

Preface

For dust you are and to dust you will return

Genesis 3:19

The presence of dust particles in the Universe is revealed by the absorption, scattering, reddening, and polarization of starlight, and by their emission or absorption in the infrared (IR) and millimeter wavelengths. Such a dust particle originates in intense stellar winds emitted from stars as they approach the end of their evolutionary stages. These evolved stars mainly seed the interstellar medium with gas and dust that eventually form molecular clouds, the birthplace of stars. Up to the 1930s, dust particles were widely considered as idle materials that dim the light of stars, redden their colors, and interfere with studies of stars themselves. Nowadays, we know that their presence is essential for several important astrophysical processes, including the formation and death of stars, and the formation and evolution of protoplanetary disks and planetary systems. By natural consequences, habitable planets such as the Earth are formed from agglomeration of interstellar dust that has been processed through the formation of planetary systems. Dust particles also play a vital role in reactions between frozen-out molecules by providing a catalytic site, as molecular hydrogen, the most abundant molecule in space, is exclusively formed on the surface of dust particles. The exploitation of infrared and millimeter astronomy based on ground-based and airborne studies in the 1970s and the progress in satellite instrumentation provided indispensable information on and insight into the size, composition, and structure of cosmic dust and have paved the way for a deeper understanding of the multiple roles of dust in interstellar space, our solar system, and the origin of life. High-sensitivity spaceborne observations have demonstrated that IR emission and absorption features of dust particles are present in almost all objects, including HII regions, reflection nebulae, young stellar objects, planetary nebulae, post-asymptotic giant branch (AGB) objects, and galaxies. The ubiquity of dust in the Universe would also involve its kaleidoscopic nature, while the interrelation between different types of cosmic dust is yet to be studied.

For a very long time, astrophysicists, astrochemists, astro-biologists, and astro-mineralogists have been working separately in their own scientific disciplines. In recent years, we realize the necessity of these experts to work together in a new and interdisciplinary field to obtain more insight into the mystery and understanding of the global cycle of cosmic dust. To provide the experts with an opportunity of starting collaboration, we have been organizing the session “Cosmic Dust: Its Formation and Evolution” at the planetary science section of Asia Oceania Geosciences Society (AOGS) Annual Meetings. Besides, our aim in convening this session at past AOGS meetings is to expand the field of cosmic dust research into Asia and Oceania and to establish a scientific community of cosmic dust researchers in this region. In AOGS 7th Annual Meeting (AOGS 2010) held in Hyderabad, India, between July 5–9, 2010, it turned out that a number of presentations were canceled due to several difficulties in attending the meeting. Unfortunately, the “Cosmic Dust” session was not an exception (10 cancelations) to end up consisting only of 23 presentations from Japan, India, China, Germany, the Netherlands, France, Finland, and USA. Taking into account the fact that this number of attendances is less than a half at the last AOGS “Cosmic Dust” session, this will enforce hard work on convening the next meeting so that cosmic dust research continues to flourish in Asia and Oceania.

This special issue of *Earth, Planets and Space* (EPS) is devoted to the AOGS 2010 “Cosmic Dust” session as its proceedings, in which all articles were peer-reviewed by two or more experts prior to publication. We thank all the authors and the reviewers as well as the editorial board of EPS and Terra Scientific Publishing Company (TERRAPUB) for their efforts into this EPS special issue, entitled “Cosmic Dust: Its Formation and Evolution (II)”. We wish that the AOGS “Cosmic Dust” session along with this special issue could help the field of cosmic dust research take root in Asia and Oceania.

Guest Editors: Hiroshi Kimura
Misato Fukagawa
Cornelia Jäger
Ludmilla Kolokolova
Aigen Li
Keiko Nakamura-Messenger