The Framework of the Geo-history in Seventeenth-Century Theories of the Earth and Its Implication

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I have published the book *Transformation of the Conception of Geocosmos: From Descartes to Leibniz*, which dealt with the development of the theories of Earth during the seventeenth century (Yamada, 2017). Unfortunately, however, I could not explain adequately the framework for description of earth history that emerged in the period and contributed to the geological thinking. First, Descartes presented a visual model of the cosmogony, in which Earth evolved into layered structure. But without the interpretation of fossils Descartes' model lacked a 'history'. On the other hand, Steno's methodology of analyzing the solids within solids revealed the principles for reconstructing the earth history. Steno admitted three kinds of rocks which consisted of mountains, hills and plains respectively. The method was succeeded by Italian scholars as 'Stenonian heritage' and made a tradition of stratigraphy. For example, Giovanni Alduino surveyed northern Italy and established four units *ordini*, though he did not use *Quarternary* (Vaccari, 2006). Lastly, Leibniz synthesized the idea of Descartes and that of Steno, recognizing the distinction between proto-earth (*incunabula*) and geological time. He also suggested that plant fossils indicated changes of environment, claiming that the history of nature compensated the history of human. Thus, although the long 'deep time' was not yet emerged, we recognize the fundamental framework for describing earth history, including human history and its environments, around the end of the seventeenth century.

Reference:
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Keywords: geo-history, Stenonian heritage, Gottfried Leibniz, Giovannni Arduino, history of geology

The Edmund Naumann documents in the Gotha Research Library at the University of Erfurt

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In the field of the history of science, archival materials are as important sources of information as published materials. This presentation aims to introduce new archival materials on Edmund Naumann who is hailed as the founding father of geology in Japan. The already known archival materials on Edmund Naumann are those held by the National Archives of Japan and the Archives of the University of Munich. The former is related to Naumann’ s career as an academic advisor to the Meiji Government. The latter is concerned with his doctorate and habilitation from and his career as a Privatdozent at the University of Munich. The new archival materials are deposited in the Gotha Research Library at the University of Erfurt. They consist of handwritten and typed letters, postcards, manuscript maps and so on, most of which were sent to the Justus Perthes Geographische Anstalt based in Gotha, one of the leading geographical publishing houses in the world from the late nineteenth to early twentieth century. Especially, Justus Perthes was famous for its academic journal dedicated to geography in its broadest sense, *Petermanns Geographische Mitteilungen*. Both Alfred Wegener’ s theory of continental drift and Vladimir Koeppen’ s scheme of climate classification appeared first in *Petermanns Geographische Mitteilungen*, and Edmund Naumann also contributed several papers to this journal. The enterprises of Justus Perthes and its successor in Gotha came to an end in 1992. The University of Erfurt took over the remaining books, periodicals, maps, and archival materials and renamed them as the “Perthes collection.” The Edmund Naumann documents are also included in this collection and they need to be scrutinized closely and thoroughly in the near future.

Keywords: history of geoscience, history of geography, archival materials, Perthes collection, Petermanns Geographische Mitteilungen, cartography

Geological philosophy and consciousness of Tatsuro Matsumoto (1): His contributions to acceptance of plate tectonics in Japan

