

Where and how did science come from? A cognitive approach.

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Scientific activities started as one of the greatest events in the history of the earth. Thus the historical question 'where and how did science come from?' can be also investigated in geoscience in so far as one of the aim of geoscience is to reveal the history of the earth (e.g., Kumazawa, Ito, and Yoshida 2002).

In fact, such origin and historical development of science has been vastly studied in the traditional metasciences such as history, philosophy, and sociology of science since the 19th century. However, these traditional metasciences have not focused on the following questions: What and how do scientists do think? When and how did humans acquire the scientific thinking in their evolutionary history? Why is it impossible for other non-human animals to engage in scientific activities? Especially, the last two questions are important to consider the history of science in terms of the geoscientific time scale.

To consider these questions, first, it is useful to look at recent developments in cognitive studies of scientific thinking (e.g., Anderson, Barkar, and Chen 2006; Carruthers, Stich, and Siegal 2002; Feist 2006; Giere 1992; Gorman 1992; Holyoak and Thagard 1995; Mithen 1996, 2002; Nersessian 2008; Simonton 2004; Thagard 2012), where the results of cognitive science and other metasciences are connected to elucidate how scientists do think in their activities. A consensus from these studies is that abstract thinking such as analogy and modeling is necessary for creative reasoning in science.

Then where did such abstract thinking come from? This is a question we would like to investigate in this talk. More specifically, first, we will outline some of the above works developing insightful arguments on the question (e.g., Holyoak and Thagard 1995; Nersessian 2008). Second, we will extend and update these arguments through examining more recent arguments in philosophy (e.g. Carruthers 2006, 2008; Dutton 2009), cognitive archaeology (e.g., Coolidge and Wynn 2009), and comparative studies of humans and non-human animals (e.g., Haun and Call 2009; Penn, Holyoak, and Povinelli 2008).

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