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SOUTH KOREA

A different exemplar

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1. Introduction

South Korea is no longer a developing country. Its gross domestic product (GDP) ranks just outside the top 10 countries in the world. Its technological advancement is well demonstrated in Korean industries and products such as electronics, ICT, automotive, oil refining, steelmaking and shipbuilding. As of 2016, Korea's gross R&D investment occupied 4.24 per cent of the nation's total GDP, the top rank in the world (joint with Israel). In that year, Korea's private companies made 77.7 per cent of the nation's R&D investment and employed 69.7 per cent of the nation's R&D personnel (Ministry of Science and ICT, 2018a). This is quite different from other countries, with the private sector, rather than the public one, being the major player in R&D in Korea.

Compared with Japan and China, Korea was very late in accessing Western science and technology. Scholars of the Realist School of Confucianism called Silhak brought back from Beijing Chinese-translated science books from the mid-18th century, and re-translated some into Korean (Park, 1986). Japan, on the other hand, had, from the mid-16th century, imported Western science and technology through trade with Portugal and later through systematic encounters with the Netherlands. China was exposed to Western science by European Catholic priests from the early 17th century. Therefore it is natural that many basic science-related terms being used in those three countries originated from Japanese translations with Chinese characters, including 'science' per se as 科學 (literally meaning 'study of classification').

Today, South Koreans take pride that Korea is the only country in the world that has fully accomplished both political democratisation and advanced industrialisation from a zero base after World War II. Germany and Japan

were already highly advanced countries before WWII, but Korea was not. During the Japanese occupation (1910–45), Korea was absolutely plundered for Japanese interests and benefit. This situation worsened in June 1950, when North Korea invaded South Korea with the support of China and Soviet Russia. By the time the armistice was signed in 1953, the Korean peninsula was completely ruined. South Korea's annual per capita income for the early 1960s was less than US\$100. South Korea was one of the most impoverished countries in the world, having a large population and no natural resources except coal. It was even poorer than North Korea, which had abundant resources of coal and other minerals but only half the population of South Korea.

When Korea gained its independence after Japan's defeat in 1945, approximately 80 per cent of the Korean public were illiterate and by 1961, 70 per cent remained so. The general public had little exposure to, interest in or knowledge of science. Major General Park Chung-hee had seized power in a military coup in 1961, and he recognised the importance of science in national development because he had observed the advancement of Japan and America during his military training in both countries. His political leadership focused on making Korea an economically well-to-do country through developing and mobilising science and technology above all (Hyun, 2005).

President Park began a political campaign for making the public aware of the importance of science. He implemented four conditions needed to advance science and technology that Dedijer (1963) suggested:

- science policy should be included and emphasised as a key in national development policy
- the political elite should recognise that science and its successful implantation are necessary for national progress
- a central research organisation should be established to foster research, to demonstrate science's role in society's major decision-making, and to support growth of science in universities
- a scientific community of researchers and teachers should be organised to cultivate science in society.

These developments are familiar to the author of this chapter, and parallel his involvement in developing Korea's national policies on science communication. When the author went to the USA for graduate study in 1978, Korea was still poor enough to demand a national examination of qualification for overseas study due to severe lack of foreign currency. In 1977, Korea's gross

national income (GNI) per capita was less than US\$1,000 (US\$960 in 1977, US\$27,600 in 2016).¹ But the Korean people were at last liberated from hunger and the basic need for household electricity was satisfied. Professor Kim's initial exposure to the philosophy of science was in a graduate communication class taught by Professor Richard F. Carter at the University of Washington (Seattle) in 1978–82. This exposure was a shock, a chance to contemplate science and technology and the policies for developing them. In 1982, Korea was politically still under the highly oppressive regime of another general: President Chun Doo-hwan. Economically, however, the country was booming, exporting labour-intensive products such as textiles and shoes and some moderate tech products such as electronic goods, steel and ships. The nation was desperate for political democratisation and scientific and technological advancement.

The author describes how he became involved in science communication:

I can't forget one day in early winter in 1986 ... in which I began to serve as a professor of communication in Sogang University after having moved from Hanyang University in Seoul. I saw a public notice in a daily newspaper that a symposium on science popularisation would be held in a conference room of the Press Center in downtown Seoul. I decided to attend there just to look at what would be talked about. A few natural scientists were found to deliver normative arguments for popularising science toward the general public. They stressed that science popularisation was urgent for national progress into further high-technology industry. But they made little mention of specific communication or media strategies for it. At the close, I commented on some potential strategies. Although I had to leave immediately to go home, several persons followed me to an elevator and wanted to meet me at my office the following day. They turned out to be public officials of the Ministry of Science and Technology who were anxious to make national policies for science popularisation. This is how I became involved in Korea's national policymaking for, first, science popularisation, and later, science communication from more of the public's perspective.

