

From philosophy of science to science of science - A casestudy on earth science

AOKI, Shigeyuki^{1*}, YOSHIDA, Shigeo²

¹University of Aizu, ²Kyushu University

According to Turchin(2003) which advocates historical dynamics, some discipline becomes mature science when qualitative (verbal) analysis develops into quantitative (mathematical) analysis. There are some examples to testify this: Newtonian dynamics, synthesis in evolution theory. Then, as we turn to the philosophy of earth science, each study puts forward qualitative analysis based on the results of New Philosophy of Science during 1960s to 1970s (Frankel 1988, LeGrand 1988, Stewart 1990, Inkpen 2005). After that, this field seems to have been stagnant and so we need to develop more experimental efforts.

In this presentation, we start from Laudan & Donovan (1988) (*Scrutinizing Science : Empirical Studies of Scientific Change*, Kluwer) and try to consider how to turn philosophical theses into mathematical models and test them against empirical findings. First problem which faces us is that, in contrast to historical dynamics, we lack statistical data in history of science. For example, in historical dynamics the data on imperial expansion/contraction are available, while such data and indexes are not yet available in history of science.

Moreover, we have the problem on what we count as scientific growth. A representative index is the increasing number of journals and papers. However, this analysis (scientometrics) is rather external as opposed to internal examination of science, thus is different from making philosophy of science itself science. Another promising hypothesis is, science is problem-solving activity, and therefore its growth can be measured by the increasing number of problems. This presentation discusses what problems await us in this line of thinking.

Keywords: philosophy of science, history of science, geoscience, science of science