

## From HPS to STS: Looking Back over My Past Sixty Years

Song Sang-yong

© 2017 *Science and Culture Review*

*Song Sang-yong is one of the best representatives of the Korean STS community.<sup>1</sup> He has been active on the international scene both in the history of science since the 1970s and in bioethics since the 1990s and has witnessed the birth of STS as an academic movement in the Western world as well as in East Asia. Having inspired a generation of Korean scholars working in STS, Song has been so generous as to serve as an EASTS advisory board member, a post he has been holding since our inception. Reaching eighty years of age in 2017, Song is nevertheless still visible in several of the international projects and networks that are making East Asia such a rich field for STS research. This article is based on his keynote speech at the Twelfth East Asian STS Network Conference in Beijing in November 2016, and its Chinese version is published simultaneously at Science and Culture Review (科学文化评论), a leading journal on the history of science and technology in China. Like Shigeru Nakayama's 2013 intellectual memoir, An Autobiography of a Historian of Science (一科学史家の自伝), it outlines Song's long and fruitful career in STS—teaching, engaging in, and exploring the possibilities of STS for East Asia. EASTS is very grateful to have the input and collaboration of a scholar of Song's caliber and would like to pass his experiences on to coming generations of East Asian STSers.*

—EASTS Editorial Office

Sixteen years ago, at the East Asian STS conference in Beijing, I gave a country report titled “STS in Korea.” Today I am going to tell you about my personal involvement with STS.

I graduated from Seoul National University (首爾大) with a bachelor of science degree in chemistry in 1959. The College of Liberal Arts and Sciences (文理大) there was the most liberal school in Korea. I took eight courses in German literature and five in biology. I audited seven courses in English and three in French. I read Friedrich

---

Song S.-y.  
Department of History, Hallym University, South Korea  
e-mail: songsy63@hotmail.com

---

<sup>1</sup> In this article, all Korean names are presented in the conventional way, in which surnames precede given names.

Paulsen, Arthur Schopenhauer, Heinrich Heine, Heinrich von Kleist, Gottfried Keller, Goethe's *Götz von Berlichingen* and *Faust*, W. Somerset Maugham, Graham Greene, Elizabethan Lyrics, and André Gide. There was no minor system at that time, but I did ostensibly take two other fields as minors.

As I was interested in interdisciplinary fields between science and the humanities, I reentered the philosophy department as a junior the following year. It was then that a nationwide student uprising broke out, protesting a rigged presidential election. This was the April Revolution, which ended with the fall of the Rhee Syngman (李承晩) government. I joined the demonstration near the capitol building at the last moment. There was great chaos, but we enjoyed a freedom that had been unprecedented since the founding of the country. The new democratic government lasted for only eight months until the military coup in 1961.

During that short spring, I became a founding member of two important societies. I worked as secretary for the Korean Humanist Association (1960–65) and the Korean History of Science Society (1962–82). Bertrand Russell (president of the Rationalist Press Association) and Julian Huxley (president of the British Humanist Association) were my heroes. I communicated with Russell and translated his short article on communism, which appeared in the university newspaper two days after the coup. I contributed articles on Huxley's transhumanism to two Korean journals. At that time, I was a naive believer in scientism; I never doubted that science would bring us endless happiness. Within science, my chief interests were biology and biochemistry—no wonder I sided with the mechanistic view of life in my bachelor's thesis. In my master's thesis, I concluded that Darwin's theory of natural selection ran counter to teleology. I was a convinced mechanist, naturalist (soft materialist), and agnostic (courteous atheist).

However, I was so glad when Linus Pauling, the Nobel Prize–winning chemist, was awarded his second prize, the Nobel Peace Prize, in 1962. I had already read John Hershey's *Hiroshima* and Takashi Nagai (永井隆)'s *Bell of Nagasaki* in 1949, and so now I read Pauling's *No More War* (1958) and wrote a long essay on the test ban movement for the university newspaper. My concern with the nuclear issue has continued to the present day.

I went to Indiana University for graduate studies in 1967, a time when race riots, the Vietnam War, and poverty were the issues of the day, and as a result, campuses were not calm. While I was at Indiana, there was an incendiary fire in the university library, a boycott by students, the detention of the president in his office, and the US Army was put on alert, among other things. These were the times that saw the assassinations of Martin Luther King Jr. and Robert F. Kennedy, the confrontation at the Democratic Convention in Chicago, the election of Nixon, and the landing of Apollo 11 on the moon. It was the most exciting period in the history of the United States.

Science still seemed to be a guarantee of progress, in spite of the tragedies of Hiroshima and Nagasaki. However, the image of science suddenly became tarnished in the 1960s by environmental degradation, such as at Minamata Bay and in the *Torrey Canyon* disaster. Science was a target of the counterculture movement that swept over industrialized countries in 1968. The attack on science came from within as well as from outside the scientific community. The critique of science was not confined to intellectuals but widely pervaded the general public. The antiscience movement aimed not only at high tech but also at science itself. This challenge to the goals and results of

science policy came to doubt the inherent norms of science and its epistemological status.

I was, in a way, one of the 1968 generation. In the Department of History and Philosophy of Science (HPS), we were mainly trained in internal history and value-free philosophy. But students were very much interested in science and society, and I could not be free from their influence. When I attended the Fourteenth International Congress of the History of Science in Tokyo and Kyoto in 1974, the desire for a social history of science was utmost. Most of the staunch internalists were to be found in the science and society sessions. There, I met Joseph Needham, Willy Hartner, Jean-Jacques Salomon, Thomas Kuhn, Erwin Hiebert, Derek J. de Solla Price, Melvin Kranzberg, Nathan Sivin, S. R. Mikulinsky, Sergey Kapitza, Abdur Rahman, Peng-Yoke Ho (何丙郁), Kiyoshi Yabuuchi (藪内清), Masao Watanabe (渡辺正雄), Eikoh Shimaō (島尾永康/馬永康), Mitsukuni Yoshida (吉田光邦), Atsuhiro Shibatani (柴谷篤弘), Shigeru Nakayama (中山茂), and Tohru Hiroshige (広重徹).

