

FOCUS: EDUCATION — CAREER ADVICE

Plans of Mice and Men: From Bench Science to Science Policy

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The transition from bench science to science policy is not always a smooth one, and my journey stretched as far as the unemployment line to the hallowed halls of the U.S. Capitol. While earning my doctorate in microbiology, I found myself more interested in my political activities than my experiments. Thus, my science policy career aspirations were born from merging my love of science with my interest in policy and politics. After receiving my doctorate, I accepted the Henry Luce Scholarship, which allowed me to live in South Korea for 1 year and delve into the field of science policy research. This introduction into science policy occurred at the South Korean think tank called the Science and Technology Policy Institute (STEPI[†]). During that year, I used textbooks, colleagues, and hands-on research projects as my educational introduction into the social science of science and technology decision-making. However, upon returning to the United States during one of the worst job markets in nearly 80 years, securing a position in science policy proved to be very difficult, and I was unemployed for five months. Ultimately, it took more than a year from the end of the Luce Scholarship to obtain my next science policy position with the American Society for Microbiology Congressional Fellowship. This fellowship gave me the opportunity to work as the science and public health advisor to U.S. Senator Harry Reid. While there were significant challenges during my transition from the laboratory to science policy, those challenges made me tougher, more appreciative, and more prepared to move from working at the bench to working in the field of science policy.

There I was, a PhD virologist from Yale, unemployed, living at home, and deciding whether to file for unemployment benefits. I was at an unimaginable crossroads and *really* needed to examine my career choices. I was a year removed from

working in a lab, a year away from the bench. Although I knew my head and heart were not in it, I knew I could probably return to that world and find a postdoc in a lab somewhere, or . . . it was the “or” that I was again confronting. And it was the “or”

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[†]Abbreviations: GSA, Graduate Student Assembly; STEPI, Science and Technology Policy Institute (Korea); STPI, Science & Technology Policy Institute (US); AAAS, American Association for the Advancement of Science; ISP, Information Society Project; ACLU, American Civil Liberties Union; KRIBB, Korean Research Institute for Biotechnology and Biosciences; ASM, American Society for Microbiology; ASBMB, American Society for Biochemistry and Molecular Biology; STEM, science, technology, engineering and math; HR, House Resolution.

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that had proven to be very difficult to navigate.

There are many alternatives to doing a postdoc, but it was hard to see that while in the middle of my PhD program. Some alternatives pay better than a typical postdoc, and some do not. Some of them are glamorous, and others not so much. At that point in time, I had been unemployed for nearly 5 months, and I had thought about trying all of them. I had applied and interviewed for dozens of them, and ultimately, I found myself at the point where I chose to apply for unemployment benefits instead of going back to the lab. The only thing more shocking than being an Ivy League PhD applying for unemployment benefits is the amount that I was eligible to receive: \$16 per month. Because I had been working overseas and had not received a paycheck in the United States for more than a year, even my backup plan of desperation was falling through. Everything was unfolding far worse than I could have imagined when I received my doctorate and set sail for a career in science policy.

My interest in policy took shape almost by accident. While in the third year of my program, I started attending graduate student government meetings for the free pizza and beer. Somewhere along the way, I stopped going for the free food and started going because I felt our merry band of overachievers might be able to effect change and help make the graduate student experience better for the next crop of budding academics. Eventually, I became Chair of Yale's Graduate Student Assembly (GSA) and found myself spending a considerable amount of time during the day working on GSA activities and less time at the bench doing experiments. My workload doubled to keep from falling behind with my experiments, but I had never been more satisfied. It was beginning to dawn on me that I was happier working on grading policy than molecular biology. I still loved science, but I did not love doing science as much as I once thought.

My fate was sealed when I began working with Yale Law School's Information Society Project (ISP) in 2007, and we eventually

made our way to Capitol Hill. Chris Mason, a Yale alumnus and geneticist, started an initiative examining the ethical and political issues surrounding the patenting of human genes. Nearly 30 percent of the human genome is patented, and Mason discovered that a bill to prohibit such patenting had been introduced in the House of Representatives.

