

The internationalization of chemistry: What strategy should Japan take?

Hisashi YAMAMOTO

Professor at the University of Chicago

The U.S. chemical industry is promoting “Collaboration”

In recent years, many manufacturing businesses in developed countries have been rapidly shifting their production bases to China and/or India. This trend seems to be progressing in the chemical industry as well.

“Collaboration” has quickly spread into U.S. drug makers across the country, and it is now the buzzword for research institutions of not only large companies but also small- and medium-sized companies and even venture businesses. U.S. pharmaceutical companies have requested their Chinese and/or Indian counterparts to conduct research projects on their behalf or to conduct joint research projects with them. In one or two years, quite a few companies have seen a multiplication in the proportion of such requested projects to their domestic projects. This kind of collaboration started with simple cases such as synthesis of chemical compounds. More recently, however, some U.S. companies are asking their Asian counterparts to conduct molecule design projects and/or other research projects which could have a large impact on their corporate future. I wonder whether I am the only one who considers this trend problematic. Even now, researchers who take a central role in such collaboration-type research projects are, of course, U.S.-based mid-career chemists. As excellent researchers, they steer their respective overall research projects, frequently travel on business to Asia, and look after or guide progress in research. This system has been going extremely well at least under present circumstances.

And yet, these circumstances can be a predictor of a big change centering on science and technology in the future. Internationalization of science and technology will advance at a much faster rate than expected, and such a thing could happen as described in the following analogy: give your junior partner an inch and he will take a yard almost before you realize it. That’s the tide of the times, and the core of scientific and technological society is anticipated to shift sooner or later from the U.S., Japan, and Europe to the emerging countries of Asia. So how does the U.S. intend to cope with this issue? And what stance should Japan take?

The U.S. is not so pessimistic about the future

The U.S. is not so pessimistic about these circumstances. Americans seem to believe that the U.S. position as the frontier of science and technology will be ensured continuously into the future. This optimistic view is said to be primarily based on their extensive and deep-laid defense networks to protect their rights even in these collaborative research projects so that the U.S. parties can seek their own profits. This kind of measure is known as “expo-protection.” Shift of fringe technology might be restrained for a while. Nevertheless, if the center of core science and technology keeps shifting to Asia at a moderate but steady pace, can the

U.S. so easily keep its position as the policy holder of the world’s science and technology? Some people do surely feel anxiety about this issue. This is because we may as well think that any industry whose core comprises genuinely advanced science and technology can be realized only after establishment of a core of academics in that nation.

Historically, the U.S. has been bringing in necessary human resources from abroad as needs arise. The nation has had enough power to do so. In addition, this has been made possible by Americanism which shows tolerance toward immigrants, together with the indefinitely rich and attractive national land. Based on these backgrounds, many Americans express their optimistic view about the future. And yet, it should be noted that some Asian countries have begun to secure human resources on terms comparable or even better than those in the U.S. Few language barriers remain any longer in the modern era, when English has been established as the international language. It is symbolic that in recent years quite a few talented chemists have moved from Japan to China, Taiwan, or Singapore. Furthermore, the best and brightest scientists and engineers of Chinese origin have begun to return home from the U.S. one after another. There is no guarantee that the U.S. will always be able to import the best and brightest scientists and engineers from Asia as in the past and present.

The most important reason of the American optimistic view can be attributed to their extremely flexible thinking about chemistry. American youths basically seek new and novel changes even if they at least follow the principle of caring about the basics of science and technology. The healthy frontier spirit of Americans still remains stern. “Life is all about going to undiscovered places and doing as-yet-unknown jobs there!” That’s how quite a few Americans think. They believe that the U.S. should take the lead in “new and all-around applied areas” and “complexity-related areas,” although they seem to concede that basic parts of science and technology would unavoidably shift to Asia. So long as the frontier spirit of always trying to develop a new field remains in the American people, the U.S. will be able to maintain initiatives to some extent in the next generation of science and technology as well. The allocation of research expenses, especially larger-scale research expenses, is excellently strategic in U.S. institutions such as the National Institutes of Health (NIH), the National Science Foundation (NSF), and U.S. Department of Energy (DOE). Such allocation is based on rigorous calculations of how invested funds will be effective to achieve results, and gives a clear image about which areas will become the arenas of international competition.

Japan urged to respond

I think that Japan has been forced to make tough choices several times in response to global strategies of other countries. Judging

from the huge population in the Asian region, however, the current change in science and technology is so much faster and of such a larger scale than ever that the whole picture cannot yet be fully seen. Moreover, in light of China's strategic behavior toward its national interests, the relevant circumstances may not always unfold in favor of Japan. Global strategies to be adopted and developed by the U.S., China, and India will affect greatly the paradigms of science and technology in Japan, as our nation is sandwiched between the U.S. on one side and the emerging China and India on the other side. Japan needs to fully consider how to cope with the coming wave of internationalization in science and technology. We need to start preparing the relevant measures now so that Japan can ensure certain initiatives in the international arena while also maintaining its national characteristics in contrast to the American hallmarks such as the U.S. immigration policy, the frontier spirit, or its bird's-eye global strategy. It is essential to establish a long-term global strategy of our own in line with our national interests in science and technology.

Specifically, it will become more important than ever to continuously create new areas of research. To this end, we should urgently undertake programs to cultivate young Japanese researchers so that they can contribute to the development of fresh new areas in the future. I would like more attention to be paid to the fact that only American citizens are qualified to apply for the nation's scholarships for graduate students in the U.S. It is true that, even in the U.S., a foreign student can be allowed to receive a scholarship from one of various private foundations and the like, but such cases are extremely limited. I would suggest reallocating some portion of Japan's scholarships for foreign students to those for youths with Japanese nationality. When admitting

graduate students in science courses, a handful of U.S. universities on the cutting edge of science and technology put the first priority on applications from American citizens, while foreign students are admitted in the limited cases of reaching the enrollment quota as well as maintaining the diversity of the respective universities.

Meanwhile, if the U.S. makes light of the basic areas, this might become a window of opportunity for Japan to solidify its foundation of academics. Even in such a case, it would be necessary to select forward-looking core areas with a narrow focus on future development, instead of choosing please-everyone areas. Among them, "molecular technology" is poised to become one of big cores of science and technology in the future. The Chemical Society of Japan (CSJ) assumes a role of actively taking the lead in developing this specific area in Japan. I hope that CSJ will continue to actively take the lead in development of "molecular technology" in a broad sense through active arguments over a global strategy in science and technology to meet Japan's national interests.

© 2010 The Chemical Society of Japan

The commentary shown here is written one of the members of the Commentary Committee of the Society, and the author is basically responsible for the contents. The Society acknowledges that this is important and worth publishing. Opinions and comments of the readers are highly appreciated.
E-mail: ronsetsu@chemistry.or.jp

The *Kagaku to Kogyo* (Chemistry and Chemical Industry) Editorial is responsible for the English-translated article.