In 1970, following my recommendation, the College of General Studies (教養課程部) at Seoul National University began to offer courses in the history of science and natural science. I taught both but made the latter a mixture of philosophy of science and science and society. At the College of Liberal Arts and Sciences, I created advanced courses: History of Science I and II and Science Studies I and II. Science Studies I was philosophy of science, and Science Studies II was science and society. For Science Studies I in 1972, I chose Kuhn's 1962 *Structure of Scientific Revolution* as the text. After 1977, I taught science and society courses at Sungkyunkwan (成均館大), Hallym (翰林大), and Yonsei (延世大) Universities. I adopted a topical approach in organizing my courses, gave updated reading materials, and encouraged lively discussion. Later on, science and society came to be called science, technology, and society at Hallym University (see below for an outline of the course I offered there in 1986). After retirement, in 2003, I taught an STS-oriented philosophy of science course at Hanyang University (漢陽大) for two years.

Course Title: Science, Technology, and Society

Textbooks:

Cho, Hongsup, ed. (1984). *Contemporary Science/Technology and Human Liberation* (in Korean). Seoul: Hangilsa.

Nakayama, Shigeru (1982). *Contemporary History of Science and Society* (Korean translation). Seoul: Pulbit.

Song Sang-yong (1984). *History of Science for General Courses* (in Korean). Seoul: Usongmunhwasa.

Ziman, John (1986). *The Force of Knowledge: The Scientific Dimension of Society* (Korean translation). Seoul: Chongumsa.

Topics:

1. What is STS?
2. Two cultures
3. Science and religion
4. A-bomb and the nuclear power plant
5. Energy
6. Computer revolution
7. The promise and danger of biotechnology

8. Bioethics
9. Pollution and the environmental movement
10. Research and development
11. The military, industry, and science
12. Antiscience movement and critical science
13. Science and technology in the Third World
14. Futurology vs. limits to growth

Though the Korean government pushed the development of science and technology, it felt the necessity for a public understanding of science and technology. Thus appeared the Scientification of the Whole Nation Movement (全國民科學化運動), reminiscent of the North Korean slogan “Fortification of the Whole Country” (全國土要塞化). I maintained that both the positive and negative aspects of science and technology should be known to the public. The popularization movement led by the government was very much lip service and destined to fail, but the movement outside the government was carried out more effectively. One publisher began to produce popular science books (the Modern Science Series, 現代科學新書) in 1972. As editor in chief of the series, I included many titles on the history and philosophy of science and on STS among the 190 pocket books issued over five years. The series exerted a deep influence on students.

In 1977, professors, journalists, and publishers who were associated with science got together to form the Korea Science Writers Association (韓國科學著述人協會). It raised important issues on science, technology, and society through occasional meetings. Much more powerful was the Korean History of Science Society (韓國科學史學會), which was revitalized in 1974. This greatly helped to nourish a critical view of science and technology through frequent events. It is no wonder that the majority of STS activists come from a history of science background. In 1980, seven scientists signed the “Declaration of 134 Intellectuals” (134人知識人宣言) against a second military coup. I was one of thirty signatories who were fired from universities for four years. Under three repressive military regimes in Korea, the criticism of science and technology was involved in the democratization movement. Environmental and nuclear issues had been taboo since the 1960s, but the proscribed citizens’ movement against pollution and nuclear power plants had become so strong by the late 1980s that the government could no longer curb it. This movement opened up a lively debate on important issues within STS.

In 1981, I reported on the present status of STS at a UNESCO symposium. I also led a UNESCO workshop for high school science teachers, to introduce STS into science education. In the late 1980s, there was a flurry of papers on STS in science education journals, reflecting a worldwide trend in science education. As a result, the Ministry of Education encouraged the inclusion of STS in a new curriculum for middle and high school science. In 1984, I was a visiting scholar in the School of Philosophy at Leeds University. I was with Jerry Ravetz, a pioneer in the STS movement, who still referred to himself as a radical. While I was in the United Kingdom I visited Bob Young of the *Radical Science Journal* in London and Roy McLeod of Sussex University. All of them were American émigrés who left during the McCarthy era. I was unable to meet with Hilary Rose and Steven Rose, but I was fascinated by Gary Werskey’s 1978 book *The Visible College*. It was translated into Korean by Song Jinwoong (宋眞雄) as

*Gwakakgwa Sahoejueui (Science and Socialism)* in 2016. I was so glad to meet him at the International Congress of History of Science in Beijing in 2005. In 2011, Les Levidow [note: an *EASTS* editor] came to the International Conference on STS at Seoul National University. After the conference, he was asked to talk about the radical science movement at a dinner with Korean STSers.

In 1987, I was a visitor for a whole year in the Department of History and Philosophy of Science at Cambridge University, where Joseph Needham made me a member of Gonville and Caius College. We met every week at high table. Francesca Bray [note: current *EASTS* associate editor], an author of the Science and Civilisation in China series, and I had been good friends in Korea, and I acquired even more friends in the history of science in China group through the Needham Research Institute. While at Cambridge I flew to Budapest and Beijing and took train and bus to Dubrovnik, Yugoslavia, for conferences. By the turn of the millennium I was able to visit nearly all the world's socialist countries, including Vietnam and Cuba.

It was surprising to find a program on STS at the Korea Advanced Institute of Science way back in 1973, yet it held a joint symposium with a similar program at Cornell University. Then the program was virtually dissolved. It was big news when in 1984 Seoul National University announced the opening of the graduate program in the history and philosophy of science (科學史與科學哲學協同課程). Though that program was internalist (rather than externalist) oriented, it offered a course on the sociology of science. Later, STS was added. The program has since produced thirty-six PhDs in the history and philosophy of science, and five in STS. The College of Medicine at Seoul National University has a Department of Medical Humanities (人文醫學教室), and this has produced fourteen PhDs in the history of medicine and five in the medical humanities.

