

## Preface

Since 2010, the Ettore Majorana Foundation and Centre for Scientific Culture (Erice, Italy) has been holding a biannual school on renewable energies and sustainability co-organized by MRS and E-MRS. The Ettore Majorana Foundation has been sponsoring world-class schools for more than 50 years. The aim of the school is to present the state of the art and future perspectives for materials applied to the generation and storage of renewable and sustainable energy. This year's *International School of Solid State Physics* was held on 13–19 July with the fifth course on “Materials for Energy and Sustainability” (MRS and E-MRS). This time, the European Physical Society (EPS) and the Italian Physical Society (SIF) merged the third course of the *Joint EPS-SIF International School on Energy* (a biannual school usually taking place in Varenna, Italy) with this school. Also the Eurosunmed Project joined the organization of the school, all adding valuable contributions to this event.

Seventy-five PhD students and young researchers from 14 different countries experienced seven days of “full immersion” in the field of energy and sustainability. They attended lectures covering some of the most important and strategic topics in the field of generation, storage, and consumption of energy, which aimed at putting these topics in perspective in terms of sustainability, with an emphasis on lifecycles. In addition, the students were given projects, which they worked on in small groups and reported on at the end of the school.

Thanks to distinguished speakers from France, Germany, Israel, Italy, The Netherlands, Switzerland, and the United States, the school gave a wide overview of energy challenges, including technologies, critical materials, pollution, safety, and economy. Teaching was accomplished through lectures and close interactions with students during the breaks, lunches, dinners, and poster sessions. Lectures focused on global climate, CO<sub>2</sub> sequestration, water-energy nexus, nuclear energy, solar power, both thermal and photovoltaic, as well as photosynthesis and biofuels, geothermal and wind energy, various forms of energy storage, thermoelectricity, the future of the electrical grid, and how to view mobility and buildings from the point of view of energy and sustainability.

Students were continuously stimulated to interact (for example, by having different neighbors during the lectures each day) and to solve problems and exercises. Their main target was to gather in teams of five to seven people and critically assess papers from *MRS Energy & Sustainability —A Review Journal*, which publishes reviews on key topics in materials research and development as they relate to energy and sustainability.

At the end of the school, each team presented its analysis of “their” paper, having done fact- and logic-checking (*i.e.*, serving as critical readers). An important aim of the school was to provide the students with the background needed to have a critical, not passive, attitude when involved in their field of research while using their familiarity with the scientific method.

The school is a great opportunity for students and postdoctoral fellows from around the world to meet with and learn from their peers and established experts in their area of study.

Most of the speakers (14 over 21) were also able to provide a manuscript based on their lectures as a further support for present and future students. These *Lecture Notes* are here reported as an on-line updated source of information in the amazing and exciting field of renewable and sustainable energies.

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