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Rethinking of the Theories of the Earth in the Seventeenth Century: Cartesian Invention and the Reformation of Geography

Toshihiro Yamada[1*]

[1]Ibaraki University

Alexander von Humboldt's (1769-1859) Personal Narrative of Travels to the Equinoctial Regions of the New Continent (1814, 1819, and 1825; English translation published in 1818-1829) was one of the books that made much influence upon young Charles Darwin (1809-1882) as geologist. In the preface of the book Humboldt stated that the most important objects for him existed in the genre of 'the theory of the Earth, or physical geography' (p. iii). And he dealt with the issues such as earthquakes, volcanoes, minerals, flora and fauna, and even human cultures and civilizations. From what source did he adopt this kind of terminology and the form of writing?
The historian of geology Martin Rudwick called the genre 'geotheory', which ascends to Rene Descartes' (1596-1650) Principles of Philosophy (1644). In reality, the pictorial representation of the fourth part of the book, articulating the cosmogony of authors like Robert Fludd (1574-1637) and suggesting the story of Genesis, provided the framework in which the theories of the Earth were developed in the latter half of the seventeenth century (cf. Magruder, 2008). Undoubtedly, this was an emergence of the mechanical model for Earth formation and marked a momentum for Earth history description.
However, given such statements as 'physics and geography' in Nicolaus Steno's (1638-1686) Prodromus (1669, p. 5) and 'natural geography' as a new science in Gottfried Wilhelm Leibniz' (16 46-1716) Ptotogaea (1749, chap. 5), we should realize the elements of geography behind the Cartesian 'invention' that is early modern formation of the theories of the Earth. In this paper, reviewing the process from sixteenth century 'cosmography' to eighteenth century 'general geography' which was revised by Newton from Varenius' work of 1650, I wish to focus upon the contents of Gassendi's philosophical encyclopedia and Kircher's magnetic philosophy and theory of the subterranean world from the viewpoint.
Pierre Gassendi (1592-1655), born in southern France, had studied fossil objects early in the 1630 s. Posthumous Philosophical Syntagma (1658) contained the part of physics, which was divided into three divisions: natural things in general, celestial things, and terrestrial things. The third was further evolved into terrestrial globe itself, meteorological phenomena, minerals, plants, and animals; apparently reorganized from the ancient categories of geography, meteorology, and natural history. Whereas Gassendi was deeply influenced from the fashion of humanism, he referred to not only classical writings like Strabo but information from the New World and natural history after Renaissance. Contrasted with the work of Descartes, Gassendi's physics was full of geographical descriptions, though non-pictorial.
Athanasius Kircher (1602-1680), famous Jesuit scholar in Rome, discussed the geographical distribution of declination of geomagnetism in the section of 'magnetic geography' in Magnet (164 1). His Subterranean World (1665) was an encyclopedia of the Earth from his peculiar viewpoint of 'geocosm'. He introduced impressive world map on which various subjects were depicted such as abysses of the sea and craters of volcanoes. The geographical information partly depended on the Jesuit world wide network.
Meanwhile, Bernhard Varenius' (1622-1650) General Geography (1650) drew attentions of intellectual people of the age. Varenius proposed a systematic geography as a branch of mixed

mathematics. Isaac Newton (1642-1727) revised the book and printed two times (1672, 1681), which later functioned as a 'vehicle' for the Newtonian physics in the eighteenth century and Humboldt estimated. When geology established the methodology to construct Earth history in the first half of the nineteenth century by reforming the framework of geotheory, the tradition of physical geography had paved a way to physical geology or later geophysics.

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