For some twenty years there had been campaigning for the establishment of independent departments of science studies at universities, and I had visited the presidents of major universities and the Ministry of Education in pursuit of that goal. It materialized in 1995, when the government agreed to the creation of STS programs at four universities. Korea University (高麗大) opened a graduate program in science studies (科學技術學協同課程), and an undergraduate Department of Science Studies (科學學科) was set up at Chonbuk National University (全北大). The Korea Advanced Institute of Science and Technology (KAIST, 韓國科學技術院) opened its Graduate School of Science and Technology Policy (科學技術政策大學院) in 2002. In addition to the graduate program on the history and philosophy of science and technology at Pusan National University (釜山大), the sociology department of Kyunghee University (慶熙大) invited three US-trained sociologists of science.

Kim Hwan-Suk (金煥錫) [an *EASTS* advisory editor], the first Korean PhD in sociology of science and technology from what is now Imperial College London, took the initiative in 1996 to launch a group studying science, technology, and society. In the same year, I participated for the first time at the Bielefeld Conference on STS, organized by 4S and EASST. Some thirty of the group's members hailed not only from sociology but also from the history and philosophy of science, political science, public administration, and economics. They started reading the *Handbook of Science and Technology Studies*, edited by Jasanoff et al., and held monthly meetings. They also organized the session on the sociology of science and technology at meetings of the

Korean Sociological Association. By 2000 it had developed into the Korean Association of Science and Technology Studies (韓國科學技術學會).

It was in 1997 that the Council for Democracy in Science and Technology was born as a part of Chamyooyondae (參與連帶, People's Solidarity for Participatory Democracy), a major civil movement in Korea. In 2000, the group was renamed the Citizens' Science Center (市民科學中心), to reduce the impression of its being too radical. It was also led by Kim Hwan-Suk, and active members included Lee Young Hee (李榮熙) [an EASTS advisory editor], Kim Dong-Kwang (金東光), Park Jin-Hee (朴眞嬉) [an EASTS advisory editor], Park Byungsang (朴炳相), Kim Myong-Jin (金明振), Han Jae-kak (韓在珪), Kim Byoungyoon (金丙允), Kim Byoungsoo (金炳秀), and Lee Jongmin (李鍾珉). The center carried out a good many ambitious programs, such as science shops, consensus conferences, engineering ethics, technology assessment, appropriate technology, and STS education. Frequent statements, press releases, and requests for legislation were made. The Citizens' Science Center became independent in 2005, and I was made nominal chair of the board of directors.

In 1994, I joined the highly influential Korean Federation of Environmental Movements (KFEM, 環境運動聯合). Though I concentrated on environmental education in KFEM, I was also active in campaigns against such government projects as the Donggang Dam, the Saemangeum Reclamation Project, the Four Big Rivers Restoration Project, and nuclear power plants. I was a key member of the Korean Society for Environmental Philosophy (韓國環境哲學會) and the Korean Association of Environmental Sociology (韓國環境社會學會).

In 1995, Qiu Renzong (邱仁宗), a Chinese philosopher of science, invited me to Beijing along with the Japanese philosopher of science Hyakudai Sakamoto (坂本百大), and together we founded the East Asian Association of Bioethics, which was expanded into the Asian Bioethics Association in Kobe in 1997. I founded the Korean Bioethics Association (KBA, 韓國生命倫理學會) the following year. The birth of Dolly the cloned sheep in 1997 had aroused great concern among Koreans. Hwang Woo-Suk (黃禹錫), a veterinarian, came suddenly to prominence at the center of a reproductive technology in which Korea was at the top. In 2004, Hwang surprised the world by establishing a stem cell line from a cloned blastocyst. Another breakthrough the following year in creating patient-specific embryonic stem cells brought him to international stardom. Right after his 2004 paper came out, the Korean Bioethics Association formed the Ad Hoc Committee on the Research Ethics of Therapeutic Embryonic Cloning. As KBA president, I sent a letter to the editor of *Science* concerning the problem of the ethics committee. The letter was published, with Hwang's response, more than six months later. At its general meeting, the KBA adopted a statement challenging Hwang to an open discussion on the ethical problems of his research: institutional review boards, authorship, and the acquisition of eggs. Hwang's two papers were shown to be nothing but fakes. However, Korea doesn't seem to have learned much from the Hwang scandal, and I believe that scientism (科學主義) is to be blamed. East Asia has a deep-rooted tradition of scientism, which lasted for more than a century. In the nineteenth century, East Asia was under the challenge of Western imperialism. East Asian countries had to make desperate attempts to survive, and it was believed that the only way was to catch up with Western science and technology.

At the East Asian Conference on Bioethics in 1995, Chen Yuan-Fang (陳元方), a Chinese medical doctor, gave her paper "Japanese Death Factories and the American



Cover-Up,” which had been inspired by Sheldon Harris’s 1994 book *Factories of Death: Japanese Biological Warfare 1932–45, and the American Cover-Up*. The most horrible abuse of science was the human experimentation carried out by the Nazis and the Japanese army during World War II. Ruthless human experiments were carried out in the name of science at Auschwitz and at the “Factory of Death” in Pingfang (平房), China. There, in what was called Unit 731, Japanese doctors experimented on, tortured, and killed more than three thousand Chinese, Russians, Mongols, Manchus, Koreans, and even Americans, in systematic studies on bacteriological warfare.

At the Nuremberg Trials, twenty-three German physicians were prosecuted for their involvement in the Nazis’ human experiments. As for Unit 731, however, nobody was ever punished: the United States pardoned its staff in exchange for the valuable information it won from them. We had sessions on Unit 731 in San Francisco, Tsukuba, Beijing, and Seoul. Nie Jing-Bao (聂精保), Guo Nanyan (郭南燕), Keiichi Tsuneishi (常石敬一), Kenzo Hamano (浜野研三), Takashi Tsuchiya (土屋貴志), Ryuichi Ida (位田隆一), Dan Wikler, Hans-Martin Sass, and I were all there.

