

Jiro Tomari, *Rejection and Acceptance of Plate Tectonics—A History of Earth Science in Postwar Japan*

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泊次郎: 『プレートテクトニクスの拒絶と受容 戦後日本の地球科学史』
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In his book on the history of earth science in postwar Japan, Dr. Jiro Tomari (泊次郎) depicts the unique process whereby plate tectonics have been brought into the Japanese earth science community. (Note that the discipline “earth science” is roughly separated into geology and geophysics.) It is known that social context played an important role in this process, which is quite different from the process in other countries; however, there is little research focusing on this topic. Tomari’s study does hit the spot and is therefore valuable from the point of view of STS as well as the history of science.

The book consists of nine chapters (including an Introduction and a Conclusion) with Foreword, Afterword, reference materials (a chronological table of events regarding plate tectonics between 1912 and 1993, a table of geologic time, and a figure about geologic belts of the Japanese islands), and two indices (of subjects and of names). Notes are listed at the end of each chapter.

In the Introduction (Chapter 0), Tomari begins by referring to existing historical researches related to plate tectonics by non-Japanese scholars. He then gives an outline of how plate tectonics issues have been discussed and/or studied in Japan from the viewpoint of history of science to reveal a lack of studies in the existing body of researches, which he deals with in the book.

Chapters 1 and 2 provide readers with a historical overview of earth science. In Chapter 1, the history of earth science related to plate tectonics between the 1830s and 1990 is summarized. Chapter 2 describes the Japanese history of earth science from after the Meiji Restoration until World War II. Japanese geology evolved under the national policies of increasing wealth and military power, and of encouraging

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new industry. The aim of Japanese geology as a whole in those days was to find natural resources and to conduct local geological surveys for land development of the Japanese mainlands and occupied territories. Consequently, Japanese geologists who tended to be concerned only with regional topics were often lacking a global perspective. On the contrary, the Japanese seismology community, from which the Japanese geophysics community was evolved, had had a global viewpoint from the start.

A unique factor in the history of earth science in Japan after World War II is that geology was greatly influenced by the Association for the Geological Collaboration in Japan (地学団体研究会), or *Chidanken* (地団研). In Chapter 3, Tomari demonstrates how *Chidanken* could have increased its influence on the Japanese geological community. *Chidanken* was founded in 1947. In those days, having the perception that nationalism had led Japan into the war, various democratization activities took place across the country. In the geological community, it was *Chidanken* that played a leading role in the movement. In the late 1950s, strongly united under its charismatic founder and inner circle, it was able to increase its presence to have taken control of the community, and successfully spread its own academic atmosphere based on the collaborative research method and the notion that geology is a historical science that seeks a law of historical evolution of the earth.

In the following two chapters (Chapters 4 and 5), Tomari examines the influence of *Chidanken's* activities on the Japanese geological community to identify two root causes of criticisms against plate tectonics. One is the fact that *Chidanken* had followed the research tradition of Hegelian Historicism, which boosted the pro-Communist and the anti-US atmosphere in the community. In this atmosphere, researches based on the Actualism approach, which, in Japan, has its roots in prewar geologists at Tokyo Imperial University (predecessor of the University of Tokyo), was strongly criticized not only as methodologically inappropriate but also as capitalistic (or bourgeois). *Chidanken* also focused on regional and descriptive researches, and tried to deny collaboration with US geologists. The tendency culminated around 1970, when *Chidanken* was most flourishing, and when plate tectonics, which originated in the US and adopted the Actualism approach, was introduced.

The other root cause is the original theory of the earth, the theory of geosynclinal orogenesis, which *Chidanken* geologists had developed under the Historicism research tradition in the 1950s and 1960s. The theory was different from the geosynclinal theory in European countries and in the US. Geosynclinal theory is NOT a theory of the earth, that is, the theory does not explain what makes geosynclines upraise to form mountain ranges. It means that the advocates of the theory could adopt any theories to explain the formation of geosynclines and mountains: plate tectonics was merely one of them. On the other hand, the geosynclinal orogenesis theory argues that geosynclines have an inherent potential to make them evolve into mountain ranges. It means that the theory had functioned as a kind of paradigm in the Japanese geological community: it was totally in confrontation with plate tectonics, another theory of the earth.

