The Politics of Technoscience in Korea: From State Policy to Social Movement

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Abstract Focusing on the changing relationships among the state, civil society, and science and technology (S&T) in contemporary Korean history, this article reviews the literature of science and technology studies on the politics of technoscience in South Korea. Arguing that the active role of the state in developing S&T is a defining characteristic of Korean S&T, this article first reviews the statist approaches to S&T, where the politics of technoscience involves mainly policy decisions. Then, by reviewing work on the role of nationalism in Korean technoscience, this article discusses the literature with attention to the reciprocal relationships between technoscience and political power mediated by the nationalist view of S&T. Next, this article evaluates the literature on the Biosafety and Bioethics Act, with emphasis on the interactions among diverse actors, nongovernmental organization activists in particular, in the legislative process. Finally, the literature on public participation and social movements in technoscience is discussed.

Keywords Technoscience · developmental state · civil society · science and technology policy · scientific governance · public participation · social movement

1 Introduction

This article reviews the literature of science and technology studies (STS) on the politics of technoscience in South Korea, including four articles in this issue. The politics of technoscience can be defined as social actions that seek to change the distribution of power in scientific and technological knowledge production and dissemination. Unlike Western STS, which is influenced by the tradition of the sociology of scientific knowledge, Korea's STS began with a strong emphasis on

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technosocial issues; the politics of technoscience has long been the focal point of Korean STS research. Since the majority of STS research conducted in Korea falls under the rubric of the politics of technoscience, it would be beyond the capacity of an article to review all of it. This article therefore focuses on a specific theme of the changing relationships among the state, civil society, and science and technology (S&T) in contemporary Korea.

Arguing that the active role of the state in developing S&T is a defining characteristic of Korean S&T, this article first reviews the statist approaches to S&T, where the politics of technoscience involves mainly policy decisions. Then, by reviewing work on the role of nationalism in Korean S&T, this article discusses the literature with attention to the reciprocal relationships between S&T and political power mediated by the nationalist view of S&T. Next, this article evaluates the literature on the Biosafety and Bioethics Act, with emphasis on the interactions among diverse actors, nongovernmental organization (NGO) activists in particular, in the legislative process. Finally, the literature on public participation and social movements in S&T is discussed.

2 The Developmental State and S&T in South Korea

The politics of technoscience in Korea cannot be discussed without considering the Korean government, because of its crucial role in developing Korea's S&T capability. In the mid-twentieth century, South Korea was economically devastated after Japanese colonial occupation and the Korean War. Since the business and universities were too weak to carry out any meaningful research and development (R&D) activity, the Korean government was the only actor that had sufficient resources and mobilization capacity for the acquisition and development of S&T and took responsibility for building an institutional infrastructure for S&T. Indeed, many distinctive characteristics of Korean S&T resulted from the fact that S&T development was pursued by the state for both economic and political purposes.

Since 1961, when Park Chung Hee seized power through a military junta, Korean political leaders attempted to legitimize the military coup with rapid economic development and anticommunism. In the process, they promoted economic development or industrialization as an attempt not merely to enhance economic well-being but also to accomplish "modernization of the fatherland (祖國近代化)." That is, Korean political leaders used economic development as a form of nation building. S&T was also emphasized as an essential resource that the state needed to mobilize for economic and national development. Like industrialization, therefore, developing indigenous S&T capability under Park's regime had strong political implications. From the outset, they were mobilized for nation building and for legitimizing the regime (B. H. Kim 2006; H.-S. Kim et al. 2010; S.-H. Kim in press; Lee and Hong 2012).

Until the twenty-first century, however, much research has focused only on how the Korean government promoted S&T for the country's economic development and paid inadequate attention to the political aspects of the state commitment to the promotion of S&T. In this line of research, the politics of technoscience meant political decision making about "what technologies the state should seek and how to seek" (Campbell 2008: 14). For instance, although Korea and Taiwan adopted similar developmental

strategies, Korea built an institutional infrastructure for S&T that was relatively inde-
pendent of foreign technology under the guidance of more direct and centralized
coordination by the state (Arnold 1988). Using the term "developmental states," statist
scholars have emphasized the Korean government's early efforts to adopt foreign
technology through importing foreign licenses to catch up with foreign competitors
(Amsden 1989; Choi 1996) or its later policy efforts to develop indigenous high
technology through state-guided "shared projects" among the state-funded research
institutes and domestic firms (Evans 1995; Kim and Lee 1996).