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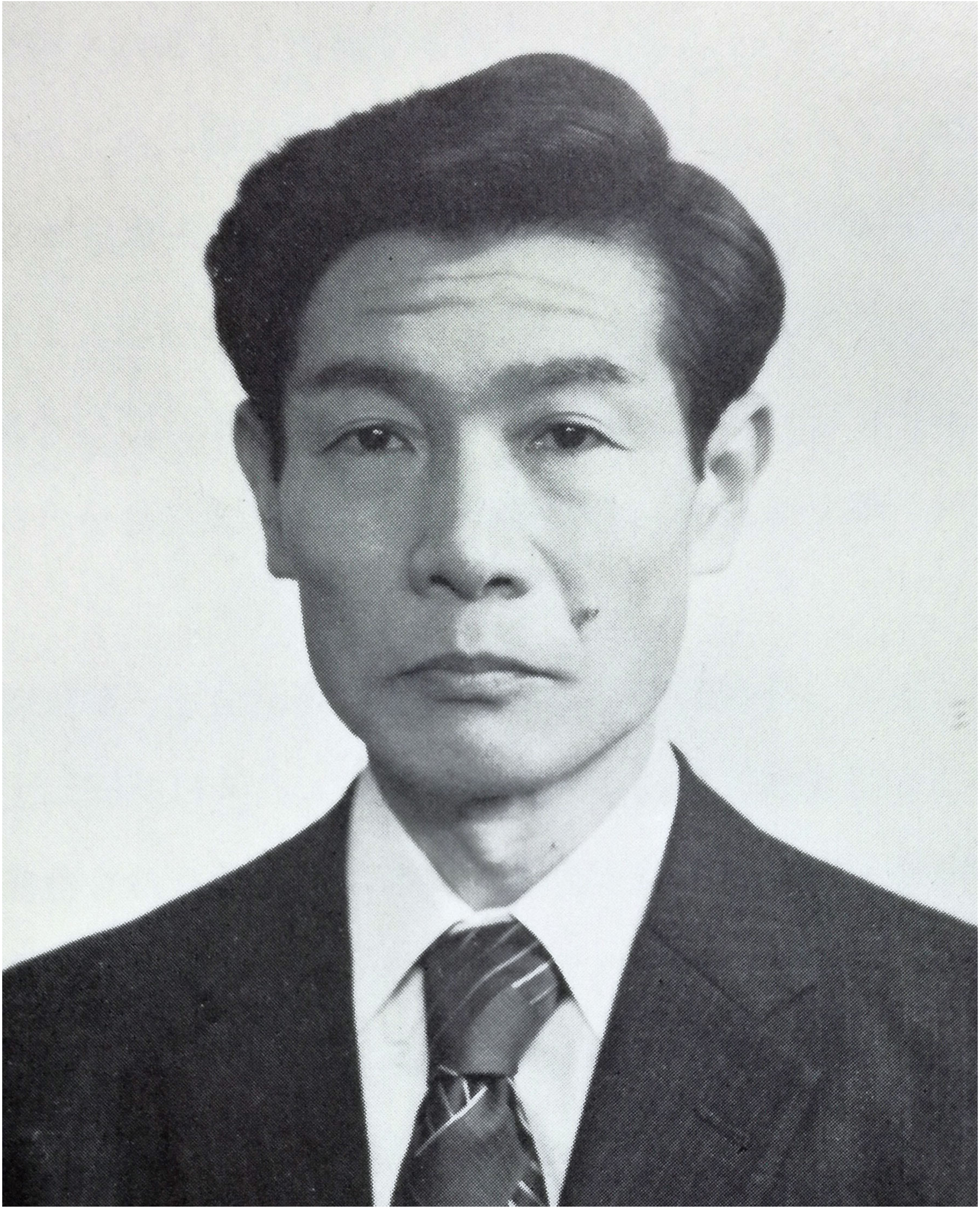
Tatsuro Matsumoto (1913 –2009) academically and mentally furthered Japanese earth science through his ca. 70 year’ s research activities. His academic contributions were mainly stratigraphy and paleontology but multidisciplinary. His substantial contributions however have been forgotten by Japanese earth scientists, since he focused his research on Mesozoic paleontology after his retirement from Kyushu University (KU) at 1977. From 1967 to 1977, the stratigraphy group of KU supervised by Matsumoto played an essential role in the introduction of the plate tectonics (PT) theory to the geology field of Japan. On the other hand, Shoji Ijiri, Matsumoto’ s classmate at Tokyo Imperial University (TIU), negative to PT, got PhD from KU at 1949. Matsumoto was skeptical about the Sakawa orogenic cycle of Teichi Kobayashi, Matsumoto’ s senior at TIU. Thus, understanding of geological philosophy and consciousness of Matsumoto is important for our understanding of history of Japanese earth science and appropriate geological methodology.
Matsumoto supervised adoptation of PT at the stratigraphy group of KU. He started to contend with issues of geosyncline at 1964. He organized a research group “Comprehensive studies of geosyncline sediments” from 1967 –1969. Many young researches attended to it. Achievements of this project were published in two memoirs of the GSJ (Matsumoto, 1968; Matumoto & Kanmera, 1971). Matsumoto (1972) mentioned his espousal of PT and pointed out that PT could not explain the Cretaceous large granitic magmatism in East Asia at that stage. In this year, Matsumoto’ s colleagues, Kanmera and Okada, attended an international symposium of geosynclinals processes at Madison. Takashi Sakai was given an assignment “review of global orogenic belts” from Matsumoto when he enrolled into the graduate school of KU at 1974. Sakai and Kanmera started to present researches of the Nichinan Group in the Shimanto Belt at 1975, which escalated developments of the accretion theory in Japan.
Japanese geologists other than Matsumoto tended to assume a tectonic force from the Eurasian continent when they explained tectonic evolution of Japan. The introduction of accretion model to the Shimanto was also a paradigm shift of the tectonic agent from the continent to the ocean. Matsumoto had proposed the Tsuhima-Goto fault in 1940’ s as a tectonic domain boundary between Japan and main Eurasian continent based on the research of Tushima (Matsumoto, 1969). Matsumoto (1961) pointed out the straight line configuration of the Hokusatu bend, the twill-weave disturbance of Nichinan and the northwestern margin of the Shikoku Basin around Kyusu. He also suggested that the Shikoku Basin would have been formed in the early to middle Miocene. These insights of Matsumoto were bases of the adoptation of PT at KU. KU adopted PT not as a trendy a prior model but a posteriori model which can explain geological features of Kyushu. Matsumoto therefore was the driving force of adoptation of PT in Japan at the initial stage.