I was elected a member of UNESCO’s COMEST (Commission Mondiale d’Éthique des Connaissances Scientifiques et des Technologies) in 2003 and was vice-chair from 2004 to 2008. Lu Yongxiang (路甬祥), president of the Chinese Academy of Sciences, and Jun Fudano (礼野順) [note: a former editor of *EASTS*] were fellow members from East Asia. COMEST was then covering the ethics of information technology, space, freshwater, energy technology, and nanotechnology, and I was in charge of its code of conduct for scientists. The 1999 World Conference on Science (WCS) in Budapest, co-organized by UNESCO and the International Council for Science (ICSU), adopted its epoch-making “Declaration on Science and the Use of Scientific Knowledge” and its “Science Agenda—Framework for Action.” The Budapest conference was significant for placing the emphasis on achieving responsibility and ethics in science through scientists’ genuine, honest soul searching. The follow-up to the WCS was left to COMEST and to the ICSU’s Standing Committee on Responsibility and Ethics in Science.

Creating a code of conduct for scientists was not easy, for some member states, including the United States, were against further standard setting. COMEST decided to utilize UNESCO’s 1974 “Recommendation on the Status of Scientific Researchers” as a starting point in the search for such a code of conduct. I wrote the background paper on revising that recommendation. In 2006, COMEST held six consultation meetings on the recommendation, in Tokyo, New Delhi, Geneva, Bangkok, Seoul, and Belo Horizonte, and I attended those in Bangkok and Seoul. More consultation meetings on other continents were planned, but not held, and then my term ended.

In Korea, in an effort to respond to the recommendations raised by the WCS’s “Science Agenda—Framework for Action,” the Korean Academy of Science and Technology (KAST, 韓國科學技術翰林院) was in 2002 handed a project by the Ministry of Science and Technology: “A Study on the Charter for Scientists and Engineers” (科學技術人憲章研究). Having been asked to take the project on, I organized an interdisciplinary team of seventeen researchers, evenly divided into older scientists, engineers, and medical doctors from within KAST, and younger STS scholars, including ethicists, historians, philosophers, and sociologists of science from outside. The research was carried out mainly by the STSers for six months, with

the scientists acting very much like advisers (though there were fourteen advisory members in addition).

The report submitted to the Ministry of Science and Technology was an impressive piece of progress toward a charter or a code of conduct for scientists and engineers. There should have been follow-up measures on the part of the government, but the ministry took no further action. Two years elapsed without visible change, and the report was completely forgotten. Just before the Hwang scandal, an ad hoc task force was formed within the Korean Federation of Science and Technology Societies (KOFST, 韓國科學技術團體總聯合會). This fifteen-member drafting team was composed of a philosopher, social scientists, and STSers including myself, as well as some top scientists. At the very outset, we all agreed that the proposed charter should stand for neither scientism nor antis scientism—well-balanced views were essential. In reality, however, there were fierce disputes between scientists and non-scientists. While the scientists defended pure science, ethical neutrality, and freedom of research, humanists and social scientists emphasized the adverse aspects of science and technology, social responsibility, and ethics. The result of three months of discussions was destined to be a compromise—the charter turned out mediocre and dull. I proposed a joint project to come up with a code of ethics for scientists and engineers, involving three institutions: Korean National Commission for UNESCO, KOFST, and KAST for the Ministry of Science and Technology. However, after Hwang's fall from grace, the government was interested only in guidelines for research ethics. KOFST alone produced a very unsatisfactory code of ethics, and in great haste.

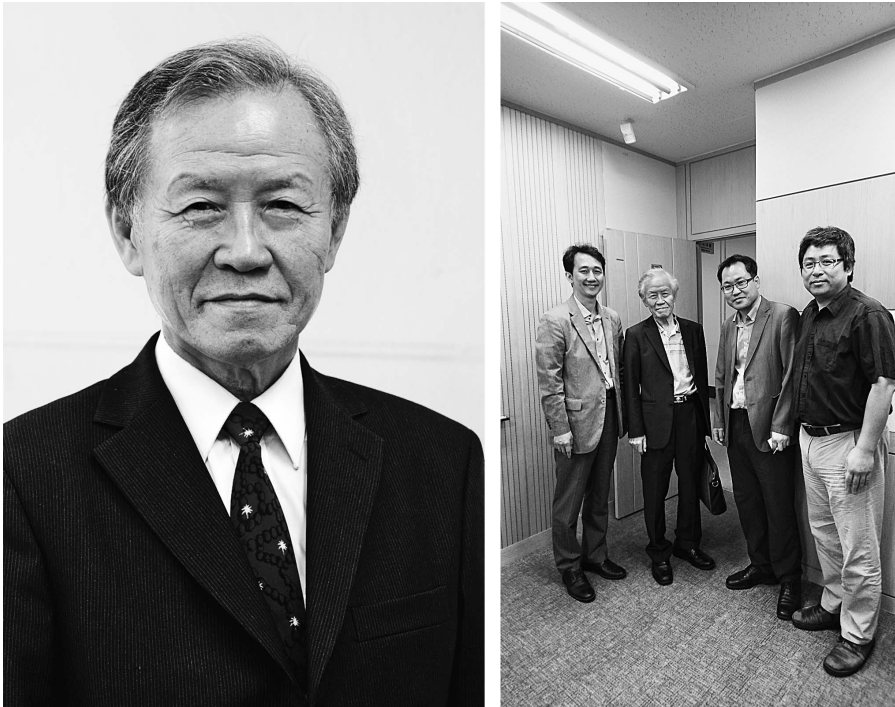
Ever since the introduction of Western science and technology, scientism has had the upper hand in East Asia. Blind faith in science and technology has prohibited people from developing a critical mind-set. In Korea, efficiency rather than flexibility was a virtue, in order to achieve rapid industrialization. Such tendencies resulted in rigid hierarchy and compartmentalization of society. Scientists and engineers were pacified and for a long time were made to be content with the status quo. Now, though, we can see the prospects for overcoming such an unfavorable climate for STS.

