

Opening the Way to the World of Extreme Measurement with Kakenhi

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Being asked to write this article has given me the opportunity to reflect on my life of research and its relation to Kakenhi for the first time. I have primarily engaged in research using scanning tunneling microscopy (STM). In the last 20 years or so, I have combined STM and quantum optics, particularly the leading-edge technology of ultrashort pulse laser, to develop new quantum measurement technology offering extreme resolution in the two domains of time and space, which I have sought to apply in nanoscale scientific research. While I have been able to take gradual steps forward, I could not have traveled this path without Kakenhi and other funding. For this I am deeply grateful as well as for the help I received from so many people.

For my graduation thesis, I affiliated with the laboratory of Professor Fujio Shimizu of the Department of Applied Physics of the University of Tokyo and was able to take part in leading-edge laser research. Then, in my masters degree program, I took part in the research of surface science in the laboratory of Professor Shin-ichi Hyodo and began time-resolved measurement using photoelectron spectroscopy. In both these laboratories, we spent our days in trial and error while developing handmade devices. My experiences in these two laboratories are the foundation of my current research.

My first encounter with Kakenhi began while I was pursuing a masters degree and when spectrometers and light sources were needed for experiments. This led me to request research funds through Professor Hyodo and Assistant Professor Masaki Kimura. I can recall the scene of celebrating over a meal with them when our funding application was adopted. In the summer of the first year of my doctorate program, I succeeded Professor Kimura as an assistant professor. Being unfamiliar with applying independently for research funds, we used Kakenhi received through a joint application to buy a multichannel analyzer and other devices and furthered our research. I am profoundly aware of Kakenhi's importance when I reflect on how this work contributed to my doctorate thesis and became the basis for my current research.

After passing the age of 30, I undertook research using radiation with a beamline built and operated by Bell Laboratories in the radiation facility of the Brookhaven National Laboratory (US). Once I returned to Japan, I had the opportunity to participate in the development of STM, which had also begun in Japan. The following year I joined the Institute of Materials Science of the University of Tsukuba after atomic image had been obtained. As Co-Investigator I recall I used Kakenhi known as Grant-in-Aid for Scientific Research on Priority Areas to buy a personal computer and peripherals. At that time a printer cost around 300,000 yen and a 20-megabyte hard disk drive around 200,000 yen. These purchases, an outsized expense for an individual, marked the start of my new life of research. This personal computer was indispensable in writing research papers and also became the start of applying for Kakenhi that has continued to today.

In addition to travel expenses that enable joint research, start-up funds for equipment were also necessary, and I remember applying for Grant-in-Aid for Scientific Research on Priority Areas, Grant-in-Aid for Encouragement of Young Scientists (A), and Grant-in-Aid for General Scientific Research (C). At the same time, fellow young educators and I enjoyed the competition of applying for many private research funds. The work of envisioning results while ordering and completing dreams is an enjoyable undertaking for researchers. Such time spent also prepared me for securing major research funds such as CREST and Grant-in-Aid for Scientific Research (S). This was a time when these applications for funds were made at the initiative of each researcher. In recent years, however, I understand that raising outside funds has become a major goal of universities experiencing decreases in operating expense grants and that applying for funds in itself has become a measure for evaluating researchers. It is extremely important to look closely at one's research from time to time. While a push from behind may enable one to advance a step forward, we should not forget the importance of an environment where calm and deliberate research and education is possible. This may be an occasion for all of us to pause for a moment and reflect on Japan's place in the global community and the path that Japan should take going forward.

Recently, significant changes have been made to the review process for Kakenhi. While these reforms were being made, I had the opportunity of serving as a Program Officer of the Research Center for Science Systems. One of the major changes incorporated in the new process is the review of large budgets by a broad range (section) of researchers transcending specializations. Applicants should perform high-quality work, and they should be able to explain in an understandable manner the details of this work to reviewers from differing areas. Meanwhile, to properly evaluate the work of applicants, reviewers must have the background for understanding specialized content as reviewers. While it may take some time,

it will be important for researchers to work on honing their sense as researchers as they come into contact with work in other areas.

As the review process grows more complex, the work of reviewers is becoming more demanding. As I have suggested above, the first consideration should be to think about the desired shape for research funds. Doing so immediately, however, will be difficult. I am also hearing of discussions on reducing the number of applicants or on increasing the number of reviewers. Regarding the former, a situation where researchers feel pressured to submit applications ought to be reconsidered. However, if we are to change the awareness of researchers and increase the quality of research, suppressing the number of applicants is likely to be counterproductive. That said, greatly increasing the number of reviewers would also likely be unrealistic. Many of the researchers asked to review applications are busy people who are achieving results. For the development of scientific research in Japan, it would be desirable if they do not refuse reviewer appointments as much as possible.

Currently, as Grant-in-Aid for Specially Promoted Research, I am working on realizing a new project that would far surpass technology developed to date. Dreaming of further developments that would open the way ahead and with the desire of returning something of what I have gained from Kakenhi, I am hoping I will be able to achieve significant results.