In principle, functional needs precede structure, although function may follow structure later (e.g. 'role'). This principle is more constructive (Carter, 2020; Kim et al., 2014) than the structural-functionalism often cited (e.g. Parsons, 1977). In Korea, the policy on science communication came from the functional need for national development. Thus, many of its derivatives, whether they were institutions, activities or studies, were the *first* such ventures in Korea, and the

1 IndexMundi (2019) using the World Bank Atlas method.

author became closely engaged in starting (or re-starting) them, as the first US-trained PhD in communication who showed serious interest and expertise in science communication in Korea. He became the first social scientist to be awarded one of the Orders of Science and Technology Merit (Woong-bi-jang) (Korea's equivalent to a US National Medal of Science) bestowed by the President of the Republic of Korea in April 2001, for his contributions to the development of science communication in Korea.

The story that follows segments Korea's history of science communication into three themes: 1) public familiarisation with science; 2) professionalisation of science popularisation; 3) specialisation of science communication. This division reflects Korea's unique history of science communication development. The conclusion suggests a new direction for effective science communication in a rapidly changing era.

2. Public familiarisation with science

On 15 August 2018, President Moon Jae-in delivered the 72nd anniversary address for Korea's Independence Day. In the address, he mentioned five deceased patriots who had not been well remembered for their great contributions to Korea's independence from Japanese rule. One was Yong-Gwan Kim who in 1934 created the first Science Day in Korea. The date he and 31 colleagues chose was 19 April, the anniversary of Charles Darwin's death (Park, 2017).

Yong-Gwan Kim was the pioneer in exposing the Korean general public to science and technology during Japanese colonial rule. At college in Seoul he majored in ceramic engineering before moving to Tokyo in 1918 for another year's study. This overseas study completely changed his career. He believed Japan's remarkable modernisation came from infusing people's ordinary way of life with science and technology, and he returned to Korea to establish the Invention Society in 1924 and publish the first science magazine *Science Joseon* ('Joseon' means Korea) in 1933.

The first Science Day in Seoul included a car parade, lectures, a radio talk, experiments, science movies and visits to science-related institutes. It was so successful that it continued for a week. It was also held in Pyongyang, then the biggest city in the north of the Korean peninsula. Contemporary intellectuals supported Yong-Gwan Kim and his activities, and this momentum led to the founding on 5 July 1934 of the Society of Disseminating Scientific Knowledge, for which he served as the executive director.

However, the Japanese colonial government in Korea came to regard the Science Day festival as being like a Korean independence movement and moved to restrain it after 1937. Yong-Gwan Kim was arrested and imprisoned in 1938. All movements to increase public familiarisation with science and technology were completely abandoned. He was released from prison in 1942, three years before Korea's liberation from Japan, but nothing remained and most of his former fellows had changed into pro-Japanese collaborators. A disappointed man, he moved to Manchuria and vanished from sight.

The first movement to familiarise the Korean public with science and technology had taken place in 1883, about 50 years before the first Science Day. Korea had signed a treaty of commerce and friendship with Japan, USA, Britain, Germany and Russia between 1876 and 1884, and now confronted a new era of civilisation and enlightenment. During the late 'Joseon Kingdom', public emissaries were sent to Beijing and Tokyo and they saw new advanced systems that might be adopted in Korea. One of their conclusions was that newspapers seemed to be a key to enlightening the general public in those developed countries.

Yeong-Hyo Park, an official emissary of King Gojong to the Japanese government, returned to Korea in January 1883 after having spent five months in Japan. Advised by the leader and symbol of Japan's modernisation, Fukuzawa Yukichi, Park brought three Japanese journalists and a printing machine to Korea to establish the first modern newspaper. He persuaded the government to publish the *Hanseong Sunbo*, a newspaper issued every 10 days. The first issue came out on 31 October 1883, announcing that it aimed to enlarge public knowledge of foreign as well as domestic news. It was intended to overcome underdevelopment by introducing developed countries' civilisations and systems (Cha et al., 2001).

From the first issue, it reported on electricity, trains, steamships, the telegraph and even astronomy. The newspaper was printed in Chinese instead of Korean, because the former was then the government's official language. Its circulation was estimated to be about 3,000. This means the newspaper was accessible to a very limited number of educated intellectuals, not to the majority of citizens. The newspaper stopped publication a year later when Park and his followers attempted the Reformist Revolution on 4 December 1884. The revolution failed and he fled to Japan.

