

## Backstory

# Far from Home: Life as a Soft Matter Researcher Abroad

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Ten years ago, I never could have predicted I would be working as a professor in Japan. I was a stereotypical, born-in-the-suburbs-of-Philadelphia American; I did not even have a passport! Leaving the United States, even for pleasure, was something I viewed with apprehension. The outside world was scary; *is it safe?*, I wondered. *How will I handle interactions if the people I meet do not speak English?* But here I am. Seven years after getting my first US passport, I have visited 21 different countries or regions and have now lived outside of the US for more than 4 years consecutively. Living and working abroad has played a huge role in shaping the person I am today—both personally and professionally. Working abroad is certainly not for everyone, but it is a unique position for aspiring academics that is often overlooked. In this article, I will explain my view on materials research outside of the United States and explain the pros and cons of working in academia abroad.

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## Soft Matter Research in Japan

The field of polymers has long been a significant research focus in Japan. Compared to the US, where polymers research is shared between many different professional organizations, the polymers community in Japan is organized through the Society of Polymer Science, Japan (SPSJ). This organization consists of around 12,000 members and has existed for nearly 70 years, acting to mobilize basic research on polymers within Japan. As elsewhere in the world, polymers research encompasses many topics, but due to the aging population of Japan, soft matter—especially pertaining to biomaterials—is of significant interest.

At Hokkaido University, I am a member of the Laboratory of Soft and Wet Matter (headed by Professor Jian Ping Gong; [Figure 1](#)), as well as a member of the Global Station for Soft Matter Research (an international collaborative project including researchers in France and the United States). Our laboratory came to be known internationally due to the invention of double network hydrogels. Briefly, hydrogels are materials that contain large quantities of water by weight but maintain solid-like properties due to their crosslinked polymer foundation. These materials possess many similarities to natural tissues but traditionally were very weak and brittle. Double network hydrogels were the first type of hydrogel to significantly overcome this mechanical weakness, altering the landscape of hydrogels research. Since then, a wide range of tough hydrogels have been produced, resulting in materials that are beginning to assume roles in biological prosthetic applications. I personally am interested in developing hydrogel composites, which allow us to mimic properties of stiffer, load-bearing tissues. In this issue of *Matter*, we present a method to create hydrogel/elastomer fabric-reinforced composites with high strength and toughness. Through controlled solvent exposure, these materials can act as bending actuators, like artificial muscles. I am happy to have found a home where I can

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<https://doi.org/10.1016/j.matt.2019.08.012>





Figure 1. Members of the Laboratory of Soft and Wet Matter: August, 2019

perform research on soft matter that both matches my interests and has an impact on society; however, you may be wondering, how did I end up so far from home?

### “So, How Did You End up in Japan?”

In the third year of my PhD at UMass Amherst, I attended the Gordon Research Conference on Polymer Physics. Here, I had the fortune to cross paths with Professor Gong, and I took this opportunity to discuss with her my interest in applying double network gels toward my own PhD research on fabric composites. (A life hack for graduate students: if you are looking for an academic position, attend a GRC or similar small workshop. There is no better way to make connections with future employers than at a small concentrated conference such as these.) We had plenty of time that week to discuss many topics, from research to the history between our Universities. Unbeknownst to me, Hokkaido University was founded by Dr. William S. Clark, also a founding president of UMass Amherst. His famous slogan—“Boys, be ambitious!”—is still known to this day in Japan, yet he is mostly unknown in the US. Later that year, she contacted me to see if I would be interested in doing a 3-month internship at Hokkaido University. Especially in Japan—a homogeneous society where ethnic Japanese make up 98% of the population—it is beneficial for students to work and interact with people from abroad. Sending 50-plus students abroad to study is not feasible, and therefore my presence was aimed at effectively “bringing American research” to Japan. In the summer of 2013, I finally applied for my passport and made my first international trip to Sapporo, Japan.

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I only spent about 10 weeks in Japan, but the trip was transformational. The research I performed ended up leading to a significant publication and a new area of focus for the Laboratory of Soft and Wet Matter, and I learned what it was like to live and work in a foreign country. I made many friends and did my best to act as an unofficial “ambassador” for the US. Before returning to America, a student who I had become friends with wrote me a note. In the note, he said that meeting me had changed his life. Prior to meeting me, he did not understand why he had been required to learn English for so many years and had avoided interacting with foreigners unless it was



**Figure 2. Professors within the Laboratory of Soft and Wet Matter, along with Their Focus Area**

Within the Laboratory of Soft and Wet Matter, research ranging from fundamentals to applications is performed. Images on the top left include examples of tough, functional gels. Images on the top right include newly developed hydrogel composite structures.

required. After working together with me, he realized that diversity is an important characteristic of a strong research group. People can pick up for other's weaknesses, and a mixture of personalities makes working in a group more enjoyable. From this interaction, I realized my time in Japan had serious impact beyond just research.

