

RIKEN

Pioneers in Science

Interviews with Researchers



Researchers Are Singer-Songwriters Performing Their Own Science



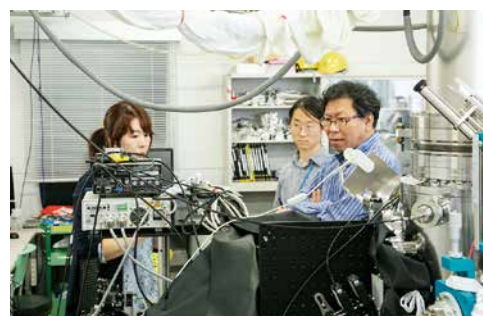
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A childhood dream, more complicated than imagined

I have a sister who is quite a bit older than me. She was involved as a researcher in inorganic chemistry, which was particularly rare for a woman in Korea back then. She taught me about things like the structure of atoms and the number of atoms and electrons in a way that was extremely easy to understand, and although I was still just in elementary school, I became totally hooked on chemistry; that was when I decided that someday, I too would pursue a career in the field. My sister eventually earned her doctorate in France, and now works as a university professor in Korea. I realize now that having blazed her own trail as a female researcher, she was something of a pioneer. Indeed, although it was quite unusual in Korea at that time, most of my female relatives worked, so I think a sense of diversity came naturally to me.

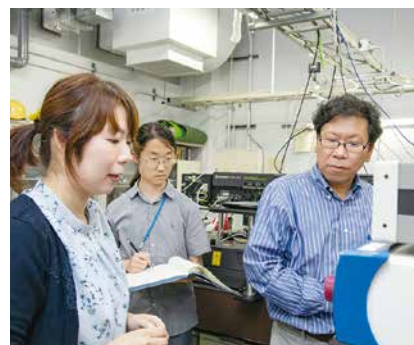
I became a researcher because I liked the work itself, but it turned out to be far more complicated than I had imagined. Almost all areas of research today involve teamwork. In addition to being a researcher, the principal investigator (PI) must fulfill various other roles, including managing the organization and communicating its work to others in an entertaining way. To put it another way, I see the researcher as a kind of singer-songwriter. After studying basic research concepts, we go on to create our own science. Like composing original songs and showcasing them in concert, we write papers and present them at conferences. Researchers are also expected to have a wide range of capabilities, able to think like a business person and possessing leadership, negotiating, and presentation skills. I myself had doubts about my future career before becoming a PI, but after much worrying, I arrived at this theory of the researcher as a singer-songwriter.



Thinking from diverse perspectives opens up new paths

In addition to a curiosity about research, it is important to build the right environment. Ensuring funding for research also requires skills to convince the public and the government of the value of our work. When introducing our research to the general public, we first reexamine what we have done, simplifying the research process and test results, and leaving in only what is most important. This clarifies the overall direction of the research, and through this process, something that at first glance seems completely irrelevant can lead to new revelations that support the work.

While I had a vague sense of being a minority ever since my years as a student, it also gave me the flexibility and respect for diversity that I think are often required for minority researchers. In a sense, I was a minority because I was often told that my research was of no use to society, but now the unique focus of my research is drawing attention, and that has naturally attracted talented young scientists. Each year, the number of those joining our lab has increased, and we now have 26 members. Because we place an emphasis on diverse ideas, our lab consists of members from a variety of fields including non-Japanese and female researchers, of which we have about 10 each.



Pursuit of every possibility leads to the future

Believing that making the box itself is more fun than trying to fit into the box we are given, we have continually developed and improved our lab's scanning tunneling microscope (STM), and today it is equipped with the only function of its kind in the world. We create new methods not by starting from scratch but by making incremental modifications. We have developed techniques for viewing a single molecule under specific environments, including extreme conditions, ultra-low temperatures, and ultra-high vacuum conditions, and we have specialized in examining in detail the properties of a single observable molecule. We are currently making modifications so that the STM can also be used in the analysis of materials and devices of use to society. We have received inquiries from people in a variety of fields and companies, and I now feel sure that we can contribute to developing real applications. In my doctoral program, I was advised that the best approach was to spend half of my time on work I was given, and half on work that I wanted to do. Capitalizing on this lesson, in advancing our efforts I try to keep in mind the goal of splitting our work evenly between basic and applied research.

My coming to Japan was a coincidence. I had originally planned to study in the United States, but during a trip to Japan I met the mentor who was to become my future academic supervisor—someone who so impressed me that I promptly changed my plans and came to study in Japan. Everything in my life has been the product of coincidence, to the extent that I think the word “necessity” might describe it better. I believe that prior to embarking on any new stage, you are doomed to failure the moment you think you could fail. The probability of success increases if you actually take action, even though that action might prove fruitless. I encourage all of you to start by taking action; the first step you take will lead to a new future.