Historians of science have also highlighted the role of the state as an institution
builder. Special attention has been given to the Korean government's decision to set up
state-funded research institutes. Faced with the lack of R&D capacity of the private
sector in the 1960s and 1970s, the Korean government decided to build new research
institutes that would meet the technological needs of local industries in the transition
to heavy from light industry. Consistent with the interests of Korean political leaders,
technocrats, and foreign advisers in promoting S&T for economic development, the
state-funded research institutes were established to win markets (industrial appli-
cations) rather than Nobel Prizes (scientific excellence) and have been working as
such (Kim and Leslie 1998; Moon 2006). As a symbol of the government's direct
involvement in scientific research, the large proportion of state-funded research insti-
tutes in the national R&D system has been a distinctive characteristic of Korean S&T.

While these studies demonstrate the role of the Korean state in building S&T
capabilities for economic development and, in so doing, defining the characteristics
of Korean S&T, they are limited in addressing the politics of technoscience. By and
large, technoscientific politics in these earlier studies has been treated only as state
policy decisions about how to promote S&T (Campbell 2008; Branscomb and Choi
1996). More fundamental technoscientific issues such as how state involvement in
S&T influences distributions of power among technocrats, experts, and lay people and
how it reinforces or changes the structure of social relationships have been rarely
discussed (Frickel and Moore 2006). The problem was particularly salient in the
earlier statist scholarship, which treated the state as a unitary actor, reflecting the
authoritarian political structure in Korea during the mid-twentieth century. In
addition, their analyses tended to focus on the influences of the state on S&T. Hardly
explored was the opposite direction of influence, such as how S&T was involved in the
nation-building process and how it helped the state obtain political legitimacy. Recent
work in STS fills in these gaps by examining nationalism encoded within Korean S&T,
the interactions among actors—including different components of the state, experts,
and civil society—over S&T policies, and public participation in S&T, including
social movements associated with science-related issues.

3 Nationalism and Coproduction of Political Power and S&T

S&T has long been linked with national sovereignty and economic prosperity. Since
World War II, the world powers have supported scientific research on a massive scale
and perceived S&T in terms of national sovereignty. Thus, the United States and the
former Soviet Union engaged in scientific competition for nuclear weapons and the
space race, and during the period of administration by the occupational forces right

after 1945, the United States closed all research institutes and laboratories in Japan, except those with an "obvious peaceful purpose" (Kevles 1987; Yoshikawa and Kaufman 1994).

Since the 1960s, the effect of S&T on national economies has raised growing concern among politicians and technocrats, as well as scholars, and most modern states agree that S&T is a critical component for economic and social development. As a result, S&T has become increasingly viewed in terms of national interests.

This is especially the case in South Korea, where the state intentionally mobilized the nationalist view of S&T. Under Park's authoritarian regime, S&T was endorsed as a principal way to develop the national economy and maintain national sovereignty. Along with "modernization of the fatherland (祖國近代化)," "national restoration (民族復興)," and "industrialization (産業化)," "nation-building through science (科學入國)" was the government's political slogan intended to rally popular support for economic development. Under Park's regime, therefore, S&T was equated with nation building, industrialization, and national prosperity (B. H. Kim 2006; H.-S. Kim et al. 2010; S.-H. Kim in press). Such a political strategy transmitted a strong nationalist view of S&T that appreciates S&T in terms of national interests. A number of STS papers have documented not only the roles of the state in shaping the nationalist view of S&T but also the effect of the nationalist view of S&T on the public's responses to issues such as the Hwang stem cell scandal (Gottweis and Kim 2009, 2010; L. Kim 2008; T.-H. Kim 2008; J. Kim 2009; Kitzinger 2008), scientists' norms and practices (Bak in press), and S&T policy making (Jasanoff and Kim 2009; S.-H. Kim in press).

The nationalist view of S&T among Koreans has drawn much attention among STS scholars who believe that nationalism was responsible for the rise of Hwang as a national hero and the Korean government's and widespread popular enthusiastic support of him during the stem cell scandal (Gottweis and Kim 2009, 2010; L. Kim and T.-H Kim 2008; J. Kim 2009). Tae-Ho Kim argues that Hwang himself took advantage of the nationalistic rhetoric to whip up public support for his research, with such statements as "I just put up Taegeuk'ki [Korean national flag] on top of the mountain of biotechnology" and "I want to put the 'made in Korea' mark on stem cells" (2008: 31). Observing Hwang supporters' strong desire to build an advanced nation through science, Jongyoung Kim (2009) also claims that nationalism helped to sustain their belief in and support for Hwang even after his misconduct was publicized. Emphasizing ethnicity as the key marker for national identity in Korea, Herbert Gottweis and Byoungsoo Kim (2009, 2010) propose a concept of bionationalism that distinguishes itself from traditional ethnic nationalism by relying on new biomedical concepts of genetics and stem cells instead of blood. As these markers were viewed not just as a means for defining national identity but also as a means for enhancing national competitiveness through new biomedicine, Gottweis and Kim contend, bionationalism reinforced developmentalism in Korea and prompted support for Hwang's controversial research (2010: 507).

