

Basic Sciences: The Overlap between State Policy and Scientific Practices^{*}

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In 1922, the Danish scientist, Niels Bohr, won a Nobel Prize in Physics for investigating the structure of atoms and of the radiation emanating from hydrogen atoms. In the same year, the International Union of Pure and Applied Physics (IUPAP) was established in Brussels, Belgium, in order to encourage international cooperation in the field of Physics. To commemorate its 100th anniversary, IUPAP has designated 2022 as the International Year of Basic Sciences for Development (IYBSD) and is currently preparing events covering a variety of subjects.¹ A large number of organisations, including the International Science Council (ISC), are currently participating in the process and working in collaboration towards the common purpose of these events. In November 2019, the plan for the International Year of Basic Sciences for Sustainable Development (IYBSSD) was formally approved in the UNESCO General Conference and is expected to be approved by the UN General Assembly in 2022.²

Although basic science originally began as the result of human curiosity in nature, intellectual curiosity has not been the sole impetus behind basic science research. A study on innovation policies concluded that supporting basic scientific research in the public sector has a greater and broader impact on private businesses than subsidies for applied research by private companies, demanding another look at the value of basic science.³ Moreover, the current issues our world is facing, such as the COVID-19 pandemic or climate change, demand a higher level of creativity in basic science research, which will inspire novel ways to recognize new problems and transform our ideas. This is probably one of the reasons behind the attempts to draw more attention to basic science through IYBSSD 2022.

Indeed, the categories of basic science or basic research and applied science are

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¹ <http://iupap.org/about-us/international-year-of-basic-sciences-for-development-iybsd-2022/> (accessed on August 1, 2020).

² Online brochure for IYBSSD 2022: <https://www.iybssd2022.org/wp-content/uploads/Brochure-IYBSSD-ENG-complete-for-online-reading-1p.pdf>. (accessed on August 1, 2020).

³ Ufuk Akcigit, Douglas Hanley, and Nicolas Serrano-Velarde, "Back to Basics: Basic Research Spillovers, Innovation Policy and Growth," NBER working paper series (2013).

not always airtight. Although basic science generally refers to natural science in the narrow sense, as the phrases “basic science” or “basic research” were simply not used until the mid-nineteenth century, even in the Western world. Instead, the term “pure science” was used. In the late nineteenth century, “fundamental research” emerged as opposed to “industrial research.” These concepts were integrated into “basic research” in the 1930s, the process of which incorporated the political aspirations of various researchers who were seeking to establish their fields of expertise with a professional identity or to secure a rationale to receive support.⁴ It was a concept “designed to bridge the gap between the desire to support research, despite the fact that scientific output is unpredictable and that the expectations placed upon science by society have been growing constantly during the twentieth century.”⁵ Ever since Vannevar Bush concisely defined basic research as “performed without thought of practical ends” in 1945, “basic science” became a widespread term in concert with the proliferation of the linear model of innovation. In particular, the emergence of “mission-oriented basic research” in the late-1950s reinforced the justification for supporting basic research while simultaneously expanding the scope of basic research. At times, “frontier” or “great challenge” were used in place of “basic research” as a result of growing awareness that the linear model could not explicate the complexity of innovation. However, neither has replaced “basic research” or “basic science.”⁶

Basic science recently became the subject of social and political attention in South Korea as well. For over thirty years since the country began its fully-fledged economic development in the 1960s, its concentration on the development of industrial technology soon boosted its status to that of a newly industrialized country. Basic science, on the other hand, remained relatively neglected in the process. The Korean government, in regretful recognition, declared 1989 as the First Year of the Basic Science Research Promotion, setting out to support an array of areas in the basic sciences. However, contentions persisted over the definition and the rightful beneficiaries from the time of legislating the Basic Science Research Promotion Act, leading to a series of amendments afterwards and eventually the complete omission of “basic science” from the law. Hence the complaints among Koreans regarding the inadequacy of basic science policies, which are raised during the nomination period

⁴ David Kaldewey and Désirée Schauz, “Transforming Pure Science into Basic Research: The Language of Science Policy in the United States,” in Kaldewey and Schauz eds., *Basic and Applied Research: The Language of Science Policy in the Twentieth Century* (New York: Berghahn Books, 2018), 104-140.

⁵ Désirée Schauz, “What is Basic Research?: Insights from Historical Semantics,” *Minerva* 52 (2014), 273-328, 317.

⁶ Tim Flink and David Kaldewey, “The Language of Science Policy in the Twenty-First Century,” in *ibid.*, *Basic and Applied Research*, 251-284.

for the Nobel Science Prize every fall.⁷

The last thematic issue for *The Korean Journal for the History of Science* (KJHS), vol. 42, no. 1 (April, 2020) covered the “History of Korean Basic Science Policies” in commemoration of the 30th anniversary of the First Year of the Basic Science Research Promotion. The current theme examines the results of such policies on a broader geographical scale—the basic science policies and research in East Asian countries. This special issue had originally been organized under the theme “Cold War and Basic Sciences,” including discussions on basic science in the United States and the Soviet Union in addition to the discussions of Korea, China, Japan, and Taiwan, examining the global impact of the Cold War on basic science research. However, the article on basic science in the United States and the Soviet Union was omitted due to unexpected circumstances, which made the initial theme of Cold War lose its interconnective relevance. Therefore, the theme was readjusted to “Policies and Practices of Basic Science in East Asia.” Before moving on to introducing each article, I would like to express my deepest gratitude to the anonymous reviewers and editors of this special issue, whose criticism and suggestions were indeed very helpful.