The Korean peninsula became independent of Japan in 1945, but soon after was again engulfed in severe ideological and political conflict. Following the Korean War in 1950, it was divided into South Korea and North Korea. South Korea, a free and democratic country, had many newspapers that reported

widely on science and technology, especially in 1957 when the Soviet Union launched Sputnik. The *Hankook Ilbo*, a daily, established the first science desk in 1958, an independent Department of Science and Technology News (Korea Science Journalists Association, 2014). Citizen exposure to science and technology news, however, was still very limited, given national literacy and the limited number of subscriptions.

How, then, did Koreans become fully familiar with science and technology? When Korea was liberated from Japanese rule in 1945, only about 130 scientists were available (Hyun, 2005). By 2016, Korea's research workforce has increased to 361,292 (full-time equivalents), ranked just behind China, USA, Japan, Russia and Germany (Korea Institute of S&T Evaluation and Planning, 2017). This leap started with the regime of President Park Chung-hee who seized power in a military coup in 1961.

In his first Five-Year Economic Development Plan (1962–66), President Park set six national directions for realising the vision of modernisation: industrialisation oriented to exporting; consecutive five-year planning for economic growth; projects to increase the income of people in farming and fishing; inducements to foreign capital and technology; development of infrastructure facilities; and the government's guarantee for supporting corporate development projects. He was determined to change Korea's main business from exporting light industrial goods to exporting heavy industry and chemical products by advancing the level of science and technology (Hyun, 2005).

Science and technology were now considered the backbone of economic growth. However, few R&D infrastructure facilities were available outside a handful of universities. The government thus established public institutions accountable for science and technology development: the Korea Institute of Science and Technology (KIST) in 1966 as the nation's major R&D institute, modelled on the US Battelle Memorial Institute; the Ministry of Science and Technology (MOST) in 1967 as the government's top decision-making agency; the Korea Academic Institute of Science and Technology (KAIST) in 1971 as the nation's major producer of advanced degrees (MS, PhD) in science and engineering; the Seoul National Science Museum in 1972, the second grand opening following a major renovation; and the Korea Science and Engineering Foundation (KOSEF) in 1977 as the nation's research funding agency.

These newly established institutes and agencies demanded many engineers and scientists, but Korea had produced only 196 domestic PhDs in science and engineering between 1945 and 1970; and in October 1970, only 309 graduate students were enrolled in the nation's graduate programs of science and engineering. There were, however, 1,220 Korean graduate students in

similar programs in the US, and approximately 1,400 Korean natural and engineering scientists with advanced degrees in science and engineering were working in America. So President Park's government invited these high-quality Korean scientists to return to Korea. They were offered very special treatment: for instance, KIST provided them with modern housing and a salary three times that of a major national university professor, in addition to relocation expenses from overseas.

Figure 33.1: President Park's stone monument (12 February 1973).

Source: KOFAC 50-year history.

President Park's impact and that of these new institutions extended the government's political motto 'Scientification of the Whole Nation', which is inscribed on his 1973 stone monument (see Figure 33.1) in the Seoul National Science Museum, currently National Children's Science Center. He was assassinated in 1979 but his legacy survives.

2.1. Professionalisation of science popularisation

In the 1980s, South Korean citizens began to enjoy a moderate level of economic prosperity, but they still suffered political oppression under the military regime of General Chun Doo-hwan. Protests against his dictatorship were so strong and persistent that the government was forced to take a big step toward political democratisation and constitutional reform, and full democracy came in 1987.

The new economic prosperity demonstrates the success of President Park's five-year economic plans. The government had bred and promoted Korea's Chaebol (unique private conglomerates) so that Korean industries could compete internationally. These conglomerates took advantage of the so-called catching-up strategy to learn and imitate the science and technology used in advanced countries' products (Kim, 1998; Lee and Lim, 2001). Scientists and engineers used their graduate training in advanced countries to make effective use of the catching-up strategy to improve the quality of Korean industrial products.

However, Korean industry needed innovations to survive in the world's competitive markets. This demanded more capable college graduates in science and engineering. The government encouraged students to undertake

majors in science and engineering instead of law and medicine, and industry supported students with scholarships and jobs. The government introduced national policies to bridge science and society so that the public could better understand science and technology, support R&D, and appreciate scientists and engineers. This shift was a final blow to Korea's traditional Confucian view that civil servants, literary scholars and farmers are socially preferable to artisans, craftsmen and tradesmen or merchants.

The term 'science popularisation' started to be commonly mentioned among scientists and was regarded as their public mission. This demanded mobilisation of scientists not only for R&D but also for science popularisation. Some professors became more interested in writing popular science than in conducting research.