STS emerged as an established field in the 1970s with the help of the sociology of scientific knowledge in Europe and America, but it is not very well known that there were predecessors back in the early twentieth century. "Science of Science" was the title of an article by Maria Ossowski and Stanislaw Ossowska in the Polish journal *Organon* in 1936. Even earlier, in 1926, Boritchevski, a Russian, wrote an article titled "Science of Science as an Exact Science." Science of science, according to him, dealt with the fundamental problems of science by dialectical materialism. J. D. Bernal's *Social Function of Science* (1939) was the first fully fledged scientific analysis of science, based on Marxism. After World War II, science of science (*Wissenschaftswissenschaft* in German, *nauko znawstwo* in Polish, and *наука науки* in Russian) was extensively studied in the socialist bloc. It was an important topic in China even after the fall of socialism in Europe.

With the collapse of socialism in the 1980s, the zeal for radical science became hardly visible. The turn of the century witnessed amazing developments in biotechnology and nanotechnology, which brought forth interest in the ethics of science and technology. Accelerated climate change reminds us of a crisis far more urgent than those of the 1960s. Nevertheless, the critique of science and technology draws little attention in the STS community.



Vannevar Bush, one of the most prominent figures who led the Manhattan Project, wrote a report to the US president in 1945 titled “Science, the Endless Frontier.” After twenty-two years had passed, though, the title he chose for one of his books was *Science Is Not Enough*. It is our urgent task to crush scientism. My work in STS has been more Low Church than High Church, according to Steve Fuller’s distinction. If I have time, I would like to write the history of STS.



**Fig. 1** Left: Professor Song Sang-yong. Right: Professor Song (second from left) in an editorial meeting with (from left) *EASTS* editor in chief Wen-Hua Kuo, editor Kim Eun-sung, and associate editor Bak Hee Je, Kyung Hee University, 17 June 2016.

### Articles and Presentations by Song Sang-yong

- Song Sang-yong 宋相庸 (1961). “J. Huxley” J. 학살리. 휴머니즘 (*Humanism*) 1: 59–64.
- Lee, Jong Jin 李鐘珍 (1962). “Chohumanismui ihae” 超휴머니즘의 理解 (Understanding Transhumanism). *Sasangkye* 思想界 September, 60–65. (ghostwritten).
- Song Sang-yong 宋相庸 (1963). “L. Pauling, Pyonghwa uihae ssaunun hwahakja” L. Pauling, 平和 위해 싸우는 化學者 (L. Pauling: A Chemist Fighting for Peace). *Daehak Shinmoon* 大學新聞, no. 508.
- Song Sang-yong 宋相庸 (1967). “Darwinism kwa mokjongnon” Darwinism 과 目的論 (Darwinism and Teleology). MA thesis, Seoul National University.
- Song Sang-yong 宋相庸 (1971). “L’Homme machine ui punsok” L’Homme machine 의 분석 (An Analysis of L’Homme machine). 서울大學校 敎養課程部 論文集 自然科學篇 (*Journal of Natural Sciences*, College of General Studies, Seoul National University) 3, no. 1: 53–69.
- Song Sang-yong 宋相庸 (1974). “Sahoejok kwahaksau tojon” 社會的 科學史의 挑戰 (The Challenge of Social History of Science). Report of the Fourteenth International Congress of History of Science, Tokyo and Kyoto. Seoul Pyongnon 서울평론 48: 22–28.

