

[Kakenhi Essay]

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Reflections on Research and Grants-in-Aid



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My father worked as a lecturer in agricultural chemistry in the Tottori University Faculty of Agriculture. On Sundays I frequently visited his laboratory to find him engaged in research, surrounded by a tortuous maze of glass distillation tubing and other lab gear. The university laboratory was a world apart from the events of daily life. In that setting, my father resembled a monk, solemnly performing sacred rituals in a quest for the truths that science had to offer. That image fueled in my own child's mind a desire to someday become a scientist in my own right.

Partly as an outcome of that influence, I ended up studying biology in the faculty of science in my university years, and eventually progressed to graduate school, where I found myself conducting research in reproductive biology. It was during my graduate work for a master's degree that I first began to gain an awareness of the costs associated with research. On one occasion, I was selected to provide a progress report in English on the research then being conducted in the lab to a visiting representative from a US-based foundation that provided extensive subsidies for research. (I seem to recall he was a program officer who had arrived to perform an interim assessment.) With only limited experience presenting papers at domestic meetings in Japan at that time, I was extremely stressed by this unexpected prospect of having to give a presentation in English. Come to think about it, this was my first taste of the difficulty involved in securing financial support for research.

After earning my doctorate, I was employed as a research associate in the Department of Anatomy in Kyorin University School of Medicine. It was a brand-new medical school with a well-equipped laboratory headed by Professor Hirano, who had just returned from the US. He vociferously encouraged me to seek grant assistance if I were serious about pursuing a career as a researcher. The first time I received a Grant-in-Aid (of 800,000 yen) for Young Scientists (A), I was secretly delighted that I had at last gained some measure of recognition as a researcher. At that time the trend of research in anatomical science was moving from conventional light microscopic observation—a method that did not demand heavy funding—to sophisticated electron microscopic examination of biological specimens treated with exotic reagents. Electron microscopy alone naturally demanded the use of not only expensive electron microscopes but also an assortment of expensive chemicals and antibody reagents. A single photo taken with an electron microscope cost about 100 yen to produce, and as many as 100 to 200 of these were taken in a single day. In a research paper, each electron micrograph has to be backed up with several hundred additional shots as supporting evidence, sharply inflating the total research cost only by photo production. The Grants-in-Aid for Scientific Research were thus a lifesaver for anyone engaged in research of this nature.

In those days, we did not have personal computers or word processors. Therefore, application forms for grant funding had to be handwritten. After polishing and refining our written wording, we would consolidate our ideas and produce the final, written copy. If we committed any mistakes in the process, we had to suck it up and start over, from scratch. In some cases, we produced the final copies with Japanese typesetting equipment hoping that documentation readily legible by reviewers would have any chance of being accepted. The way we prepare applications by computer for electronic submission these days says something profound about the speed of technological progress.

I was promoted to lecturer and several years passed. One day, a thick bundle of documents from the US National Science Foundation found its way to my desk. When I opened it, inside was an invitation to serve as a grant referee. First of all, I was floored by the sheer volume of application-related documentation. As I began thumbing through the materials, I noticed that each application included documents explaining the background to the subject matter, the results of preliminary experiments, the detailed experimental methods, and the anticipated findings of the proposed research, all presented in an easily comprehensible style better than I had seen in many research papers. In effect, I was amazed by the huge qualitative difference that distinguished these applications from the applications for Grants-in-Aid that we had prepared in years past. Research funds in the US typically comprise large sums of money but a sizable share of that funding is allocated for salary for applicants and research assistants. The share allocated for lab equipment and reagents is not as significant. This difference in the structure of Japanese and US research funding was yet another surprise. The prospect of receiving no salary unless one's application for grants is approved seemed tantamount to a life-and-death struggle with real swords. As I received salary from the university and submitted applications only for research funding, I felt by comparison as if I had merely been engaged in kendo practice with a wooden sword and protective gear. This contrast gave me some insight into the source of dynamism that characterizes the US.

Following a period of research at the University of California at San Diego, I returned to Japan and promoted to professor in Gunma University's Institute of Endocrinology (now known as the Institute for Molecular and Cellular Regulation). When I was ready to engage in research of my own, I was extremely happy to have one of my research projects approved for Grants-in-Aid for Scientific Research (B). After that, I continued to win grant approval for projects in Grants-in-Aid for Scientific Research (B). I was deeply grateful for the approval of additional grants I received for projects in Grant-in-Aid for Exploratory Research and for Scientific Research on Priority Areas. This funding facilitated my research on sugar transporter and water channel aquaporins. The Priority-Area funding on aquaporins in particular proved highly rewarding because it not only enabled me to interact and exchange information with other Japanese researchers in this field but also gave me the opportunity to actively engage with a number of world-leading researchers, including Dr. Peter Agre who later on received a Nobel Prize. In the pursuit of research, there really is no substitute for interpersonal networking of this kind. Moreover, in my view, the structures in place for priority-area research have proved to be even more effective than allocations of money *per se*.

I am hopeful that the future of the Grants-in-Aid for Scientific Research program will place emphasis on providing support for really unique research projects that no one else in the world is either engaged in or willing to pursue. Recent years have witnessed a proliferation of large-scale research projects on themes of global interest that are backed by intensive and heavy investments on a scale in the billions of yen. However, if you think about it, one of the key conditions for these enormous levels of research funding is the expectation that the projects they support will reap returns commensurate with the amounts invested. In that respect, it may be justifiable to assume that such projects typically are not really aimed at breaking new ground. My hope is that the Grants-in-Aid for Scientific Research program will be harnessed to fund and nurture germinal work on unique themes that eventually develop strong roots and form foundations for our future growth.