The Korea Science Writers Association (KSWA) was founded in 1977 by 10 prominent scientists and science writers, including Professor Moon-Hwa Hong (pharmacologist) and Professor Jung-Hum Kim (physicist) (Korea Science Writers Association, 2008). One year later, the Korean Science & Technology Publication Association (KSTPA) was established by publishers of science and technology books. The two associations aimed to promote science writing and the publishing of science books, hoping to make science more popular with the general public. They instituted awards and, in 1984, KSWA awarded the first Science Writer Prize to Professor Myung-Ja Kim, an active science writer and broadcaster. KSTPA awarded its first Science Book Prize in 1983 (Korean Science & Technology Publication Association, 2018).

As Korean industries became more competitive, the government pushed public R&D institutes to make their research results more available to industry. Those R&D outcomes produced a plethora of scientific and technological information. Major newspaper and broadcasting media came to employ science-specialised journalists to satisfy public curiosity and were ready to organise the Korea Science Journalists Association (KSJA). On 15 December 1984, 51 journalists working at 13 media outlets gathered at KIST, Korea's biggest national R&D centre and established KSJA.

The inaugural declaration of KSJA ended with a commitment to play a part in developing the nation's science and technology through expansion and improvement of science journalism (Korea Science Journalists Association, 2014). The government welcomed KSJA's interest in promoting national policies on the development of science and technology and President Roh Tae-woo (1988–93) delivered the keynote speech to the 1991 KSJA meeting. In Korea today, the journalist's role of promoting science and technology seems stronger than reporting on science with a critical eye.

The government was interested in the efforts that other advanced countries were making to expand and improve science popularisation. Officials from the Ministry of Science and Technology visited the author after the 1986 symposium and invited him to use his international experience to advise them on a national policy for science popularisation. Consequently, he conducted policy research on utilising mass media for science popularisation, examining the state-of-the-art techniques of other advanced countries. The research project commissioned by the government was the first full-scale undertaking dealing with national science communication policy in Korea.

The research, *Considerations and Policies for Science Communication Media*, was completed in November 1987 (Kim, 1987). It introduced established arguments that science popularisation and science communication were needed not only for national modernisation but also for further development of democracy (e.g. by using scientific information to improve rational decision-making). It also analysed the state of the art in organisations (e.g. the American Association for the Advancement of Science (AAAS), the British Association for the Advancement of Science (BAAS) and the National Association of Social Workers (NASW)), systems (e.g. awards, fellowships), media (e.g. *Science*, *Nature*) and science news in US, UK, Japan and Korea. It presented a comprehensive picture of potential policies to advance science popularisation and science media in Korea.

The ministry then funded the author for a series of research projects through the Korea Science and Engineering Foundation (KOSEF): in 1988, for policy development on educating and training social leaders to enhance their understanding for the importance of science, science policy and science popularisation; in 1990, for building an effective system of publicising science-related information to facilitate science journalism; in 1991, on activating 'Science Month of April' for science popularisation; in 1992, on long-term plans for science popularisation with an analysis of US examples for the science popularisation movement. A collection of these produced the first book on science popularisation policies in Korea: *Studies on Policies for Science Popularization in Korea* (Kim, 1993). It introduced to government officials and the scientific community new strategies for extending science to the general public.

In 1996 the Korea Research Foundation appointed the author as principal investigator of a three-year research project to diagnose the state of scientific culture in Korea. Six researchers analysed the Korean public's understanding of science and technology, the contents of science-related news reports in major dailies, the contents of science-inclusive advertisements in mass media, the reflections on science in plays and movies, the implications

of science in recreation/leisure activities and facilities, and the potential of mutual development between science and society. This resulted in the first comprehensive book about scientific culture in Korea: *Understanding of Scientific Culture – Communication & Comparative Analysis* (Kim et al., 2000).

The 1991 research on 'Science Month of April' introduced to Korea the world's major science festivals: UK's BAAS summer festival, Edinburgh International Science Festival, USA's National Science and Technology Week and Japan's Science and Technology Week. Korea had briefly celebrated 'Science Day' under Japanese rule, but after independence, it regularly commemorated the establishment of the Ministry of Science and Technology in 1967. However, people did not see Science Day as a 'festival'. They could not imagine that science and technology, seemingly rigid and formal, might be entertaining until the Korea Science Foundation (KSF), a scientific-culture promotion agency, held the first week-long Science Festival in April 1997.