Column

“I don't throw away memories,” says Dr. Kim, who still treasures the diaries he continued to write from the age of five until he came to Japan. As he got busier, Dr. Kim set writing aside for 20 years or so, but resumed his diary when the state of emergency was declared over Covid-19, changing our lives overnight. Writing in his diary, which he made himself, is now a daily routine for Dr. Kim.



Resolving to Engage in Research after Carefully Considering My Priorities

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Hiroshi Yamamoto

Discarding the unnecessary to reveal what was truly important

In my master's program where I studied in an organic synthesis lab, many students chose a career working in pharmaceutical companies. As the style specific to the lab was not focused too much on probing what one did not understand and deepening one's research, I sensed a depressing gap with my own ideals.

Rather than advancing to a doctoral program, I thus considered looking for a job. One day, though, one of the associate professors asked me what I intended to do, and encouraged me to study further, saying he thought I should go on to pursue a doctorate. That remark gave me a supportive push, and I began to search for a lab at the doctoral level. At the time, I struggled a lot with the decision, but after I sorted out my priorities and took a hard look at my ambitions, prejudices, and vanity, the thought that I really did enjoy research finally remained at the end of that process. So, accepting that I might have to sacrifice some things, I moved on to a doctoral program, choosing a different lab from my master's program.

Being resolute in choosing a path will help overcome difficulties

After completing my doctorate, I was encouraged by my supervisor to join RIKEN. Having become busy parenting, and hoping to manage my laboratory efficiently—including staff I had hired using external funds that I had obtained—I took the step of studying management on my own. The research environment at RIKEN was very pleasant, but I decided to take my career a step higher and become independent as a principal investigator (PI) in order to establish that the results of my work had come out of my own research and my own original research themes. After applying for various



vacancies, I was eventually accepted as a PI at the Institute for Molecular Science. When recruiting staff for my lab, I try to communicate my values and policies. While respecting others and making sure that everyone feels free to pursue their own research, I offer advice to junior researchers when they seem to have strayed a bit. In other words, my approach is to maintain just the right distance, keeping an eye on everyone without appearing to be overly vigilant.

I continue to take the same approach as I got into while I was studying for my master's degree, prioritizing things, overlooking those that were lower priority and being resolute in identifying and choosing those on which I would not compromise. When I had my hands full parenting, I was easy-going about it, disregarding, to some extent, everything other than safeguarding my children's lives. When you lack the time and energy, you should not have to worry about what others say about things like the "ideal" way to raise a child. Once you understand that if you just stick to your principles you can skip everything else, I think your range of options—both in terms of your career path and other major life events—will expand. If my research had gone on the back burner because of the time I spent on child-rearing, I would have accepted that as my lot. My principles have never wavered.

Pursuing honest research, for myself and for future humankind

One of my research themes, which I have been pursuing ever since my days at RIKEN, is the organic superconductive transistor. Another subject that I have been particularly focused on recently is research to control electron spin using chiral molecules, which can be distinguished as either right-handed or left-handed. It is said that electron spin may also be related to the movement of electrons that occurs in life, which I think this subject connects to a variety of fields. When I change research themes, instead of making a complete switch I try to ensure that only about half of the content is new so that I can make use of the strengths I have gained through previous work. Although I am engaged in research at a national organization, that does not mean that I can immediately produce something that will benefit the public. In the future, however, I hope that some electronic device that I have created will find use in society. To me, my customer is future humankind, and I constantly remind myself that it is for those people that I want to continue pursuing straight-ahead research.

There may be those who are standing now at a crossroads in their lives as researchers. First of all, it is vital that you think about where your own interests and strengths lie. Based on the knowledge and experience you have cultivated thus far, take a good look inside yourself and be flexible in considering your strengths. Then turn your attention to what you will do to capitalize on those strengths—and where you will do it. Making the right choice in what you want to do will go most of the way to determining your research path. Research cannot be conducted based on concepts alone; it is important to anchor it in reality. If you have not decided where you are heading, your work will not go well. I also think it is important to attend academic conferences, read theses and books in fields somewhat outside your own, and take the initiative to proactively seek out people and information.



Hiroshi Yamamoto



Column

When his wife was appointed to work overseas, there were times Professor Yamamoto had to handle parenting and housework himself. His specialty is "no-frills cooking." He enjoys exploring how far he can go in cutting corners, while still ensuring the food tastes at least fairly good. Despite his busy life, Professor Yamamoto enjoys many hobbies, including tea ceremony, shogi (Japanese chess), boating, and others.