Keywords: Matsumoto, Tatusro, plate tectonics, accretion model, historical geology



The Father of National Meteorological Services in Japan: An Weather Observer Henry Batson Joyner –England, Japan, and Brazil –

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Henry Batson Joyner was born on July 9th, 1839 as eldest son of Henry St. John Joyner, of Northwick, (abt 1810–1882) Harrow, England. The father, St. John Joyner was a tenant farmer, occupying 1000 acres of land and also he was a dedicated citizen weather observer. He send regular reports and some reports about remarkable events by request from the meteorologist George James Symons (1838-1900) who published "British Rainfall". Some of St. John's reports were published in "Symons's Monthly Meteorological Magazine" (MM) also published by Symons.
Batson served as an engineer of railways and a resident engineer of a town in England to 1870, in which year he left England to take up an appointment under the Imperial Government of Japan, being employed first in the Public Works Department, in the construction of the earliest railway in Japan. He carried meteorological instruments including a raingauge and a thermometer, presented by English donors and performed volunteer weather observation at Tokyo for two years and send reports to England. They were also published in MM. After that he got a chance to establish the national meteorological service of Japan. He trained and instructed the native students in a thorough knowledge of that science and laid the solid basis on which the service system was built up. This led to the prosperity of the later Central Meteorological Observatory of Japan, today's Japan Meteorological Agency.
He left Japan in 1877, and after a short stay in England, proceeded at the latter end of 1878 to Sao Paulo, Brazil as Engineer in-Chief for the planning and construction of the extensive water supply and sewerage system of the city. He also performed weather observation there for five years and send data tables to Meteorological Office, England. But it didn't lead the national meteorological service of Brazil. Further studies about the details of the observation, including the instruments, the siting, supporters, should be needed
On the completion of his works as Engineer in-Chief in May 1884, he returned to England hoping to recruit his somewhat impaired health, but got worse and died on the 23rd of November. Observation data tables of five years are stored in the National Meteorological Library and Archive of Met Office United Kingdom. Summary of the observation at Sao Paulo was published in "Quarterly Journal of the Royal Meteorological Society" after his death. He was buried in Kensal Green Cemetery, London.

Keywords: Henry Batson Joyner, history of meteorology, National Meteorological Services in Japan, oyatoi gaikokujin

Histories of Climate Change Research in Japan

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I will review researches about climate change in Japan from 1890 to 1980.