The Science Festival was extended into the 'First APEC Science Festival' held in Seoul in August 1998. Korea was scheduled to host the Asia-Pacific Economic Cooperation (APEC) conference of Science Ministers in 1998. The author was asked to suggest a science-related project on which APEC countries could cooperate beyond R&D collaboration by the science officer of then President Kim Young-sam. He came up with the idea of an 'APEC Science Festival' for youths, with the host rotating among member countries. Because APEC countries had few commonalities regarding culture, history, nature, race, science and youth were a suitable common ground for mutual development in APEC countries.

This produced in Korea a new vocation of science-specialised public promotions through exhibitions, events and entertainment.

Science popularisation tries to improve science and technology literacy. It is based on the learning-theory model: more interest leads to more knowledge, which results in attitude change, hopefully more positive. Communication is supposed to serve two functions: information transmission and persuasion. The former is assumed to increase interest and knowledge; the latter to change attitude. Thus, popularisation effects have been measured as to how much interest the public has in science, how much knowledge they have and how positive their attitude is toward science (Miller, 1983; Durant et al., 1989). Further variables are often also measured, such as political knowledge (e.g. Bauer et al., 2000).

In 1991, the KSF surveyed the public understanding of science for the first time, and then again in 1995. Korea Gallup designed and executed both as face-to-face interviews. Survey results were reported in international forums (Kim and Yoon, 1993, 1995). Many questionnaire items were modelled, for comparison and in light of competition, on the US and the EU surveys of public understanding, literacy and perceptions of science. (These surveys would continue into the 21st century.) They assessed interest in science, knowledge of scientific facts, perceptions of science's effects on living conditions, health, economic development and environment, as well as media-related sources of scientific information (see Appendix II, Kim et al., 1996).

These surveys, based on the learning-theory model, take the information provider's point of view and perspective. But there was a growing view that Korea needed a new, innovative model that could reflect the public's point of view and perspective about science and communication. Eventually, the ministry's subsidiary organisation, the Science and Technology Policy Institute (STePI), decided to fund the author in a joint research proposal with a US team that included two University of Washington faculty members, Professors Richard F. Carter and Keith R. Stamm. The full report of this research, which focuses on public engagement with science, was published in a book (Kim et al., 1996).

Public engagement starts from relevance brought forth by vexing problems and/or by issues in which available, often conflicting, solutions compete. The theory is that problems and issues therefore govern involvement with science and technology, insofar as science and technology are conceived to contribute to solving those problems and issues. Communication is considered effective if it achieves public exposure to and focused attention on problems and/or issues, and subsequently relating them to science and technology, recognising that this might *not* accomplish knowledge gain and attitude change about science. This process of engagement was suggested as a new model for measuring public understanding of science (PUS) after two pilot tests in Korea and US.

This new model (see Kim, 2007b) was anticipated to mark a turning point for the establishment of science communication and for traditional PUS studies. Science communication practitioners could improve their effectiveness by starting with contemporary problems and/or issues. This might enable the public to construct meaningful impressions of science and technology, irrespective of knowledge of or attitude toward them. Korea was set to start a new era of science communication, not depending upon the limited learning-theory model.

3. Specialisation of science communication

Although South Korea's industrialisation and economy seemed to have become much stronger in the 1990s, its international competitiveness was falling. Korean companies had long been indifferent to R&D investment and the export of their products was declining. In late 1997, Korea encountered a financial crisis due to lack of foreign currency and had to ask the International Monetary Fund (IMF) for a bailout. In return, the government had to restructure its national economic system, which gave rise to massive company closures and sweeping employee dismissals in 1998–99. The so-called IMF crisis, one of the biggest economic disasters in Korea's modern history, did give momentum to R&D investment and scientific and technological advancement.

The Korean government grew much more concerned with advancement of science and technology, now even more firmly believed to be the engine of economic growth and prosperity. The government became more committed to involving the public and to encouraging talented youths to major in science and engineering, greatly increased the national R&D budget, and induced the general public to recognise the importance of science and technology. The Ministry of Science and Technology and its subsidiary organisation, the KSF, established the Academy for Scientific Culture, an educational institution for science communication at Sogang University, promising their full funding for the academy's operation. The academy was headed by the author who, with Professor Deok-hwan Lee of the Department of Chemistry at Sogang University, constituted an operating committee. Lee had earned a high reputation as a traditional science populariser and science communicator, writing numerous columns in newspapers and often appearing on TV as a science commentator. In 2003, the Academy for Scientific Culture was formally founded as an affiliated institution of the Sogang University Graduate School of Mass Communication.