The bill itself, HR 977, was short, vague, and not likely to pass, but it was a first step in crafting a substantive legislative response to human gene patenting. Mason helped to convene a miniature briefing and brainstorming session on Capitol Hill with stakeholders from various fields and organizations. With Yale's ISP contingent, biotech lobbyists, American Civil Liberties Union (ACLU) lawyers, researchers from the National Academies, patent law professors, and congressional staffers, including staffers from then-Senator Barak Obama's office in attendance, we sat in a room for two hours and debated what provisions the gene patent legislation should contain. It was that experience of scientists and policy makers sitting in a room debating the complexities of crafting sound science policy that convinced me that I wanted to make a career out of merging my love of science and interest in policy and politics. I just had to figure out how to do it.

The plan was first put in motion just before graduation, when I received the Henry Luce Scholarship. The Luce Scholarship provides young Americans between the ages of 21 and 29 with a stipend to live in East Asia for 1 year and facilitates their employment in the career field of their choice. Through this incredible opportunity, I lived and worked in Seoul, South Korea, from fall of 2008 to the summer of 2009. For my work placement, I chose to serve as a visiting scholar at a science think tank called Science and Technology Policy Institute (STEPI), where I was not only the sole foreigner, but I was also the only bench scientist. The other researchers received their doctorates in fields such as economics, sociology, political science, and public policy, but they all seemed much more comfortable with science policy than I was at the time.

Like other science policy think tanks, STEPI uses social science research and analysis to assess, evaluate, and plan how scientific research is organized, funded, and managed. I was given the freedom to pursue and develop my own projects that would ultimately lead to a research paper or report of some kind. But, in order to know where to begin, I first had to learn new sets of terminologies, methodologies, and prevailing theories. I had flung myself headlong into the unfamiliar world of social science research and needed to learn on the fly. What did the terms “impact,” “outcome,” “foresight,” “program analysis,” and “assessment” mean in the context of social science research? How did federal investments in technology relate to product commercialization and economic development? What is a “catch-up stage?” Luckily, my mentor at STEPI was a graduate of the doctorate program at George Washington University’s Center for International Science and Technology Policy. He was gracious enough to loan me some of his textbooks and point out some relevant journal articles and policy reports that served as my rudimentary introduction to the field of science policy.

However, I later realized that while my knowledge of theory and terminology was limited at the start of my Luce year, I still possessed a plethora of invaluable skills from my years at the bench. While earning a doctorate, you learn how to digest a large amount of knowledge in a given field and boil it down to the most salient points. You recognize how to assimilate that knowledge and find the holes and inconsistencies in a particular research area. And because you have to live and work with the consequences of science policy decisions made by people who may or may not have ever seen the inside of a laboratory, you understand a critical component of science policy that escapes many policy makers.

After a crash course in science policy, I became interested in the various ministries, research institutes, academic centers, and funding programs that spur innovation and comprise Korea’s science and technology innovation system. I focused this interest as I began collaborating with Emanuel Pastreich,

an American business professor from Solbridge International School of Business in Daejeon, Korea, a city that is home to a large number of government research institutes. Pastreich was contracted by the Korean Research Institute for Biotechnology and Biosciences (KRIBB) to assess the institute’s international collaboration programs. Together, we interviewed dozens of scientists and administrators from across Korea, China, and Japan to understand how Korean scientists interact with foreign collaborators and compare their strategies and programs to those of other scientists in the region. This project was a great opportunity to understand the challenges, outcomes, incentives, and disincentives to scientific cooperation as a whole and, in particular, international biotechnology cooperation.

In addition to my position at STEPI and work with KRIBB, Pastreich asked me to help establish a new Biotechnology Initiative at the Asia Institute, an environmental policy think tank that he founded, focusing on technology, business, and international relations. In leading this effort, Pastreich and I also examined how private and public biotechnology organizations within Korea collaborated with each other and how Korea’s biotechnology sector performed as compared to other Asian neighbors.

When my year in South Korea drew to an end, I started working my science policy contacts to find job openings timed to my return to the United States. Although I felt as though I had a strong network to draw on, time and distance took their tolls, and I had little to no success. I redoubled my efforts once I returned in the fall of 2009. I assumed that finding a job in science policy would be challenging. I knew that I was returning to one of the worst job markets in the last 80 years and had missed the traditional spring season for science policy fellowships (the traditional gateway into science policy), but I was determined to blaze my own trail. With my credentials and experience, I was confident that something would pan out within a month or so.