Keywords: climmate change, global warming, carbon dioxide

Comparison and visualization of cultures by academic disciplines

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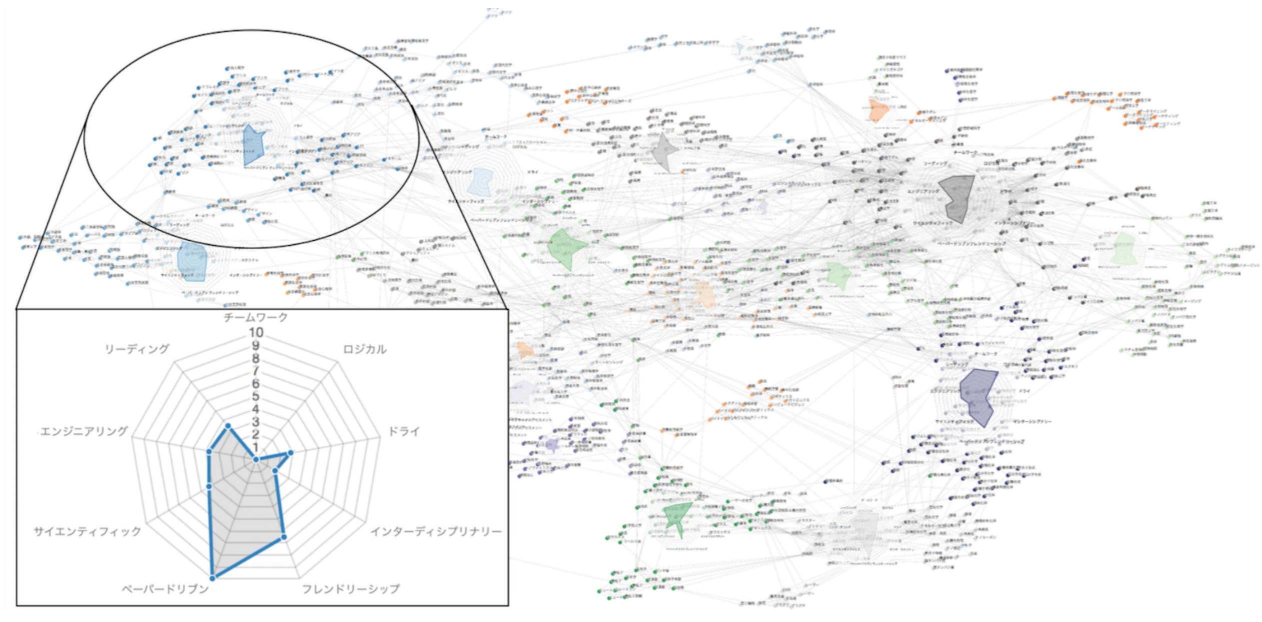
As society getting complex and academic disciplines getting divided, social issues become difficult to be solved by a single academic discipline only. Interdisciplinary studies, i.e. fusion and cooperation of multiple academic disciplines, become much popular under such situation of our society. In interdisciplinary studies, it is important that researchers in different academic disciplines understand each other’ s values and cultures, which stays quite difficult for the most of researchers. In order to promote the mutual understanding among different academic disciplines, we analyze the result of a survey asking researcher's academic philosophy and behavioral features, find research communities and extract their cultural characteristics. We visualize the result of the analysis as a network with charts that represent academic disciplines' cultures. We believe that our system makes it easier to compare academic disciplines' cultures and helps researchers in different community understand each other.

This work is supported by the Collaboration Research Program of IDEAS, Chubu University IDEAS201608.

Keywords: Interdscipline studies, Academic collaboration



Psychosomatic human ability and mind climate

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1. Significance of the project and subjects so far addressed

At the beginning of the "mind climate" study project (abbr. *MC*), an earth scientist and a western culture specialist built up the idea of the project as a development of their long activity in what they named "the science of philosophy of science". They had started an inquiry how consensus can be attained across borders among strongly segmented natural sciences. A multidisciplinary team was then gathered on the basis of the philosophy of science.

There was another hidden objective. As Lindsey, A.D. pointed out, preparatory abundant discussion is necessary prior to agreements, or rather, discussion is much more substantial for democracy than the attained consensus itself. This is serious for us Japanese because there is terrible lack of discussion through almost all academic communities.

As we repeated the meeting, we became noticing that the range of the scientific logics was questionable. Here is where feedbacks from philosophy or other humanities are desirable. Philosophers and other humanities specialists have so far developed various technical terms that are useful for examination of the quality of logics.

Some time was dedicated to generic arguments. But any results derived from generic discussion remain generic. Accordingly; our *MC* study has to introduce specific contents earlier.