- Song Sang-yong 宋相庸 (1975). "Sakharov ga koroon kil" 사하로프가 걸어온 길 (The Footsteps of Sakharov). *Daehak Shinmoon* 大學新聞, no. 949, 1 December.
- Song Sang-yong (1976). "Haecckel's Monistic Philosophy of Nature." *Philosophical Studies* (哲學研究, 철학연구회) 11: 193–209.
- Song Sang-yong 宋相庸 (1979). "Wonja energy ui Munjejom" 原子 에너지의 問題點 (Problems of Atomic Energy). *Kwangjang* 廣場 8–9: 71–74.
- Song Sang-yong 宋相庸 (1980). "Kuhn ui Paradigm" 쿤의 패러다임 (Kuhn's Paradigm). *세계의 文學* (*Literature of the World*) 18: 194–204.
- Song Sang-yong 宋相庸 (1981). "Kwahak kwa sahoe e kwan haeye yongu; Paekyong kwa hyonhwang" 과학과 사회에 관한 해외연구의 배경과 현황 (Overseas Studies on Science and Society: Background and Present Status). UNESCO Hankukwiwonhoe (Korean National Commission for UNESCO), 53–83.
- Song Sang-yong 宋相庸 (1981). "Songjang ui hangye" 성장의 한계 (Limits to Growth). In *문학과지성사 現代社會와 哲學* (*Contemporary Society and Philosophy*), 292–303. Seoul: Munhak kwa chisongsa.
- Song Sang-yong 宋相庸 (1981). "Pankwahak ui kiwonkwa chongae" 반과학의 기원과 전개 (Origins and Development of Antiscience). In *To wa ingankwahak 道와 人間科學* (*Tao and Humanistic Science*), 385–94. Seoul: Samildang 三一堂.
- Song Sang-yong 宋相庸 (1983). "Changjokwahak un kwahakinga?" 창조과학은 과학인가? (Is Creation Science a Science?). *Kwahak kua kisuul 과학과 기술* (*Science and Technology*), September: 59–63.
- Song Sang-yong 宋相庸 (1984). "Joseph Needham. Chungguk kwahaksa Taejangi" 조지프 니덤. 중국과학사 大長征 (Long March to the History of Science in China). *오늘의 책* (*Books Today*) 3: 374–88.
- Song Sang-yong 宋相庸 (1985). "Hyongmyongjok kwahakchollhak" 혁명적 과학철학 (Revolutionary Philosophy of Science). *人文科學研究* (*Studies on Humanities*) 5: 59–76.
- Song Sang-yong 宋相庸 (1986). "Hibakusha wa wonjaryok" 히바쿠샤와 原子力 (Hibakusha and Atomic Power). *Daejon Ilbo* 大田日報 22 October.
- Song Sang-yong (1987). "Tycho Brahe in Korea." Paper presented at the Regional Conference, International Astronomical Union, Beijing, 4 October.
- Song Sang-yong 宋相庸 (1988). "Haek Dilemma" 핵딜레마 (Nuclear Dilemma). *Kookmin Ilbo* 國民日報 28 December.
- Song Sang-yong 宋相庸 (1990). "Kwahak kwa yuli" 科學과 倫理 (Science and Ethics). In *Hyondae hankuk ui sahoeuli 現代韓國의 社會倫理* (*Social Ethics of Contemporary Korea*), 292–301. Seoul: 峨山社會福祉財團 (Asan Social Welfare Foundation).
- Song Sang-yong 宋相庸 (1991). "Wonjaryok palchon sibi" 원자력發電 시비 (Nuclear Power Plant: Pros and Cons). *科學과 技術* (*Science and Technology*) 9: 66–68.
- Song Sang-yong 宋相庸 (1991). "Kwahak kisuul kwa daeryangsalyuk" 과학기술과 대량살육 (Science, Technology, and Holocaust). *哲學과 現實* (*Philosophy and Reality*) 11: 12–16.
- Song Sang-yong 宋相庸 (1994). "Yongumsulsa Newton" 연금술사 뉴턴 (Newton, an Alchemist). *學世界* (*Chemworld*) 34, no. 4: 311–12.
- Song Sang-yong 宋相庸 (1995). "Jesus, Marx, Laotzu saieso—Needham ui saeng aewa sasang" 예수, 마르스,老子 사이에서—니덤의 생애와 사상 (Among Jesus, Marx, and Laotzu: The Life and Thought of Joseph Needham). *한국과학사학회지* (*Journal of the Korean History of Science Society*) 17, no. 2: 184–87.
- Song Sang-yong 宋相庸 (1995). "Needham ui hanguk kwahaksa yongu." 니덤의 韓國科學史 연구 (Needham's Study of the History of Science in Korea). *韓國史 市民講座* (*Lectures on the History of Korea for Citizens*) 16: 223–38.
- Song Sang-yong (1999). "Science, Technology, and Society Studies in Korea: Background and Prospects." *Science, Technology, and Society* 4, no. 1: 107–14.
- Song Sang-yong (1999). "The Needham Thesis Revisited: Why Not the Scientific Revolution in China?" Paper presented at Kaoshiung Normal University, 5 June.
- Song Sang-yong (2000). "A Comparative Look at the Development of Science and Technology in Japan, China, and Korea: An Introductory Sketch." In *Globalization in East Asia: Past and Present*, edited by Yoshimoto Kawasaki and Shigeto Sonoda, 241–46. Tokyo: Chuo University.
- Song Sang-yong 宋相庸 (2001). "Saengmyongkonghak ui tojon kwa yulijok taeyong" 생명공학의 도전과 윤리적 대응 (The Ethical Response to the Challenge of Biotechnology). In *Je 14 Hoe Hankuk Chollhakcha Daehoebob* 제14회 한국철학자대회보 (*Proceedings of the Fourteenth Conference of the Korean Philosophers*), 3–14. Iksan, South Korea: Wonkwang University.
- Song Sang-yong, et al. 宋相庸 외 (2001). "Saengmyongkwahak kwalyon yonguyuli hwangnip pangan e kwanhan yongu" 생명과학 관련 연구윤리 확립방안에 관한 연구 (A Study for Establishing the Research Ethics in Life Science). 국가과학기술자문회의 보고서 (Report to the National Advisory Committee on Science and Technology).