Yet more nuanced accounts of the function of the nationalist views of S&T as a mediating force between the state and S&T are found in Sheila Jasanoff and Sang-Hyun Kim's comparative analysis of the views of nuclear power in the United States and Korea. Defining sociotechnical imaginaries as "collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects" (2009: 120), they use the concept to explicate

the interactions between nuclear technology and political power in the United States and Korea. Note that the concept is likely to be linked to exercise of state power. They attempt to understand, therefore, how technoscientific and political order are coproduced by exploring not only what roles each state played in defining the social meaning of nuclear power but also how the development of nuclear power encoded a specific notion of what a nation should stand for. Jasanoff and Kim also assert that, while nuclear technology has been imagined with nationhood in the United States and Korea, each country has developed very different sociotechnical imaginaries. While the US nuclear imaginary has been primarily "a potentially runway technology" that demands effective containment, the South Korean nuclear imaginary can be epitomized as "the atom for national development." Under Park's military regime, nuclear power became incorporated into the state's imagining of national development. Coinciding with a national desire for energy self-sufficiency to support rapid industrialization, Koreans tended to perceive nuclear power as a critical technology for economic independence. In its efforts to attain "self-reliance in the development and use of atomic energy," the Korean government framed nuclear power "not just as a means for, but as an object of, national development" (133–34). In Korea, therefore, the most pressing risk associated with nuclear power is the failure to develop the technology independently rather than preventing potential accidents. At the same time, as much as nuclear power technology is viewed as essential for national development, the state has become responsible for the technoeconomic development of nuclear power.

Such differences in sociotechnical imaginaries of nuclear power between the two countries are related to differences in each country's responses to nuclear accidents, articulated social and technical controversies, and justifications of state policy. For example, Jasanoff and Kim (2009) link Korea's weak antinuclear movement to the country's sociotechnical imaginaries. As Koreans have shared with their government the sociotechnical imaginary of "empowering the nation through science and technology," their desire for improving national nuclear technological capability has tended to outweigh their concern about nuclear accidents and enabled the Korean government "to nullify criticism and to retain its policy focus on securing the capability to assess and improve the safety and performance of the KSNP [Korean Standard Nuclear Power Plant] model" (138). In this way, Jasanoff and Kim show not only how the sociotechnical imaginaries mediate the process in which S&T and the state are coproduced but also how they influence distributions of power between the state and civil society. As discussed in the next section, Sang-Hyun Kim would later extend similar arguments into the politics of human embryonic stem cell (hESC) research in Korea.

While Jasanoff and Kim's (2009) account for the interaction between a technology and state power fruitfully goes beyond the description of the roles of the state in S&T, their analysis of the nationalist view of nuclear power in Korea is still predominantly associated with the role of S&T in economic development. In contrast, Sung Won Kim (this issue) addresses the nationalist view of S&T as the base of national sovereignty by probing the popular myth of Benjamin Whiso Lee as the imaginary father of the Korean nuclear bomb. Lee was a Korean American theoretical physicist known for his contribution to the renormalization of gauge theory, for which Gerard 't Hooft and Martinus Veltman claimed the Nobel Prize in 1999. Lee's death in a car accident in

Illinois in 1997 gave rise to a conspiracy theory among Koreans that the US Central Intelligence Agency killed him for his role in nuclear weapons development secretly initiated by Park in the 1970s.