2. Psychosomatic dimension

MC is very chronic: human minds need to be viewed as a result of the evolution process of lives. (This is explaining why the *MC* plan was first raised by the earth scientists.) Up to now, we discussed about several matters like the tacit dimension , and the imprinting. All these phenomena designate human psychosomatic function, which is the result of the evolution of human bodies.

Above all, the phenomenon called "emergence" is important. During the long career as an engineering researcher, the author had a lot many chances to observe closely the human activity in the real world, finding that the real world was being completely controlled by competent experts, and that every genuine expert had a remarkable core of ability, emergence.

When an expert faces a problem, emergence starts. This process does not draw solutions from any "sort and merge" or any other sequential manners, and yet quickly outputs apparently suitable responses at once. In contrast, standard scientific analyses must first fragment the problem into elements, and solve them sequentially one by one. But even if all solutions are got, synthesis of them into a whole solution is difficult, or in many cases impossible. (Every scientist would acknowledge this.) Logical methods are thus of no use in the struggle for existence where agile reactions are vital: we realize that the development of the emergence mechanism has been a key to survival.

This is performed in the flesh underneath the consciousness. Emergence occurs solely when we input signals into the flesh: *i.e.*, logics have no relevance. This is easily seen in case of sports and performance arts. But in case of legal profession or medicine as examples of brainworks, too, labored enormous quantity of memory becomes mature, i.e. fully integrated, only through the psychosomatic processing. The human psychosomatic ability covers several substantial facets of personality including the sense of justice and taste, which are more profound than logical matters. Many scientists are not prepared for this kind of subjects, but *MC* study will not be allowed to skip them.

Finally, let us see one ongoing study. In case of writings about the Japanese *MC*, foreign authors have a significant merit, less biasedness or multitude of points of view. This principle will work for Japanese

authors, too. If they have firm belief on a world religion like Christianity or Islam, they are eligible as foreigners. Two books written by different strict Japanese Protestants are being read paralleled. They argued two different situations of the politics of one identical Japanese medieval regime, which was a brand-new samurai regime. It took over the government from a preceding aristocracy. It then met very big societal changes of an exceptional magnitude within the Japanese history. Such a great pressure is expected to surface some deep structure of Japanese *MC*.
Acknowledgement This work was supported by the Collaboration Research Program (IDEAS201608) of Chubu University.

Keywords: mind climate, emergent behavior, psychosomaticity

Towards the better interdisciplinary collaborations 1

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It is widely recognized that highly-qualified research requires interdisciplinary cooperation. Another widely known fact is social agreement (collective knowledge) is often observed in geoscience, where aggregates multiple fields from physics, biology, natural resource, environment, society, and governments. Most researchers have experienced the difficulty, while a few have considered and analyzed its dynamics and mechanism. We claim that most interdisciplinary conflicts are caused not by evidence (data and logic) but by other factors, which hardly are logically described by aesthetic sense, intention, morality, world views. The non-logical systems have been constructed as survival strategies for environmental adoption and have evolved to complex systems. We need to clarify how those non-logical systems effect on our decision making in order to propose a theory of collective agreement. Moreover, they are artifacts which demand responsibilities of human beings. We thus call the artifacts as backgrounds of decision making "mind climate (MC)" and will scientifically analyze them.
Our current work is to formulate a three-layered MC model: (1) physical: geography and climate, (2) biological: genetics, epigenesis, and physiology, and (3) social: imprinting, culture, religions, education and policies. Those layers intricately form MC. Scientists already have working on (1) and (2), whereas most areas of (3) are open. This paper will classify MC formulations and possible effects on individuals and groups of researchers.
Moreover, we propose solutions of discoordination of transdisciplinary activities, such as dialogue as life-long education, school education, and self-reflection.
This work is supported by the Collaboration Research Program of IDEAS, Chubu University IDEAS201608.