The academy focused on science communication training primarily for scientists and employees of science-related institutions. Its program consisted of an eight-week training course (four courses per year; one three-hour night class per week). Those eight classes covered the following themes: importance of scientific culture, principles of science communication, science magazines, science speech, science journalism, science online media, science broadcasting and science policy. Program graduates received a Certificate in Science Communication Leadership. The Academy for Scientific Culture trained about 1,400 science-related personnel before it closed in March 2012.

KSF urged Sogang University to establish an independent master's degree program focused on producing specialists in science communication. This first graduate program specialising in science communication in Korea was to be fully funded and, in 2004, a new MA program of science communication was founded within the Sogang University Graduate School and headed by Professor Lee. This second academy program was a two-year MA degree program requiring a master's thesis. It emphasised theories and research methodology of science communication (Sogang University and Korea Federation for the Advancement of Science and Creativity, 2011). The MA program has produced 33 graduates as of 2017 and continues to exist, although it is no longer funded by the government. KSF also used to fund KAIST master's program of science journalism that admitted science-related media professionals as students from 2010. Its main focus was on helping them to keep up with advances in science and technology.

There is no historical record of undergraduate classes in science communication in Korea. However, the contribution of Won-Bok Hyun, a former science journalist, is noteworthy. A pioneer of science journalism in Korea, he studied advanced science reporting as a one-year fellow of the Columbia University School of Journalism in New York in 1967–68. Working as a science journalist and even after retirement in 1975, Hyun taught an undergraduate class of science journalism at the Department of Journalism, Hanyang University, in 1969–85 and at Sungkyunkwan University in 1976–84 (Song, 2011).

The first PhD in science communication from Korean Schools was produced in 2004 in the Sogang University Graduate School. In 2004 Dr Seong-Cheol Park completed a doctoral dissertation entitled 'Cognition of Scientific and Technological Topics on the Media'. He discovered people were more engaged (i.e. interest and cognition) with science and technology in respect to relevant problems. His work did not use the traditional research model of a relationship between scientific messages and knowledge gain or attitude change.

Even as Korea began its economic renewal, overcoming the so-called IMF crisis, President Roh Moo-hyun, who took power in 2003, remained committed to advancing the level of science and technology. His government upgraded the position of the Minister of Science and Technology to that of Deputy Prime Minister. It authorised the National Science and Technology Council to control and coordinate the government's total R&D budget across all the ministries. In addition, it adopted 'ScienceKorea' as a key political slogan for improving public understanding of science and its contribution to economic growth. KSF was authorised to implement diverse activities for the ScienceKorea movement (see Cho, 2012; Cho and Kim, 2012, for KSF's/KOFAC's (since 2008) activities).

To start a social movement for ScienceKorea, the government promoted Professor Woo-Suk Hwang, a stem-cell researcher, as a national hero for pioneering breakthroughs in human stem-cell cloning research. However, his research team's publications in *Science* (2004–05) were found to have fabricated evidence, resulting in a world-famous fraud scandal (Kim, 2007a). This might have damaged the cultural authority of science in Korea (see Gauchat, 2012).

Still obsessed with the potential contribution of science to economic growth, the Korean government was interested in how much the general public supports and understands science and technology. KSF began to conduct a national survey every two years starting in 2002. Like the earlier surveys of 1991 and 1995, it was designed and executed by Korea Gallup or other private poll companies. The questionnaire was modelled after the traditional PUS measures such as interest in and understanding of diverse scientific concerns (e.g. scientific and medical discoveries, new invention of technology, environmental pollution, economy, education and agricultural problems, military and international policies) and attitudes toward the scientist's attributes (e.g. endeavour to solve future problems, work for the benefit of mankind, effort to contribute to society, working alone, being unable to get enjoyment of life).

These longitudinal data (2002–16) were recently analysed by two master's students of Professor Martin Bauer at the London School of Economics (Lee, 2017; Chae, 2017). They confirmed that the Confucian instrumental attitude toward science, though fading away in the younger generation, still influenced the Korean public's utilitarian sense of science, and a media event such as the match between AlphaGo (a computer 'Go' player powered by artificial intelligence) and a Korean 'Go' player promoted public knowledge of artificial intelligence.²

The PCST Network, an international network for people active in studying and practising the public communication of science and technology, was launched in 1989. During the seventh conference held in Cape Town, South Africa, in 2002, Korea submitted a proposal to host the ninth conference in Seoul in 2006 with the theme 'Scientific Culture for Global Citizenship' and the promise that the KSF would support the event. It would be an historical occasion for science communication in Asia: the first time the PCST conference was hosted by a non-Western country. Competing with China's proposal, Korea's was accepted in a vote of the Scientific Committee of PCST Network.

