

## From earth science to earth and planetary science as multidisciplinary fields

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One of the most important mission of the philosophy of earth and planetary science is to understand the history on how the earth and planetary sciences have emerged from the earth sciences and its sociological background and dynamism of scientific thought. In other words, this issue may be what the earth science is and also what the earth and planetary science is. In a popular scenario (Marvin 2002), the earth and planetary science had begun to emerge through the application of the methods of earth sciences for the Moon during the great Apollo program. This scenario probably captures some truth, but there remains another question that “the earth science” here covers not the entire earth sciences but a part mainly of solid earth sciences.

Some earlier specific fields of earth and planetary science already dealt with the Moon and planets in the same way as the Earth significantly prior to the beginning of the space age. For example, Sir Jeffereys (1891-1989), famous for his pioneering work obtaining the seismic velocity structure of the Earth, had also studied on the interior of the Moon and the Saturn’s rings at the early 20th century. The *Geophysical International Journal* (1922-present), in which many epoch-making classic articles on the earth’s internal structure were published, were originally the supplement of a journal of Royal Astronomical Society, suggesting that many of scientists treated the Earth as a celestial body at that time. In the field of geochemistry, the idea recognizing the meteorites as a primitive materials providing crucial reference to understand the terrestrial materials was also put forward in the early 20th century (Goldschmidt, 1938). The journal *Geochimica and Cosmochimica Acta*, which treated equivalently the geochemistry and cosmochemistry, was first published in 1950 earlier than the beginning of space age. These trends may be the seeds for the modern earth and planetary sciences.

The establishment of modern earth and planetary sciences may be closely related with the building consensus of the earth sciences as a multidisciplinary field. The program of International Geophysical Year (1957-58), which organized cooperative searches covering the solid earth sciences, atmosphere-ocean sciences and the space physics, played a significant role in making linkage among previously-independent research fields about the Earth. This program, originally proposed by Van Allen, had been backed up by the development of space vehicle technology, which in fact provided the first artificial satellites Sputnik 1 and Explorer 1.

During the same era, the planetary sciences came to be clearly defined as another multidisciplinary field. It is noteworthy that this was not only based on the space programs but also was dependent on the remarkable findings in the neighboring research fields such as the establishment of the theory of stellar formation and evolution, accumulation of the global knowledge of the Earth, and the construction of molecular genetics. In the preface of *Icarus*, the journal first published in 1962 by American Astronomical Society, we find the following statement in the first paragraph: “It stands, above all, as a tribute to the new interdisciplinary science of the solar system—which is emerging to claim its own identity at the cross-roads of the allied disciplines of astronomy, geology, geophysics, meteorology, geochemistry, plasma physics, and biology—and a recognition of its anticipated importance in the years to come.” This put emphasis on this new scientific field to be characterized by its multidisciplinary nature. The ensuing achievements of planetary exploration programs seem to have just embodied this discipline associated with the development of the theory of planetary formation.

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