Sung Won Kim asks why so many Koreans came to believe the conspiracy theory and had a mythical image of him, even though Lee was not involved in nuclear weapons research in his career and was even a critic of Park's dictatorship. Kim attributes the misconception to a series of novels that mixed Lee's biography with his imagined role in the development of Korean nuclear weapons. Not only did the novels portray Lee as a martyr who led the codevelopment of nuclear weapons by North and South Korea, but also they described the nuclear missiles as weapons to protect the Korean peninsula from imperial Japan. Then Kim relates the widespread belief in Lee's mythical image to the sociopolitical context in the early 1990s. North Korea's withdrawal from the Nonproliferation Treaty in 1993 increased political tensions on the Korean peninsula tremendously. Kim suggests that such a political condition fostered the imaginary story of Lee appealing to Korean conservatives, who were sympathetic to Park's policy to develop nuclear weapons for national self-defense despite the strong opposition from the United States. Since Japan has been believed to oppose Korean reunification, anti-Japanese sentiment and the desire for reunification entrenched in the story also helped even liberals who were against Park's dictatorship embrace Lee's myth. Intertwined with political conditions and nationalism embedded in nuclear weapons development, therefore, the myth of Lee, widely accepted among Koreans, helped the past president's controversial nuclear weapons policy and even his dictatorship look legitimate.

Both the prominent roles of the state and the nationalist view of S&T are unique characteristics of Korean S&T. Indeed, the consideration of the influence of nationalist ideas on the relationship between S&T and the state is essential to understand the politics of technoscience in Korea. As such, the discussion of the roles of the nationalist view of S&T in Korea also makes a unique contribution to STS by highlighting the reciprocal relationship between S&T and political power that is mediated by the nationalist view of S&T. Certainly the roles of national sociotechnical imaginaries appear more salient in Korea or East Asia, which are more collectivist than are Western societies.

Combined with developmentalism, nationalism in Korea wields the power to shape diverse aspects of Korean politics (Shin 2006). As an observer of the Hwang scandal noted, "Unlike the western countries, where the postmodern discourses about nation and nationalism are flourishing, nationalism is still received as a relevant sociopolitical agenda in Korea" (T.-H. Kim 2008: 44). Similar to Gi-Wook Shin's (2006) contention that nationalism in Korea based on blood and ethnicity has suppressed civil rights on behalf of national interests, the STS literature on nationalism in S&T has seen developmental nationalism promoted by the authoritarian regime as marginalizing more democratic views of S&T. Yet, as Gottweis and Kim (2010) suggested, nationalism can be constructed in many ways by different actors, and different types of nationalism may compete. Central as it is to the mobilization of S&T in Korea, nationalism remains a key issue for not only politicians and technocrats who would promote a specific technoscientific project but also scientists who attempt to obtain the governmental and public support for their research, as the Hwang scandal suggests. STS researchers should therefore pay closer attention to who attempts to

elicit and mobilize the nationalist view of S&T and in what ways and how it reinforces or changes the power relations among different groups.

4 Civil Society and the Politics of the Biosafety and Bioethics Act

An S&T policy often comes with conflicts and negotiations among groups with different interests and views, as exemplified by a well-known US conflict over National Science Foundation legislation between Vannevar Bush and Senator Harley Kilgore (Kleinman 1995). To capture the politics of technoscience, therefore, researchers should pay greater attention to the interactions among actors with different views of and interests in S&T, including political leaders, technocrats, experts, NGOs, businesses, and the public.

Noting the extended range of social actors for the development and control of S&T, the recent STS literature tends to use the concept of S&T governance instead of S&T policy (Irwin 2008). In this sense, research on the politics of technoscience is likely to coincide with an analysis of S&T governance. Korea is an excellent case for the transition of the emphasis from S&T policies to S&T governance. It is believed that, whereas relatively few political leaders and technocrats shaped S&T policies for economic development under the authoritarian political structure until the 1980s, more diverse actors have become involved in scientific governance over time. Furthermore, as Korean society became democratized and STS grew, there emerged a new understanding of and interest in S&T starkly different from those based upon developmentalism and nationalism (Gottweis and Kim 2010; H.-S. Kim 1999; S.-H. Kim in press; Quet and Noel this issue). The conflict over the Bioethics and Biosafety Act (BBA) is a good example.

The Hwang scandal raised worldwide concern about the lack of adequate biotechnology regulations and bioethics in Korea. It should be noted, however, that there had been a strong demand for biotechnology regulations from Korean civil society and a substantive move to impose stricter social controls on biotechnology even before the Hwang scandal erupted (S.-H. Kim in press). Claiming that strict regulations on biotechnology would hamper its development, advocates of biotechnology were confronted with such a demand, and the conflict over the regulation of biotechnology culminated in the BBA. The most controversial issue in the conflict was whether human embryonic cloning and human-animal nuclear transplantation research should be allowed and, if so, who would decide and under which conditions. The BBA, which took effect in 2005, gave the National Bioethics Committee the legal authority to determine whether or not individual human embryonic stem cell (hESC) research would be allowed.