2 'Go' is an abstract strategy board game for two players, in which the aim is to surround more territory than one's opponent.

Figure 33.2: PCST-9 notice.

PCST Network allowed a ‘host’ country to have two members on the Scientific Committee and the author was joined on the committee by Dr Sook-Kyoung Cho, a historian of science (especially science museums) and a senior staff member of KSF. She dedicated herself to getting the full support of not only KSF but also other related organisations, including the Ministry of Science and Technology. The Local Organizing Committee based in Korea composed the program in close coordination with the international Scientific Committee. The conference (see Figure 33.2) attracted 463 participants from 31 countries (PCST Network, 2018). Through this international conference, the Korean government and public got to recognise the significance and potential contribution of science communication to the public understanding of science and, further, to economic growth and national prosperity.

The field of science communication had long been unfamiliar even among communication scholars and the associations that represented them. But there was growing interest in the field, and in 2007–08 the Korean Society for

Journalism and Communication Studies (KSJCS) moved to establish a new sub-group, the Division of SHER (Science, Health, Environment and Risk) Communication. The author served as chair of the preparatory committee, which led to KSJCS approving the SHER Communication Division in 2008. Professor Sung-Kyum Cho of the Chungnam National University was elected the first chair of that division. Since then, the division has been very active, providing a platform for presentation of academic research papers in the spring and autumn annual conventions of KSJCS.

Science communication in practice began to branch out. The Ministry of Science and Technology was eager to have a science-specialised public television channel. Although a few public television channels such as KBS and EBS sometimes produced excellent science programs, the government thought the general public should have access to more science programs to enhance scientific literacy. KSF organised the preparatory committee to begin a science TV channel and YTN, a 24-hour public cable television news channel, was chosen to accommodate another science-specialised channel with KSF's financial support. *YTN Science* was launched in 2007. In Korea, if a cable television channel is selected as being in the public interest by the Korea Communications Commission, every cable television firm is required to carry that public-interest channel. *YTN Science* is now running as such a public channel. Although it is questionable how much the science channel has widened public exposure to science and technology in this internet-rampant era, the channel has created a new cohort of professional program producers.

The National Science Museum had existed in Seoul since 1926. In 1990, it moved to Daejeon, located in the middle of South Korea and embracing several nearby science research institutes. Daejeon would host the 1993 Daejeon World Exposition. According to a 2008 National Science Museum analysis, its approximately 3,000 exhibits consisted of mostly eyes-on materials, artefacts, visual images, dioramas and hands-on displays whose main focus was on transmitting scientific knowledge, accompanied in most cases by printed labels and history. Only 26 of the exhibits were related to or connected with Korea's contemporary problems and issues (Lee and Kim, 2008).

As South Korea's industrialisation and economic levels grew, the government decided to build an advanced national science museum in Gwacheon near Seoul, and so organised a special bureau within the Ministry of Science and Technology, with a preparatory committee in 2001. The special bureau was to deal with practical business affairs for constructing the new museum and the preparatory committee was its advisory body. The committee was composed of diverse experts including an architect, a science historian, an exhibition

centre builder, a curator, a science educator and a science communication specialist. However, it did not take long before the different intentions and goals of the bureau and the preparatory committee came to the surface. The former wanted to emulate or copy a science museum or centre from advanced countries, while the latter wanted to create a world-unique, Korean-styled science museum. However, at that time, the Korean government's 'catching-up' stance and strategy prevailed everywhere and so the special bureau was able to thwart the preparatory committee's hopes.

A member of the preparatory committee, the author proposed a basic principle that a science display in the new museum needed to enhance public engagement by being related to relevant problems that were presently or potentially threatening our lives and society. The committee's architect strongly suggested a creative design of the museum building. But those points did not fit major concerns of public officials that were, rather, to expedite the process of decision-making and to seek a world-level resemblance to advanced countries' museums. The Gwacheon National Science Museum opened in 2008 and it could in effect be said to be the first modern, considerably interactive science museum in Korea. It made full use of hands-on, audio-visual and simulation techniques in style, while concentrating on transmission of scientific knowledge.

Following the opening of the Gwacheon National Science Museum, the government decided to build national science museums in three other big cities: Busan, Daegu and Gwangju. The Gwangju National Science Museum opened in October 2013, the Daegu National Science Museum in December 2013 and the Busan National Science Museum in December 2015. Elsewhere in Korea, the number of public and private science museums or centres increased greatly, from 60 in 2008 to 130 in 2017.