- Song Sang-yong, et al. 宋相庸 외 (2002). “Kwahakkisulin honjang chejong e kwanhan yongu” 과학기술인 현장 제정에 관한 연구 (A Study on the Charter for Scientists and Engineers). 과학기술부 연구보고서 (Report to the Ministry of Science and Technology).
- Song Sang-yong 宋相庸 (2003). “Saengtaeuiki wa chayonnkwan—White 2se myongjerul chumsimuro” 생태위기와 자연관—화이트 2세 명제를 중심으로 (Ecologic Crisis and the View of Nature with Special Emphasis on the White Jr. Thesis). *인문학연구 (Journal of Humanities)* 33: 169–79.
- Song Sang-yong 宋相庸 (2004). “Inganbaea Chulgsepo yongu ui yuli” 인간배아 줄기세포 연구의 윤리 (Ethics of Human Embryonic Stem Cell Research). *생명연구 (Studies on Life)* 6: 115–31.
- Song Sang-yong (2005). “Joseph Needham in Pyongyang.” Paper presented at the Eleventh International Conference on the History of Science, Technology and Medicine in East Asia, Munich, 8 August.
- Song Sang-yong (2005). “Bacteriological Warfare in Recent History.” Paper presented at the International Conference on Bioethics, Gijon, Spain, 23 November.
- Song Sang-yong 宋相庸 (2006). “Cholhakja duri bon Dawin” 철학자들이 본 다윈 (Darwin Viewed by Philosophers) 다윈 탄생 200 주년 기념 심포지엄에서 발표. Paper presented at Darwin Bicentennial Symposium, Seoul, 2 July.
- Song Sang-yong (2006). “Unit 731 in the Context of East Asia.” Paper presented at the Eighth World Conference on Bioethics, Beijing, 8 August.
- Song Sang-yong (2006). “Human Rights, Science, and Ethics.” COMEST Ordinary Session, COMEST Fourth Session Proceedings, Paris.
- Song Sang-yong (2006). “Reflections on the UNESCO Recommendation of 1974.” Background Paper for the UNESCO Consultation Meetings.
- Song Sang-yong (2006). “The Rise and Fall of Embryonic Stem Cell Research in Korea.” *Asian Biotechnology and Development Review* 9, no. 1: 65–73.
- Song Sang-yong (2007). “The Hwang Woo-Suk Scandal Hasn’t Ended.” Invited paper presented in the session “After Hwang” at the Atlas of Ideas: Mapping the New Geography of Science Conference, London. *Bioethics (생명윤리)* 8, no. 2: 1–10.
- Song Sang-yong (2007). “Environmental Ethics in Korea, 2000–2005.” *KAST Review of Modern Science and Technology* 3: 1–4.
- Song Sang-yong 宋相庸 (2008). “Yebangnjsclr, chonmungajuui, tonghmulkwon” 예방원칙, 전문가주의, 동물권 (Precautionary Principle, Expertism, and Animal Rights). *Hankyoreh* 한겨레 28 May.
- Song Sang-yong 宋相庸 (2008). “Needham, sekyunjon, tongasiakwahaksa” 니덤, 세균전, 동아시아과학사 (Needham, Bacteriological Warfare, and History of Science in East Asia). *Hankyoreh* 한겨레 20 August.
- Song Sang-yong (2008). “Socialist Origins of STS.” Paper presented at the Eighth International Conference on STS in East Asia, Wuhan, China, 20 March.
- Song Sang-yong 宋相庸 (2009). “Inmunhakja Darwin” 인문학자 다윈 (Darwin as a Humanist) 특별강연, 한국연구재단 (Special Lecture, Korea Research Foundation), 7 November.
- Song Sang-yong (2010). “Reflections on the Second Wave of STS.” Paper presented at the Annual Meeting of Society for Social Studies of Science, Tokyo, 27 August.
- Song Sang-yong (2010). “An Historian of Western Science Looks at the War and Medicine in East Asia.” Paper presented at the International Symposium “War and Medicine in East Asia, 1937–1953,” Center for Hospital History and Culture, Seoul National University Hospital, 1 October.
- Song Sang-yong 宋相庸 (2011). “Three mile som, Chernobil, Fukushima” 스리마일섬, 체르노빌, 후쿠시마 (Three Mile Island, Chernobyl, and Fukushima). *Hankyoreh* 한겨레 26 March.
- Song Sang-yong 宋相庸 (2011). “Saengmyong e kwalyondoem myotkaji munjedul” 생명에 관련된 몇가지 문제들 (Some Problems on Life). In Chiryoo rul nonhada 치료를 논하다 *Talking about Therapy*, 121–38. Chunchon, South Korea: Sanhaek 도서출판 산책.
- Song Sang-yong 宋相庸 (2011). “Noli, yoksa, sahoe. kwahakcholhak ui pyonmo” 논리, 역사, 사회. 과학 철학의 변모 (Logic, History, Society: Changing Faces of Philosophy of Science). In *Kwahakcholhak: Hurum kwa chaengjom, kurigo hwakjang 과학철학: 흐름과 쟁점, 그리고 확장 (Philosophy of Science: Stream, Controversies, and Expansion)*, 479–507. Paju, South Korea: Changbi 창비.
- Song Sang-yong (2011). “COMEST Explores International Action in Environmental Ethics.” Paper presented at the Kyoto International Symposium. *Environmental Philosophy (환경철학)* 11: 133–42.
- Song Sang-Song (2012). “A Philosopher Looks at Climate Change.” Paper presented at Regional Workshop on Impacts and Mitigation of Climate Change in Asia and Oceania, Vladivostok, 30 July.
- Song Sang-yong (2013). “Beyond Scientism: Coming of the Ethics of Science.” Paper presented at the European Patent Office, Munich. *KJHS (Korean Journal for the History of Science)* 35, no. 2: 389–98.

## Suggestions for Further Reading

- Bernal, J. D. (1939). *The Social Function of Science*. London: Routledge.
- Bernal, John D., and A. L. Mackay (1966). "Towards a Science of Science." *Organon* 3, no. 66: 9–17.
- Calvin, Melvin (1956). "Die Chemische Evolution und der Ursprung des Lebens." *Die Naturwissenschaften* 1, no. 17: Korean translation by Song Sang-yong, 1958.
- Collins, Harry, and Robert Evans (2002). "The Third Wave of Science Studies: Studies of Expertise and Experience." *Social Studies of Science* 32, no. 2: 235–96.
- Commoner, Barry (1971). *The Closing Circle: Nature, Man, and Technology*. New York: Knopf. Korean translation by Song Sang-yong, 1980.
- Conant, James B. (1900 [1952]). *Modern Science and Modern Man*. New York: Columbia University Press. Korean translation by Song Sang-yong, 1973.
- Dedijer, Stevan (1965). "The Science of Science: A Programme and a Plea." *Minerva* 4, no. 4: 489–504.
- Dobrow, G. M. (1971). *Wissenschaftswissenschaft*. Berlin: Akademie.
- Fu, Daiwie (2007). "How Far Can East Asian STS Go?" *East Asian Science, Technology and Society* 1, no. 1: 1–14.
- Fu, Daiwie, Yuko Fujigaki, and Togo Tsukahara et al. (2011). "An East Asian STS Panel Discussion on Japan's 3/11 and Fukushima Crises." *East Asian Science, Technology and Society* 5, no. 3: 375–422.
- Fu, Daiwie (2012). "Kuhn's Structure of Scientific Revolutions and Developments of History and Philosophy of Science and Science and Technology Studies: A Short Story." *East Asian Science, Technology and Society* 6, no. 4: 541–48.
- Fuller, Steve (2000). *Thomas Kuhn: A Philosophical History for Our Times*. Chicago: University of Chicago Press.
- Fuller, Steve (2007). "Learning from Error: An Autopsy of Bernalism." *Science as Culture* 16, no. 4: 467–74.
- Gao, Lu (2016). "From Dialectics of Nature to STS: The Historical Evolution of Science Studies in China." In *Science Studies during the Cold War and Beyond: Paradigm Defected*, edited by Elena Aronova and Simone Turchetti, 267–88. New York: Palgrave Macmillan.
- Giere, Ronald N. (1993). "Science and Technology Studies: Prospects for an Enlightened Postmodern Synthesis." *Science, Technology, and Human Values* 18, no. 1: 102–12.
- Hamlin, Christopher (2007). "STS: Where the Marxist Critique of Capitalist Science Goes to Die?" *Science as Culture* 16, no. 4: 397–461.
- Harris, Sheldon H. (1994). *Factories of Death: Japanese Biological Warfare 1932–45, and the American Cover-Up*. London: Routledge.
- Heisenberg, Werner (1959). "Die Plancksche Entdeckung und die Philosophischen Probleme der Atomphysik." *Universitas* 14, no. 2: 135–48. Korean translation by Song Sang-yong, 1962.
- Hong Sungook, S. Y. Lim, J. H. Park, and T. H. Kim (2008). "The Hwang Scandal and Human Embryonic Stem-Cell Research." *East Asian Science, Technology and Society* 8, no. 1: 1–45.
- Jamison, Andrew (2006). "Social Movements and Science: Cultural Appropriations of Cognitive Praxis." *Science as Culture* 15, no. 1: 45–59.
- Jananoff, Sheila, et al., eds. (1995). *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage.
- Kuhn, Thomas S. (1962). *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press. Korean translation by Kim MyungJa, 1980; Kim MyungJa and Hong Sungook, 2013.
- Li, Zhengfeng (2016). "Reflecting STS: A Historical Review of STS in Mainland China." Paper presented at the STS Network Conference, Beijing, 18–20 November.
- Martin, Brian (1993). "The Critique of Science Becomes Academic." *Science, Technology and Human Values* 18, no. 2: 247–59.
- Mikulinski, S. R. (1974). "La Science de la Science: Problèmes et Recherches des Années 1970." In *Science Policy Studies, International Commission for Science Policy Studies, IUHPS, Tokyo*, 186–200.
- Muller, H. J. (1957). "Radioactive Fallout and Human Progress." In *Proceedings of the Second Congress of the International Union of Humanism and Ethical Union*, 26–35. Utrecht, the Netherlands: IHEU. Korean translation by Song Sang-yong, 1962.
- Nakajima, Hideto (2007). "Differences in East Asian STS: European Origin or American Origin." *East Asian Science, Technology and Society* 1, no. 2: 237–41.
- Nakajima, Hideto (2013). "Depoliticization or Americanization of Japanese Science Studies." *Social Epistemology* 27, no. 2: 163–76.
- Nakayama, Shigeru (1991). *Science, Technology and Society in Postwar Japan*. London: Kegan Paul.