A number of studies have examined the legislative process from different angles (Hwang and Sleeboom-Faulkner this issue; S.-H. Kim in press; Yoon, Cho, and Jung 2010). All of them explain the conflict between (a) a coalition of NGOs, religious groups, bioethicists, and the Ministry of Health and Welfare and (b) a coalition of scientists, biotechnology industries, and the Ministry of Science and Technology. Jeong-Ro Yoon and colleagues (2010) portray the conflict over the BBA in terms of an alliance advocating bioethics and an alliance advocating scientific advancements. The BBA was "a milestone in the installation of a regulatory framework for biotech-

nology" because, before the legislation, the Korean government's concern had been to promote biotechnology for enhancing industrial competitiveness, as epitomized by the Biotechnology Promotion Law (2010: 337). The birth of Dolly the cloned sheep in 1997 generated contrasting responses in Korea. Alarmed by the ethical implications of cloning research, the religious, academic, and NGO communities launched a campaign to demand legal regulations on cloning. At the same time, scientists and the government accelerated the development of biotechnology in the hope that it would bring huge economic benefits for Korea. The conflicts between these two sides attracted media coverage and soon became an important political issue. Despite some intensive debates, however, the two sides could not reach consensus. Through the coordination of the Ministry of Science and Technology and the Ministry of Health and Welfare, BBA was passed in 2003. While it has many drawbacks, Yoon and colleagues evaluate that the enforcement of the BBA has improved biotechnology governance in Korea significantly through the mandatory review of research on human subjects by an institutional bioethics review board (2010: 345).

An interesting and important contribution of the story of the BBA is that it exhibits the conflicts between two governmental agencies, the Ministry of Science and Technology and the Ministry of Health and Welfare. The Ministry of Science and Technology, whose goal is the promotion of S&T, wanted to "preempt the jurisdiction of bioethics by including a section on bioethical issues in the amendment of the preexisting Biotechnology Promotion Law," while the Ministry of Health and Welfare, whose goal is safety, claimed that "bioethics is a human issue, and as such, a health and medical responsibility" (Yoon et al. 2010: 341). Allied with different groups, the two ministries submitted their own bills. Whatever the ministries' real motivation was, allying with a governmental agency should have given the two conflicting groups, especially the alliance advocating bioethics, the political clout to be heard in the discussions of the BBA.

Unlike Yoon and colleagues (2010), who interpret the BBA legislation as a conflict between advocates of bioethics and advocates of scientific advancements, Seyoung Hwang and Margaret Sleeboom-Faulkner (this issue) and Sang-Hyun Kim (in press) contend that the concern of the NGO activists against hESC research was to protect the public interest and democracy: civic concern was prioritized over bioethics or religious concern. According to Hwang and Sleeboom-Faulkner, the media and politicians portrayed the conflict as a struggle between science and ethics, instead of reflecting diverse voices, amplifying the argument of the advocates of biotechnology. Kim also asserts that, unlike in many Western countries, where religious conservatives were the most vocal critics of hESC research, in Korea progressive social movement activists, including feminists and environmentalists, played major roles in the debates about the regulatory legislation over biotechnology. By promoting their vision of democratic control of S&T, these NGO activists, especially those in the Center for Democracy in Science and Technology (CDST), challenged the dominant imaginary of S&T as the promoter of national development and prosperity that backed the coalition for hESC. For Kim, therefore, the politics of hESC research and BBA should be understood as a struggle between two contrasting views of the role and nature of biotechnology in relation to the social order and well-being of Korea, what Jasanoff and Kim (2009) called "national sociopolitical imaginaries."

Hwang and Sleeboom-Faulkner's article in this issue is also distinguished from other research on the BBA legislation in that it stresses the roles of bioethics experts and scientists in formulating biotechnology governance and how these participants viewed their roles. For example, often motivated by religious concerns, bioethics experts joined the alliance for the legislation and contributed much to developing regulation by introducing the global consensus on bioethics and regulatory legal frameworks in other countries to public debates. Yet they tended to keep the boundary between activism and expertise, as illuminated by a Roman Catholic doctor who characterized his participation in bioethical issues "as being more of advocacy than of expertise" (Hwang and Sleeboom-Faulkner this issue). As bioethics became professionalized, bioethical concerns have become dominated by professionals and implemented by the bureaucratic measures consistent with international standards. Hwang and Sleeboom-Faulkner thus view the BBA as a missed opportunity to accomplish the bottom-up public representation in S&T governance in Korea: the ideal of scientific citizenship and democracy once shared and promoted by NGO activists in the move toward biotechnology governance has been replaced by that of professionalization and bureaucracy over time.