Keywords: Mind climate, Decision making, Inter-discipline Communications

Developmental rule of complex science

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Through the extensive compilation of research history for the last 500 years in natural science, the evolution of complex science can be summarized into three periods. These are: (1) Period of Description, (2) Period of Classification, and finally (3) Period of Systematization. Regarding biology, the first period (Period of Description) lasted a long time, following the binominal nomenclature by Carl von Linne (1707-1778). Afterwards, the distribution of animals and plants was classified over the world, and Ernst Haeckel (1834-1919) proposed the phylogenetic tree of life. Charles Darwin (1809-1882) also speculated the evolution of life which is generally known as the Period of Systematization. Now in 21st century, a similar cycle is on-going in gene-level research, which includes (1) cataloging the kinds of genes and composing organisms including prokaryotes and Eukaryotes), (2) classifying a large database of genes), and (3) the development of a model to discuss the origin and evolution of life. This cycle is common in any natural science field. In the case of planetary science, (1) a catalog of planetary bodies was created by Copernicus and Brahe in the 16th century, followed by (2) classification performed by Galileo in the 17th century, and later (3) systematization done by Galileo and Kepler in the 17th century. And now, the second cycle is underway with an ever-growing catalog of exoplanets beginning with the initial discovery in 1995 and now totaling more than 6,000. In the case of Earth Science, the first descriptive period was the cataloging of Earth’s surface geology, which continued over 500 years. The classification of on-land geology by 1945 resulted in the geosynclinal-development model, with ocean geology being left until 1965. In 1968, immediately after the classification of ocean-floor geology and geophysics, the theory of plate tectonics was proposed. And then, classification of geologic units between ocean and continent had been achieved.

Keywords: complex science, Period of Description, Period of Classification, Period of Systematization

Meaning of life from the cosmological viewpoint

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As we survey the literature on the meaning of life, a theme which looks so “philosophical”, we find that the arguer explicitly or implicitly appeals to cosmology. For example, T. Nagel, a famous philosopher who argues for the meaninglessness of life, concludes that both at the micro-level (the happiness of individuals, etc.) and macro-level (prosperity of human beings, advancement of civilizations and cultures, etc.) life is meaningless. The ultimate grounds he gives are that “eventually the solar system will cool or the universe will wind down or collapse, and all trace of your efforts will vanish.” (Nagel 1979; 1987) On the other hand, some cosmologists argue for the meaningfulness of organism or life as a philosophical consequence of contemporary cosmology. This talk will re-examine the cosmological assumptions and the argument structure of the type of nihilism which Nagel et. al advocate.

Keywords: philosophy of earth and planetary science, philosophy of science, philosophy

How does political philosophy contribute to the policy controversy concerning space exploration?

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Since space exploration (especially, manned space exploration) requires huge resources, it has been discussed whether governments should conduct space exploration programs as public enterprises or not. In this controversy, people mention a wide variety of considerations concerning space exploration such as cost-effectiveness of manned space exploration programs, value of big science, historical significance of human’ s expansion into outer space, and so on. The question how these considerations could relate to justifiability of public funding of space exploration belongs to the research field of political philosophy. In particular, the answer depends on theories of ‘distributive justice’ (i.e. the issue of just allocation of resources). However, almost no participant in the above controversy have referred to political philosophy. In this talk, I discuss what morals we can get about the political issue of justifiability of public funding of space exploration by reference to theories of distributive justice in political philosophy. Especially, I try to show what kinds of rationales could justify public funding of space exploration on the basis of a political theory called ‘liberalism’, which claims that governments must respect individuals’ liberty.

Keywords: space exploration, space policy, political philosophy, space ethics

Interdisciplinarity in Geosciences: Maximizing societal impact through research-outreach-teaching synergy

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Geoscientists use a wide range of scientific skills and knowledge, from physical sciences to computer science, and from life sciences to engineering, to study a myriad of phenomena involving the planet Earth. Interfaces between geosciences, social sciences and humanities subjects have become increasingly important and offer many new possibilities in research and education. In this presentation, I will first examine the idea of interdisciplinarity in geosciences, taking into account both the nature and practice of interdisciplinarity (e.g., Repko, 2011). By analyzing how interdisciplinary knowledge in geosciences is critical to solving global problems, I will then discuss its implications for research-outreach-teaching synergy with illustrative examples from a collection of recent studies across the world (Tong, 2014a and 2014b). Finally, I will put forward the case of building communities of practice across research and education, with close partnerships between geoscientists at different stages of their careers. I will argue why building such partnerships and communities is crucial to maximizing the societal impact of geosciences as an interdisciplinary endeavor.

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Keywords: Interdisciplinarity, Societal impact, communities of practice