Commemorating its 10th anniversary in 2018, the Gwacheon National Science Museum is renovating major halls such as the Traditional Science Hall and Basic Science Hall. Their exhibition is going to use more storytelling techniques so that the public might hopefully feel more connection (Gwacheon National Science Museum, 2018), but it is unfortunate that the exhibits still tend more towards the informative than the engaging.

4. Conclusion and discussion

Private industry and commerce have become very powerful in Korea. The government is no longer the leader of the nation but just one leading actor, especially in the area of science and technology. Private corporations

such as Samsung, LG, Hyundai and SK, in order to survive in the global market, are charged with advancing the cutting-edge levels of science and technology via their huge R&D centres.

Korea has changed into a highly S&T-friendly country in a relatively short period of time. Science and technology are strongly believed to be the main engine for economic growth and social change by the public. But what about democratic change? What about public engagement? What about the problem-solving capability of science and technology that might constitute the cultural authority of science (see Kim, 2019)?

As Korea has experienced rapid modernisation, the most important thing seems to be the commitment of both the political elite and the public to solving national problems through science and technology. As long as they are fully engaged with solving problems, they cannot avoid orienting to science and technology in clarifying problems and constructing their solutions. President Moon Jae-in's current government has put emphasis on public interests and social responsibility of science and technology, and the Ministry of Science and ICT pays new attention to solving problems closely related to the public's daily life, such as unhealthy foods, chemical hazards, cyber misconduct, transportation-related problems, epidemic diseases, environmental pollution and natural disasters (Ministry of Science and ICT, 2018b). To clarify these problems, the government pursues active communication with the public and seeks to fund R&D to develop technologies to solve them.

Science communication needs to enable people to be more engaged with the multifaceted interdependent nature of problems. A solution (e.g. cars) for the transportation problem brought about a more complex problem of climate change (Kim, 2012c), which demands interdisciplinary teamwork (Kim et al., 2016). Science and technology, scientists and technologists too, require effective interdependence. Thus, for interdisciplinary problem-solving, science communication might need to contribute, first and foremost, to constructing teamwork prior to and along with using science and technology to contribute to producing an innovative solution (Kim, 2020). With effective interdependence we could get super-charged engagement.

Today, we can access scientific knowledge almost without limits of space and time through internet communication technology. Why do we still need public science campaigns, science festivals and exhibitions as well as science museums and centres (and so many educational institutions) that mostly aim to pour and push scientific knowledge into the public's memory? Many might be a waste of public money.

There is an argument for a new approach, a new paradigmatic model of science communication for effective problem solving, individual or team, disciplinary or interdisciplinary. The traditional learning-theory model for knowledge gain and attitude change presumes just a persuasion function for communication—a presumption that has all too often been the information provider's wishful thinking. An alternative (Kim, 2007b, 2012a, 2012b) relates science to a problem-solving situation that is the key to bringing forth public engagement. And then it expects people to construct some impression about science, whatever the changes in scientific knowledge or attitude change: an impression relevant to where they are coming from. But the government and science institutions are resistant to this suggested new approach, as are students of science communication, who continue to assume that if scientists transmit scientific knowledge, the public will learn it and cultivate a positive attitude toward science. They still hold the typical notion that the next best (competitively) is to try harder rather than to try better.

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Timeline

Event	Name	Date	Comment
First interactive science centre established.	Daejeon National Science Museum	1990	2008: Gwacheon National Science Museum
First national (or large regional) science festival.	Korea Science Foundation (currently KOFAC)	1997	
An association of science writers or journalists or communicators established.	Science writers	1977	1984: Science journalists 2008: Science communication scholars
First university courses to train science communicators.	Sogang U Academy for Scientific Culture	2003 (full-scale)	
First master's students in science communication graduate.	Sogang University MA Program of Science Communication	2006	An independent program
First PhD students in science communication graduate.	Sogang University Graduate School	2004	
First national conference in science communication.	Organised by a division of SHER (Science, Health, Environment, Risk) Communication	2008 (academic)	
National government program to support science communication established.	Academy for Scientific Culture	2003 (full-scale)	
First significant initiative or report on science communication.	First comprehensive research report	1987	By author of this chapter, Hak-Soo Kim
National Science Week founded.	Science Day (old)	1934	1967: Science Day (new) 1997: Science Festival
First significant TV programs on science.	YTN Science TV	2007 (full-scale)	
First awards for scientists or journalists or others for science communication.	Science Book Prize	1983	1984: Science Writer Prize
Date hosted a PCST conference.	PCST-9, Seoul, South Korea	17–19 May	

Event	Name	Date	Comment
Other significant events.	First PUS survey	1991	
	New PUS Measurement Model	1996	
	New Science Communication Model PEP/IS	2007	

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