The story of the BBA legislation in Korea distinguishes itself from earlier accounts of the role of the state in S&T policies in many ways. First, it illustrates that the state cannot be conceptualized as a unitary actor. In developmental states where politics are marked by authoritarianism, the state is likely to be perceived as a unitary actor for a single national goal of economic development. Emphasizing a strong political leadership in Korea, much scholarship, the statist perspective in particular, has described the S&T policy-making process in the Park's regime as a coherent top-down process. Then, does the BBA case reflect the changing political order resulting from the democratization of Korea? Certainly. However, perhaps STS researchers should have made greater efforts to unveil the conflict and bargaining among political elites, governmental agencies, and other major actors in the making of S&T policy even before the democratization of Korea. Here Megan Greene's (2008) account of the history of Taiwanese S&T development deserves recalling: unlike the popular conviction of the Taiwanese state's leading role in economic development, the Taiwanese government could not construct a coherent S&T policy and scientific institutions until the late 1990s, when the interests of political leaders and technocrats finally converged. Joel Campbell also complains that, in presenting the Korean government as "the leader in adoption and development of technology," research on Korean S&T policy has failed to explain S&T decision making or the policy process (2008: 33). Therefore, future work in STS may need to take a skeptical look at any account of the state as a unitary actor, be it in scientific governance in recent years or in S&T policies under the earlier authoritarian regime, and pay greater attention to the policy-making process instead of policy itself.

Second, by revealing the roles of NGO activists, bioethicists, religious groups, and governmental agencies, the story of the BBA legislation demonstrates the presence of a well-developed Korean civil society. Despite limitations, the BBA is a symbolic case in the history of Korean technoscientific politics in which a campaign initiated by NGO activists, allied with many other stakeholders, ended up with regulatory legislation on S&T. As discussed in the next section, certainly the demand from civil society armed by a new understanding of S&T was the primary force in introducing

the technological assessment and public participation into Korea's legal framework of S&T policy (H.-S. Kim 1999; M.-S. Kim 2002; Y.-H. Lee 2008; Park 2013). S&T policy in Korea is now under the scrutiny of civil society and expects participation of a great range of actors. Certainly the story of BBA indicates the transition from S&T policy to S&T governance in Korea.

Third, given the interest of STS in public participation in S&T, it is expected that STS researchers will emphasize the active roles of civil society in the politics of technoscience. Nonetheless, it is surprising that little literature on scientific governance in Korea considers the role of the industry in the process. In their accounts of the political struggle over biotechnology governance, for instance, researchers have made only passing references to the influence of industry on the BBA legislation. It might result partly from the fact that, unlike in the United States and Europe, few large business conglomerates represent biotechnology in Korea as yet. It is also possible, however, that the neglect of business in previous literature has concealed the significance of a main actor in the politics of technoscience. At this point, Campbell's (2008) observation of the history of S&T policy in Korea deserves attention. In her detailed description of how the Korean state's role in S&T changed from the 1960s to the 1990s, Campbell asserts that S&T policy in Korea has been made mainly by the state and the business sector: while the state dominated S&T policy making with decisions made in a top-down fashion in the 1960s and 1970s, the state's role has become increasingly marginal since the large business conglomerates (*chaebol*) began to take initiative in major R&D projects. As much as her description holds true, the literature on the politics of technoscience in Korea has overlooked an important actor in Korean S&T.

5 Public Participation and Social Movements

The legislative campaign for BBA in the early 2000s means that a new view of S&T has emerged in Korea, one that is sharply distinguished from the state's view, which is based on developmentalism and nationalism. As shown by the campaigns for the BBA legislation, the novel view of the role and nature of S&T emphasizes the representation of public opinion in S&T policy making and even S&T development. In particular, the CDST, created by Korean STS scholars, has promoted participatory democracy in S&T. In 1999, its aim was propounded in *Paradox of Progress: Toward Democracy of Science and Technology*, cowritten by key members of the CDST. It is no wonder that the CDST has organized a series of consensus conferences, first with the Korean National Commission for UNESCO and later with the Korea Institute of S&T Evaluation and Planning as a part of technology assessments (M.-S. Kim 2002; Park 2013). Indeed, the concerted efforts by the CDST and other NGO groups for democratization of S&T contributed much to the inclusion of public participation in a legal framework of S&T in Korea. Stating that technology assessment should extend participation of lay experts and NGOs and get public opinion, Article 23 of the Enforcement Ordinance for General Law of Science and Technology enacted in 2001 requires public participation in technology assessment. Although the extent to which consensus conferences and participatory technology assessments affect S&T policies

in Korea is still questionable, such changes must be acknowledged as a great advance for Korea, which has long been known for its top-down policy decision making.

