

## PREFACE

This volume presents the Proceedings of the NATO Advanced Study Institute on “Bio-Photonics: Spectroscopy, Imaging, Sensing, and Manipulation,” held in Erice, Sicily, Italy, from the 2nd to the 17th of July 2009. This meeting was organized by the International School of Atomic and Molecular Spectroscopy of the “Ettore Majorana” Center for Scientific Culture.

Possibly, *bio-optics* started with the work of Dutchman Antoni van Leeuwenhoek who, in the seventeenth century, built optical microscopes for fun and observed bacteria and red blood cells with his homemade instruments. With Albert Einstein’s introduction of the photon in 1905, optics turned into photonics, which enabled one of the research tools of modern *bio-photonics* – the laser. Today, it is clear that existing optical technologies can provide many novel opportunities and tools for the life sciences. In turn, biological applications continue to stimulate novel optical technologies: e.g. various emerging approaches for achieving sub-wavelength optical resolution.

The purpose of the Institute was to present a broad overview of the emerging field of bio-photonics including the optical analysis, spectroscopy, sensing and imaging of biological systems as well as their manipulation and modification.

Each lecturer provided a coherent section of the program starting at a somewhat fundamental level and ultimately reaching the frontier of knowledge in a systematic and didactic fashion. The formal lectures were complemented by additional seminars and discussions. The Institute gave the participants an opportunity to present their research work in the form of short seminars or posters.

The participants came from 18 different countries: Belarus, Estonia, France, Germany, Italy, Kazakhstan, the Netherlands, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, the United States, and Uzbekistan. 21 lecture series and an interdisciplinary lecture were presented. In addition 16 short seminars and 12 posters were contributed by the participants. Two round table discussions were held. The first round-table discussion took place during the first week of the school in order to evaluate the work done and consider suggestions and proposals regarding the organization, format and presentation of the lectures. The second round-table was held at the conclusion of the entire meeting in order to discuss various proposals for the next course of the International School of Atomic and Molecular Spectroscopy.

I would like to thank the co-director of the Course Academician Aleksander Voitovich, the members of the Organizing Committee (Prof. Steve Arnold, Prof. Eric Mazur, and Prof. Martin Wegener), the secretary of the Course, Mr. Ottavio Forte, and Prof. John Collins for his help in organizing and running the Course and for agreeing to be the co-editor of this volume.

I wish to acknowledge the sponsorship of the meeting by the NATO Organization, the Karlsruhe School of Optics, Boston College, the Italian Ministry of Scientific Research and Technology, the Sicilian Regional Government, and the USA National Science Foundation.

I am looking forward to our activities at the Ettore Majorana Center in years to come, including the next 2011 meeting of the International School of Atomic and Molecular Spectroscopy.

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