As I careened toward the end of my PhD without a set future plan, my experiences in Japan kept creeping into my mind. I knew I wanted to stay in academia, but I started to wonder if returning to Japan should be a serious consideration. I had survived a short stay, and I thought if I returned to Japan, I could continue to work on the new field we had started during my internship, and I could have an impact on the lives of future students I interact with on a daily basis. With a stroke of luck, the Faculty of Advanced Life Science was opening a tenure-track Assistant Professor position shortly after my planned graduation time, so in the summer of 2015, I returned to Sapporo to apply for the position. I was successful and began working as an Assistant Professor in November 2015. Nearing my 4-year anniversary, I have learned that there are many differences as well as some similarities between working in the US and Japan.

### Comparing Academia in Japan to the US

In Japan, laboratories are formed to focus on specific research topics, and many professors work together as PI's toward a common goal. In the Laboratory of Soft and Wet Matter, for example, we have a total of six professors, studying a range of topics

pertaining to soft matter (Figure 2). Having many staff allows us to research many areas, from basic physics to applied medical studies. Students primarily report to one professor or in some cases are co-advised by more than one professor. While day-to-day interactions occur within the smaller groups, all students must present at a “monthly report,” which is attended by all professors and students. This setup makes running a laboratory with ~50 members feasible, as all students have someone that they can discuss in detail with daily without overburdening staff members.

Laboratory startup and funding also differs from the US. Since the laboratory continues perpetually, with both students and staff coming and going, there is less burden during the initial startup period. For example, when I began my position, it took very little time for research to begin because the lab already had equipment and students were aware of the location of materials and supplies. Funding is unique in that the head of the laboratory is charged with attaining large funding sources that can support research and overhead for the entire lab, while other PI's are expected to apply for funding to support concentrated research efforts. In this system, there is less pressure for assistant professors to fund their research independently. While it is expected that we should apply for grants and our success in acquiring funding is included in our tenure review, money to support research generally comes from the laboratory head. As a young professor, I was grateful for the support I received and that I could focus on research while starting my group.

Contrasting academic research in the US, most research in Japanese labs is performed by bachelor's and master's degree students. The fourth year of the bachelor's course in Japan is primarily research based, and students are expected to work in the lab daily. Japanese businesses usually aim to recruit students with master's degrees, and therefore, most students continue onto the master's course after completing their bachelor's degree. The downside of this approach is PhD's are less valued in industry, compared to in the United States. Furthermore, students are generally not funding through the PI, and need to apply for external scholarships to enter the PhD course. This further reduces the number of PhD students. Scholarships cover three years of research, putting additional pressure on students to finish on time. Generally, one peer-reviewed paper in an international journal is required for graduation. These three year cycles, result in quick turnover. It is important to continually have older students train younger students to prevent a loss of knowledge after graduation.

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### Challenges of Working in Japan

While many aspects of the “umbrella” laboratory style benefit young, international researchers, there are, of course, many challenges as well. The primary challenge of working in Japan is the language barrier. Except for tourist locations, day-to-day activities are difficult to perform in English. Even at the University, not all Japanese students can communicate in English at a high level. Therefore, to live and work in Japan, it is important to learn Japanese (well, at least the basics...), which can be extremely daunting. When I arrived in Japan I could not speak Japanese, and while I am still not fluent, it has improved to a level that I can survive in my daily life. I do not view this challenge negatively, however. For me, learning Japanese has allowed me to connect with people I would not have a chance to otherwise. Being able to go to a small town,

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far from the well-worn tourist path, and communicate with people is extremely rewarding. Having never learned a foreign language, I also find it fascinating to see how some nuances can be described better in one language or another. “Stretching” these parts of my brain that had not previously been used has had an impact on my world view. To people considering working abroad: view this as a great opportunity to learn something new and connect with new people in the process!

Another challenge of working in Japan is that I am truly on the other side of the world from my friends and family. While I have now created “new” friends and family on this side of the world, I think the transition has been hard for my parents. I have been happy that people from my life in America have made the effort to come visit me in Japan and see what the world has to offer outside of the West.

### The Future

While it is still too early to tell where I will spend the rest of my career, I am extremely satisfied in my decision to take a position abroad after completing my PhD. I have had the opportunity to travel the world and share my research to people in countries I never would have dreamed of previously. Especially to prospective graduates, I urge you to consider an “outside the box” academic career. I think you will be shocked at how the transformational influence it can have on your life. Following on from the inspirational words of Dr. Clark, “Let’s continue to be ambitious!” and develop a diverse, worldwide community focused on soft matter research.

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