In Chapters 6 and 7, Tomari finally examines the details of how plate tectonics was brought in to the earth science community in Japan. Its introduction was initiated by scientific journals and books for general readers. The seafloor spreading

concept, the predecessor of plate tectonics, was introduced by *Kagaku* (『科学』, *Science* in Japanese) in 1963, and was followed by the publication of a book about continental drift in 1964. In 1969, *Shizen* (『自然』, *Nature* in Japanese) carried an explanatory article on plate tectonics for the first time. A bestselling science fiction novel *Japan Sinks* (『日本沈没』, or *Nihon Chinbotsu*) that adopted plate tectonics and was published in 1973 contributed to make people familiar with the theory. It can be said that plate tectonics became popular in the Japanese society at large relatively soon after its introduction.

As for academic circles, the Japanese geophysics community had also accepted plate tectonics soon after the introduction of the theory. On the contrary, it took about 20 years for the Japanese geological community to accept plate tectonics without hesitation, except for some Japanese geologists who followed the Actualism approach and who were mainly involved in petrology. They accepted plate tectonics in the 1960s. During the days of rejection, the theory of plate tectonics was criticized in two ways. First, many *Chidanken* geologists rejected it from the point of view of Historicism. As discussed in Chapter 4, they had claimed that geological researches had to follow the Historicism approach. Plate tectonics was therefore considered methodologically inappropriate. Secondly, plate tectonics conflicted with geosynclinal orogenesis developed by *Chidanken* geologists. Both theories can function as research paradigms; thus, they were incommensurable with each other. However, as anomalies had become obvious in geosynclinal orogenesis in the middle of the 1970s, they gradually began accepting plate tectonics. In addition to the anomalies, studies of accretionary complexes had been advanced to enable the geology of the Japanese islands to be satisfactorily explained by the concept, and the mechanism of accretionary complex formation is just consistent with plate tectonics. Thus, finally, in the middle of the 1980s, plate tectonics was widely accepted in the Japanese geological community.

In the Conclusion, Tomari first summarizes the arguments developed in the previous chapters, and then briefly describes the aftermath of the introduction of plate tectonics in the Japanese geological community. To conclude, he refers to remaining problems for further researches.

To supplement Tomari's argument on Japanese geophysics, the reviewer would like to recommend a recent work by another talented young historian of science, Dr. Kim Boumsoung (金凡性), *Beyond Local Science: The Evolution of Japanese Seismology during the Meiji and the Taisho Eras* (Tokyo: University of Tokyo Press, 2007, iv + 174 pp.). It is a great benefit for the history of science and STS that studies on the history of Japanese earth science are being pursued.

Lastly, reviewing the book from an STS perspective, the reviewer would like to add a little explanation of Tomari's career to help better understand his work. Tomari is not only an up-and-coming historian of science who has completed a doctoral program in history of science at the University of Tokyo Graduate School of Arts and Sciences in 2007, but also is well experienced in the fields of geophysics and journalism. He studied geophysics at the Faculty of Science, University of Tokyo in the late 1960s. According to the Afterword of the book, Tomari could accept the concept of plate tectonics without a fight. He then entered The Asahi Shimbun Company, one of Japan's major newspaper publishers. He recalls that, in the world of journalism, plate tectonics had become "a matter of course" by 1975, and that he

was therefore surprised at the fact that quite a lot of earth scientists had not accepted plate tectonics when his colleagues and he ran a story on earthquakes in 1973, the 50th anniversary of the Great Kanto Earthquake. He was quite confused by the situation (p. 243), and began his quest for answers. In short, the book is the result of his long researches. Based on his 35-year career as a journalist and his experience in geophysics, his work can satisfy not only readers with internal viewpoints but also those who apply external approaches.