- Nie Jing-Bao, Takeshi Tsuchiya, Hans-Martin Sass, and Keiichi Tsuneishi (2003). "A Call for Further Studies on the Ethical Lesson of Japanese Doctors' Experimentation in Wartime China for Asian and International Bioethics Today." *Eubios Journal of Asian and International Bioethics* 13, no. 3: 106–7.
- Nie Jing-Bao, Nanyan Guo, Mark Selden, and Arthur Kleinman, eds. (2010). *Japan's Wartime Medical Atrocity: Comparative Inquiries in Science, History, and Ethics*. London: Routledge.
- Ossowska, Maria, and Stanislaw Ossowski (1964). "The Science of Science." *Minerva* 3: 172–82.
- Price, Derek J. de Solla (1964). "The Science of Science." In *The Science of Science*, edited by Maurice Goldsmith and Alan Mackay, 195–208. London: Souvenir.
- Price, Derek J. de Solla (1965). "The Scientific Foundations of Science of Science." *Nature* 106, no. 4981: 233–38.
- Ravetz, Jerome R. (1971). *Scientific Knowledge and Its Social Problems*. Oxford: Oxford University Press.
- Rose, Hilary, and Steven Rose (1969). *Science and Society*. London: Allen Lane.
- Rose, Hilary, and Steven Rose, eds. (1976). *The Political Economy of Science: Ideology of/in the Natural Sciences*. London: Macmillan.
- Russell, Bertrand (1935). *Religion and Science*. London: Oxford University Press. Korean translation by Song Sang-yong, 1976.
- Salomon, Jean-Jacques (1998). "Science, Technology, and Society on the Eve of the New Century." *Bulletin of Science, Technology and Society* 18, no. 6: 414–20.
- Sasamoto, Yukuo (2009). "Korean Atomic Bomb Victims." *Historia Scientiarum* 19, no. 2: 160–69.
- Spiegel-Röesing, Ina (1973). *Wissenschaftsentwicklung und Wissenschaftssteuerung. Einführung und Material zur Wissenschaftsforschung*. Frankfurt-am-Main: Athenaem.
- Spiegel-Röesing, Ina, and Derek de Solla Price, eds. (1977). *Science, Technology and Society. Cross-Disciplinary Perspective*. London: Sage.
- Steiner, Helmut (1989). *J. D. Bernal's The Social Function of Science, 1939–1989*. Berlin: Akademie.
- Susskind, Charles (1973). *Understanding Technology*. Baltimore: Johns Hopkins University Press. Translation by Song Sang-yong and Park Sun Chol, 1979.
- Werskey, Gary (1978). *The Visible College*. London: Allen Lane. Korean translation by Song Jin Woong, 2016.
- Werskey, Gary (2007). "The Visible College Revisited: Second Opinions on the Red Scientists of the 1930s." *Minerva* 45, no. 3: 305–19.
- Werskey, Gary (2007). "The Marxist Critique of Capitalist Science: A History in Three Movements?" *Science as Culture* 16, no. 4: 397–461. Korean translation by Kim Myong-Jin, 2011–12.
- Woodhouse, Edward, David Hess, Steve Breyman, and Brian Martin (2002). "Science Studies and Activism: Possibilities and Problems for Reconstructivist Agendas." *Social Studies of Science* 32, no. 2: 297–319.

**Song Sang-yong** is professor emeritus in the Department of History at Hallym University, Chunchon, South Korea. He received his BS in chemistry and BA and MA in philosophy from Seoul National University, and an AM in the history and philosophy of science from Indiana University. He is a Life Fellow of the Korean Academy of Science and Technology.