First, Meng Li traces the historical development of basic research policy in the People's Republic of China (PRC) through the science and technology development plans established by the Chinese government and attempted to investigate the expectations of the Chinese government on basic research as well as the trend of science and technology development in the country. As demonstrated by the emergence of the concept of “fundamental-oriented research,” introduced in the mid-1980s but since disappeared, the role of basic research and the Chinese expectations surrounding it were not purely oriented towards pure science. Government support for basic research in the country remains inadequate despite the large number of mid- and long-term plans. The recent conflict between the United States and PRC will prove to be a critical factor in shaping future Chinese policy regarding basic research.

Daisuke Konagaya traces the history of basic research in Japan through the history of “inter-university research institutes (IURIs),” which emerged in the 1950s. While the Research Institute for Fundamental Physics (RIFP) at Kyoto University was recognized as a model for the ideal democratic management of science, the Institute for Nuclear Research (INS) at the University of Tokyo could not avoid conflicts over its

⁷ Shin Hyangsuk and Moon Manyong 신향숙·문만용, “Gicho gwahakgwa gicho yeon-guui saieseo: Gicho gwahak yukseong jeongchaekgwa gichogwahak yeon-gu jinheungbeobui deungjang 기초 과학과 기초 연구의 사이에서: 기초 과학 육성 정책과 기초과학연구진흥법의 등장 (Between Basic Science and Basic Research: Basic Science Development Policy and the Emergence of Basic Science Research Promotion Act),” *Hanguk gwahaksa hakhoeji 한국과학사학회지* (The Korean Journal for the History of Science) 42:1 (2020), 247-273.

management. This was the result of diverging opinions during the process of its democratic organization, which stemmed from an inherent problem in the IURI system and the underlying potential for conflict as regards the autonomy of the participating scientists and the autonomy of the universities to which the research institutes were affiliated. Therefore, the political, administrative, and bureaucratic situations, along with the opinions of their respective communities, had to be constantly borne in mind so as to enable the scientists to effectively lead their research activities more broadly. Nevertheless, the cases where inter-university research institutes were established in the national universities provide important lessons for the Korean system of basic science research, which is intensively centered on several elite universities specializing in science and technology or located in the capital area.⁸

Manyong Moon presents the political and scientific endeavors of Korean biologists to advance their fields of expertise and stimulate the research activities in the midst of insufficient research environment. In order to complete the tasks, from the ecological survey of the Demilitarized Zone (DMZ) in the 1960s to the nature conservation movement in the 1970s, they maximized the use of various channels including the international network of biologists and some private links to the top political leadership. The fact that the biologists who were supposedly pursuing pure science research made as much use of their political surroundings as possible, including the Cold War, demonstrates how the growth of Korean science and technology cannot be fully explicated by the simple narrative of government-led, compressed growth. Although the scope of this article is limited to biology, one should be able to find similar patterns in other fields of science too.

Lastly, Kuo-Hui Chang, Gary Lee Downey, and Bono Po-Jen Shih traced the life and the vision of Ta-you Wu, who as a physicist participated in the establishment of government policies, both directly and indirectly, and examined the Taiwanese policies of science and technology. Above all, Wu emphasized cultivating talents in the long run in order to advance fundamental research in science. However, his idealistic and fundamental plan was not in harmony with the aims of the Taiwanese government, which prioritized the reinforcement of military power and the fast promotion of industry in confrontation with the PRC. Towards the 1970s, Wu had no other choice but to shift his focus towards scientific education instead of the general policy of science and technology. The case of Taiwan calls for a comparative study with

⁸ The recently announced initiatives to increase the capability of the natural science colleges at national universities in basic science included a plan to support “foothold research institutes for science.” The cases of IURUs may be consulted in order to realize the plan. Gim Geunbae 김근배 et.al., *Geojeom gibanui gichogwahak heobeu guchukgwa yeongnyang ganghwa bangan yeongu* 거점 기반의 기초 과학 허브 구축과 역량 강화 방안 연구 (The Initiative for Building and Facilitating Hubs of Colleges of Natural Sciences for Basic Sciences) (Korea Research Foundation, 2020).

Korea, which also has concentrated on industrial technology instead of basic science for the speedy development of science and technology. In particular, comparing the Taiwanese Industrial Technology Research Institute mentioned in the article with the Korea Institute of Science and Technology would no doubt prove to be intriguing.

These four thematic articles each cover different fields of basic science, discuss different associated means of policy, and present different arguments. Nevertheless, they echo in common the voices of scientists who engaged in diverse ways in the process of developing policies to promote basic science research. After all, the significance of the current special issue is in the essential framework and information it provides for future comparative studies, which are to deal with the ways in which basic science was promoted and developed in East Asia and the role of the relevant systems, scientists, and engineers in the process. We should look forward to a more profound series of research based on this stepping stone.