

## Foreword

The pioneering infrared space observatories IRAS, COBE and ISO have laid the groundwork for our current understanding of the properties of interstellar dust which prior to this, was considered to be merely a nuisance in the lives of observational astronomers. Today we realize that dust plays a prominent role as actor and tracer of the structure of matter and of its physical and chemical evolution, which is key in the formation of galaxies, stars and planets. A comprehensive understanding of Galactic dust has also become essential to further advances the analysis of the structure and polarization of the cosmological microwave background.

Observations from the Spitzer Space Observatory, Akari and from ground based telescopes, continue to provide the momentum to widely-diversified dust studies. The Atacama Large Millimeter Array and the space missions Herschel, Planck and the James Webb Space Telescope are on the immediate horizon and will launch us into a new decade of unprecedented quality of data from which our perspective on dust in space will skyrocket. Dust will be revealed over the widely varying physical conditions in galaxies from the Milky Way to distant ultra luminous galaxies; the diffuse interstellar medium of the Galaxy will be studied in depth as well as protostellar condensations in molecular clouds and protoplanetary disks around young stars. The interplay between the structure of interstellar matter and the magnetic field will be studied via measurements of the polarization.

The analysis of current and future observations must push forward the frontiers of our comprehension of the physical and chemical nature of interstellar dust, and the processes responsible for forming and destroying dust, much of which remains essentially empirical today. To make headway in this, it is imperative that collaboration between astrophysicists, physicists and chemists, is accelerated and that physical and chemical laboratory studies and observations find a common ground. We organized a school in Les Houches that brought together students from diverse fields along with international experts in the areas of dust observations, theoretical modeling and laboratory experiments on interstellar dust analogs. This book gathers lectures presented at the meeting. They give a wide account of present research and near-future perspectives to further our understanding of the nature and physical processing of dust in space.

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We thank the Centre de l'Énergie Atomique, the European Space Agency, the Institut d'Astrophysique Spatiale, the Institut de Radio-Astronomie Millimétrique and the Programme National de Physique Chimie du Milieu Interstellaire du Centre National de Recherches Scientifiques for funding the school. We are grateful to Brigitte Rousset and all of the staff from the Centre de Physique des Houches for the school organization.

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