brazilian Synchrotron Light Laboratory (LNLS), BR

Instrument innovations, neutron sources
• B. HABERL, Oak Ridge National Laboratory (ORNL), US

Mössbauer Spectroscopy
X-ray Magnetic Circular Dichroism
• D. HASKEL, Advanced Photon Source, US

Planetary science and minerals
• Y. LEE, Yonsei University, KR

Instrument innovations, photon sources
• N. MARQUES DE SOUZA NETO, Brazilian Synchrotron Light Laboratory, BR

Communicating High Pressure Crystallography Topic: Instrument innovations, FELs
• H. MAYNARD-CASELY, Australian Nuclear Science & Technology Organization, AU

Instrument innovations, neutron sources
• E. McBRIDE, Stanford Linear Accelerator (SLAC), US

Principles of HP single crystal diffraction
• M. MEYER, Rigaku Oxford Diffraction, PL

Metal Organic Frameworks
• S. MOGGACH, University of Western Australia, AU

XAS
• M. NEWVILLE, University of Chicago & Argonne National Lab, US

Shearing, plastic deformations, strain induced phase transitions, non-equilibrium processes
• T. OHUCHI, Geodynamics Research Centre, Ehime University, JP

Synchrotron Techniques & laser heating
• V. PRAKAPENKA, University of Chicago & Argonne National Lab, US

Principles of HP powder diffraction
• C. PRESCHER, University of Freiburg, DE

Neutron Techniques
• A. SANO-FURUKAWA, J-PARC Centre, Japan Atomic Energy Agency, JP

Materials discovery and synthesis, chemistry
• T. STROBEL, Carnegie Institution for Science, US

Diffuse scattering in high pressure research
• M. TUCKER, Oak Ridge National Laboratory (ORNL), US

Inelastic Scattering
• M. WILKE, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum, DE

HP multigrain Crystallography
• L. ZHANG, Centre for HP Science & Technology Advanced Research, CN

Hydrides
Crystal Structure Prediction
• E. ZUREK, University of Buffalo, NY, US

PURPOSE OF THE COURSE

Subjecting matter to extreme conditions reveals a multitude of fascinating phenomena, and is applicable to a wide range of disciplines. From the extremophiles that exist in the deepest depths of our oceans to the exotic new materials that are made when atoms are pushed ever closer together, understanding the structure of materials at extreme conditions affects Biology, Chemistry, Physics, Geoscience and Material Science. In order to achieve its goals, high pressure research has been always at the vanguard of technical progress. It is a discipline in which equipment plays a particularly important role. State-of-the-art diamond anvil cells can now achieve megabar ranges of pressure, millions of times atmospheric pressure, with this beaten by an order of magnitude in dynamic compression experiments. In this manner, scientists are able to mimic the conditions in the interiors of giant planets. Nature is even more ambitious, as in the stars petapascal pressures (the order of tens to hundreds billion atmospheres) are reached. In the laboratory, we can even create conditions of pressure, temperature and magnetic fields that are not found naturally, allowing us to complement nature to explore more exotic phases of matter. Therefore, the course will cover broad ground in the application of extreme conditions crystallography. The topics will span from fundamentals of high-pressure single crystal and powder diffraction, to presenting the many flavors of static and dynamic compression, to reviews of sources for extreme conditions work (synchrotrons, neutrons and free electron lasers). Complementary experimental (Mössbauer spectroscopy, X-ray magnetic circular dichroism, X-ray absorption spectroscopy, inelastic scattering) and computational methods will also be discussed. Diffraction analysis on the structure of liquids, glasses and nanocrystalline materials as well as multigrain crystallography will also be introduced. The lectures will be harmonized with the related sessions of interactive tutorials, providing hands-on experience to the attendees. These workshops will be focused on basic laboratory skills and the elements of data processing software related to the high pressure characterization of materials.

APPLICATIONS

Interested candidates should register by 13rd December 2021 using the form available at the URL **http://erice2022.azuleon.org** or by writing to the Executive Secretary of the International School of Crystallography:

Dr. Annalisa Guerri
University of Florence — Tel: +39.055.4573429
50019 Sesto Fiorentino, Italy — email: *annalisa.guerri@unifi.it*

Please include the following information in your application: i) Your full name(s), age, gender, citizenship; ii) Your 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. Applicants may be able to apply for partial financial support. Please visit www.crystalerice.org to view the full eligibility criteria. Young researchers should include in their application a list of no more than five scientific publications that they have authored, and a letter of recommendation from their supervisor or from a senior scientist, that justifies any support that the researcher requests. In order to reflect the multi-disciplinary nature of the Course, priority will be given to applicants who have an appropriate scientific discipline, a good publication rate and a strong correspondence between their current research interest and the topics covered by the School.

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 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

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• PLEASE NOTE
Participants must arrive in Erice no later than 8 p.m. on 3rd June 2022.

K. DZIUBEK – S. DEEMYAD – H. MAYNARD-CASELY
DIRECTORS OF THE COURSE

T.L. BLUNDELL
DIRECTOR OF THE SCHOOL

A. ZICHICHI
EMFCSC PRESIDENT