Of course, the challenge to the dominant view of S&T as an engine for economic and national development does not emerge from a historical vacuum. Noting Korean STS scholars' active involvement in technosocial issues, some researchers link Korean STS to the social movement toward democratic S&T for the public good. Indeed, STS scholars' close engagement in technosocial issues was widely perceived as a distinctive characteristic of Korean STS or East Asian STS in general (Chen and Wu 2007; Fu 2007). Mathieu Quet and Marianne Noel's article (this issue) addresses this idea. They argue that, in student and antidictatorship movements since the 1970s, people who were interested in S&T's role in society aside from economic development opened a critical discourse on S&T as a way of challenging the authoritarian political regime. The organizations they created continued to emerge and disappear in interaction with larger social movements against the authoritarian regime until the 1980s. At the time of the democratization of Korea in the 1990s, Western STS emphasizing public participation in S&T drew the attention of these activists, who later became key members of the Korean STS community. Such historical experiences resulted in strong commitments to technosocial issues among many members of the Korean STS community, as exemplified by their deep involvement in the CDST. Relying on interviews with key informants, Quet and Noel provide important information of the historical and political roots of STS in Korea. Still, those who can understand Korean may find an interesting supplement in Jin-hee Park's 2013 article on the history of the debates over democratization of science in Korea.

While participatory technology assessment represents sponsored public participation in S&T, social movements are indicative of spontaneous public participation in S&T (Bucchi and Neresini 2008: 462). After democratization, Korea has witnessed contentious politics on technoscience, including social controversies and political struggles over nuclear power and nuclear waste depository facilities (Y.-H. Lee 2013), mad cow disease (J. Kim this issue; Y. C. Kim and J. W. Kim 2009; J. E. Lee 2012; Lee, Kim, and Wainwright 2010), large national construction projects (Cho 2004; Hong 2004; J. Kim and J. Kim 2013), biosafety and bioethics (S.-H. Kim in press; Hwang and Sleeboom-Faulkner this issue), digitalized national identification cards (Y.-H. Lee 1999), public water fluoridation (Suh 2005), and industrial disease in the semiconductor industry (J. Kim and H. Kim 2013).

Among many cases of contentious politics over S&T issues, street protests against the Korean government's decision to import US beef attracted attention from STS scholars, political sociologists, and political scientists. In early April 2008, the Korean government decided to reopen its market to US beef, which had been banned because of the concern about bovine spongiform encephalopathy (BSE), or mad cow disease. The decision soon prompted public worry about the BSE risk and led to massive nationwide street protests against the government's decision, which spanned the whole summer, with a million participants in more than two thousand demonstrations. During the incident, the Korean government, the conservative media, and some experts defended the safety of US beef, whereas NGO activists, the progressive news media, and counterexperts linked BSE with US beef (J. Kim this issue; Y. C. Kim and J. W. Kim 2009; J. E. Lee 2012; Lee, Kim, and Wainwright 2010).

Some STS scholars claim that the distinct features of the protest may contribute to STS scholarship of public participation in technoscience. In his article in this issue, Jongyoung Kim argues that the street protest or candlelight protest, as a way of expressing opposition to the Korean government's decision, has many distinct features. Delineating the protests as spontaneous gatherings of a networked, inclusive, heterogeneous, and unpredictable public, Kim first argues that the publics in the candlelight protest could be distinguished from the publics who were formed from formalized settings or an emergent concerned group often discussed by the STS literature. Then, he stresses their roles by noting that the protesters mobilized various forms of protests, from street protests to filing lawsuits, which he terms "multitentacled participation." In particular, lay people's role in knowledge production is emphasized. In the process, "collaborative expertise" was constructed, as "experts conducted research and made scientific claims about the risk of BSE and lay people disseminated oppositional experts' knowledge claims and popularized them through the Internet." To handle the technosocial issue, counterexpert scientists, veterinarians, doctors, lawyers, and social scientists also worked together to rebut the government's claim of the safety of US beef, which constitutes another dimension of collaborative expertise (J. Kim this issue).

