

## Kakenhi and My Life as a Researcher

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I'm an awkward kind of person and somewhat slow on the uptake; I'm never up-to-date with the latest fashions. In fact, my ability to understand things is quite poor, and when I'm listening to a lecture, reading a book, or having a conversation I find it difficult to instantly grasp the essence of an argument. I often have to read an academic paper two or three times before I understand it properly. Sometimes it is only several years after hearing a lecture or reading a paper that I finally understand the true meaning of its contents. So I'm only too aware that I am not cut out for the kind of research that would require me to keep constantly up-to-date with all the latest information and compete with other researchers in a popular, fashionable field. The only approach for a researcher like me is to focus on niche topics and avoid competition with other researchers and groups. This kind of thinking has driven my choice of research topics throughout my career.

Another factor is that I am based at Ehime University, a typical regional university. Unlike the former imperial universities, which have benefited from various special measures and receive the bulk of the Grants-in-Aid for Scientific Research (Kakenhi) each year (in FY2015 these seven universities accounted for a total of 37% of the funding), regional universities do not always have all the latest facilities and equipment. It is impossible for regional universities to compete with the big universities in the same research fields. I wanted to find a topic that would make effective use of the unique characteristics of Ehime University. Luckily for me, the Center for Marine Environmental Studies to which I belong has been collecting biological samples from around the world over 50 years. The Environmental Specimen Bank (generally called *es*-BANK) set up in 2002, is an archive of 120,000 refrigerated biological and environmental specimens. Few archives anywhere in the world can rival this one for the global scale and long history of its collections. Making the best possible use of this unparalleled resource struck me as the key to carrying out meaningful research at Ehime University.

My research is basically to clarify the impact of environmental pollutants on wildlife and on assessing their risks. I became interested in the subject and started my research in 1989, when I became a graduate student. In those days, very few people were interested in the field. There were no appropriate academic meetings where I could present my research papers, and in the early days I used to present my papers at small sessions at a variety of different academic conferences. The situation changed dramatically in 1997, around the time of the publication of a Japanese translation of *Our Stolen Future*, by Theo Colborn, Dianne Dumanoski, and John Peterson Myers. This book triggered widespread social concern by suggesting a link between environmental pollution by endocrine-disrupting chemicals (also called environmental hormones) and a number of reproduction abnormalities observed in wildlife and humans. The book led to a surge in the volume of news reporting on the subject, and government ministries and agencies started to call for research to be done on environmental hormones. Attendance at seminars and conferences picked up, and there was a rapid increase in the number of research papers in the field. There was a lively debate about the arguments put forward in the book, and a number of research projects started to show promising results. Within ten years, however, media interest in the topic faded, government funding was cut, and the number of people attending relevant conferences fell back to the low levels. I cannot believe that the issues raised in *Our Stolen Future* were all resolved within the space of a single decade. It is a great shame that the number of Japanese researchers working in the field should have dropped just when reports are suggesting that the endocrine system is closely linked to the nervous system and immune system, and that various chemical substances have an impact not only on the endocrine system but on the nervous system and immune system as well. I have not yet managed to obtain an answer that satisfies me to the questions raised in *Our Stolen Future*, and continue to carry out research on environmental hormones to the present day.

Whether these choices and decisions of mine have been successful or not is unclear, but as a result I was able to obtain Kakenhi funding for two projects: “Clarification of factors governing sensitivity of disruption of intracellular receptor–xenobiotic metabolizing enzyme signaling pathways by chemical substances” (FY2009–2013) and “Multiple omics analysis to understand the species difference in chemical-intracellular receptor signaling disruption” (FY2014–2018). These are not research topics that can immediately lead to cooperation with local communities and help to invigorate the economy in the short term. Without a bottom-up system like Kakenhi, which values the ideas that come from researchers themselves, it would probably have been impossible to carry out this research. In fact, I have

applied for top-down funding provided by other organizations for several similar projects, and they were all unsuccessful. I want to use this opportunity to express my admiration and gratitude to those who came before us for their achievement in putting this funding system in place.

At the same time, there are aspects of the system that I would like to see improved. Specifically, I would like to see an increase in the percentage of successful applications. As an initial step in this direction, would it not be possible to ensure that at least 40% of applications are successful in categories that require relatively low levels of funding, such as Challenging Exploratory Research category and Scientific Research (B) and (C) categories? From my own experience evaluating proposals, I know that it was often very difficult to assess the relative merits of competing proposals, and in many subjects I lacked sufficient knowledge to evaluate the merits of the proposal fairly. I was always worried that my own inadequacies might cause me to overlook worthy projects. It is difficult to predict what kind of research is likely to be useful in the future. There are countless cases in which research totally unconnected with prevailing social concerns has produced astonishing and unexpected results. In the aftermath of annual cuts to the operational subsidies paid to universities and research facilities, the funding made available to individual faculty members and researchers is much lower than it used to be. Many scientists are now in a position in which they cannot continue their research if their application for a Kakenhi grant is unsuccessful. In any group, increasing the size of the base leads to greater strength at the top, and increases overall quality. A situation in which ambitious and driven researchers are unable to continue their research because of a lack of funding is likely to result in a lowering of the overall level of scientific research in Japan.