Certainly the candlelight protests demonstrate many novel phenomena that STS researchers need to elucidate with new concepts. Engaged with important concepts and theories in STS such as public participation, experts' role in social movements, and risk politics, therefore, Jongyoung Kim's account of the candlelight demonstrations contributes much to STS scholarship. Nevertheless, it might be the old politics dimension involved in the street protests rather than the phenomena Kim stresses as distinct features that distinguishes the candlelight demonstrations from protest movements discussed in STS. In particular, to understand why the protest was so massive and how it could develop into the online movement for impeachment of President Lee, the political legacy of the authoritarian state needs more attention. Because of the long history of authoritarian regimes installed by military coups, the authority of the Korean government and political institutions has often been questioned. In addition, Korean politics has been severely divided by ideology, region, and generation, even after the country became democratized. Such a political condition tends to exacerbate any potential political dispute over technosocial issues, as participants are likely to fuel the dispute in whatever ways they can, and the diminished trust in political institutions is likely to increase concerns. Therefore, public concern about BSE was easily intertwined with the progressive's opposition to neoliberal policies of the new president and brought a massive protest. The clash between the conservative and progressive media over the safety of US beef and the vulnerability of Koreans to BSE exhibits such a political context (Bak 2011; Lee and Koh 2009; Lee, Kim, and Wainwright 2010). Very often, the politics of technoscience in Korea is about challenging state power and does not follow the logic of subpolitics as Ulrich Beck (1992) presented.

It is also notable that, despite the large body of literature on the social movements associated with technosocial issues in Korea, the topic has been restricted to descriptions of the social controversy and protest over the issues. There is little research on the influences they had on researchers, scientific fields, and the diffusion of technoscience. Hess and colleagues recently mapped the relationships of S&T and social

movements according to the locus of change. Each involves "reform movement or counter-movements with scientific fields," "the adoption and reconfiguration of technology by social movements," and "scientists who enter the political arena, often in collaboration with social movements, to oppose policies supported by elites and advocate alternatives" (2008: 475–76). Important as all these changes are, few empirical studies of Korean social movement in STS have examined the first two cases. Work on Korean social movements in STS needs to broaden the scope of research topics.

6 Conclusions

By examining the literature on the politics of technoscience in South Korea, this article has discussed the changing relationships among the state, civil society, and S&T in contemporary Korea. For decades, S&T in Korea has been aggressively promoted and mobilized by a developmental state for both economic and political purposes. Not only did the Korean government build an institutional infrastructure for R&D and use the process as a way of nation building, but also it mobilized a nationalist view of S&T that appreciates S&T in terms of national interests. Under this context, decisions involving S&T rarely became politicized, despite its political role for legitimizing the authoritarian regime. In contrast, the burgeoning contentious politics over technosocial issues in recent years reflects the conflicting values and interests embedded in technoscience, as well as the growing power of civil society in contemporary Korea. It is no doubt that STS scholars and NGO activists have promoted a new understanding of technoscience and have sometimes significantly influenced technoscientific politics, as in the case of the BBA. On the other hand, developmentalism, nationalism, and old political ideologies still have strong influence on the politics of technoscience in Korea. STS research on the politics of technoscience in Korea therefore needs to examine how the new understanding of technoscience has been intertwined with the legacy of the developmental state.

While the literature on the politics of technoscience has effectively demonstrated the interdependence of technoscience, the state, culture, and civil society in Korea, there are many research areas to which future research should pay greater attention, such as the conflicts over technosocial issues between governmental agencies and the interaction of business, political ideology, and social movements with the diffusion of a technoscience and research practice. Yet another important missing element in previous literature is the comparative study of technosocial issues among East Asian countries. For example, the active role of the developmental state in S&T, which this article claims as a defining characteristic of Korean S&T, may also be an important element characterizing S&T in East Asia. Many countries in East Asia have also witnessed the same technosocial issues, such as environmental and antinuclear movements, mass street protests over BSE-related policies, and public participation in S&T decisions. Such similarities provide a great opportunity for comparative studies of the politics of technoscience. What are the similarities and differences in antinuclear movements, public reactions to BSE risk, and the credibility and authority of scientific experts among East Asian countries, and how do they interact with the legacy of the developmental state in each country? How far East Asian STS can go may depend on the extent to which researchers can answer these questions.

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