Instead, I found it very difficult to get my foot in the door. I was frustrated and be-

wildered by my own inability to translate my degree and experience into a job interview, much less a paying position. I questioned if my contacts were the right people. Or perhaps I did a poor job of cultivating my network. But it seemed as though there were very few job openings and a far greater number of job seekers. For instance, I applied for a scientific liaison position at a non-profit research coalition. I sent in my application the day after it was posted, and three days later, the posting had been taken down. A few days passed without a response from the organization, so I called to ask if the position had been filled. Their human resources department informed me that they took the posting down because they had received such an overwhelming number of applications for this PhD level position that there would be no way to go through all of them if the posting stayed up. It made me wonder how many unemployed policy-leaning, life science PhDs were out there.

By December 2009, I had already been unemployed for 5 months and failed to find success with any of my five successive “back-up plans,” including management consulting, substitute teaching, and even unemployment benefits. In that time, I began working with Michael Felberbaum, a career coach at Numespot.com, who helped me assess my job-hunting strategies, networking skills, back-up plans, and my own ability to put my aspirations into perspective. Working with Felberbaum forced me to confront my fundamental professional motivations, ask myself whether my goals were realistic, and weigh my interests in a science policy career against other career options. In analyzing my setbacks and these issues, I believed that I might have had some very bad luck, but I was still committed to pursuing a science policy position.

In addition, I recognized that I was missing two critical factors to make my aspirations a reality: 1) a strong foot in the door of the science policy field and 2) contacts within organizations that are willing to hire in a tough economic climate. I knew that one of the most direct ways to achieve both of those aspirations is through a science

policy fellowship. But I was still 3 to 4 months away from even interviewing for a single fellowship and 9 months away from September, when most fellowships begin. So when a friend from graduate school sent me a job listing advertising for an adjunct professor at a 4-year college just south of Las Vegas, I jumped at the chance and crafted a new plan. I would teach undergraduate biology courses at Nevada State College for a couple of semesters and use that time to prepare for a myriad of science policy fellowship applications and job interviews that were to come around that spring.

While there are many more fellowship opportunities that exist, I admit that I hit my personal threshold for personal statements and recommendation requests after filing the following applications:

- AAAS Science and Technology Policy Fellowship (<http://fellowships.aaas.org>). The oldest and most notable science policy fellowship that provides the opportunity for PhD scientists to work in executive branch agencies and the U.S. Congress.

- California Science and Technology Policy Fellowship (<http://fellows.ccst.us>). One of the newest fellowships modeled after the AAAS Fellowship. This yearlong program allows PhD scientists to work in the California State Legislature.

- Christine Mirzayan Policy Fellowship (<http://www7.nationalacademies.org/policyfellows>). A 3-month fellowship at the National Academies of Sciences that focuses on informing science policy by marshaling and codifying the best scientific expertise possible.

- American Society for Biochemistry and Molecular Biology (ASBMB) Policy Fellowship (<http://www.asbmb.org/advocacy/Advocacy.aspx?id=13624>). A yearlong fellowship that has a heavy focus on science communication from the society to policy makers and from policy makers to the society and the public.

- American Society for Microbiology (ASM) Congressional Fellowship (<http://www.asm.org/index.php/policy/congressional-science-fellowship-application.html>). This fellowship selects one

PhD microbiologist to work on the staff of an individual congressman or congressional staff for 1 year.

Additionally, I applied for a full-time position at Science and Technology Policy Institute (STPI) in Washington, D.C., an American think tank that performs many of the same policy research activities as South Korea's STEPI organization. All of these opportunities present different gateways into the field of science policy. Some are more research oriented, while others require a lot of science communication. A few positions require fellows to utilize a fair amount of their scientific expertise to be successful, but in many cases, fellows simply need to apply scientific methodologies and thought processes in order to be effective.

While teaching in Nevada, I subscribed to science policy blogs to stay current on issues, continued to cultivate contacts at political conferences, and worked with my career coach to improve my interviewing skills. After two semesters at Nevada State College, I was selected for the ASM Congressional Science Fellowship. I ultimately found my way back into science policy in one of the best positions I could ever hope for: working on Capitol Hill. I joined 28 other early and mid-career scientists who were similarly selected by their professional scientific society to spend a year working in the U.S. Congress. Although we were all funded by our individual professional societies, the AAAS handled our orientation program and administrative activities, and through that administrative process, we joined another 180 AAAS Executive Branch fellows to form the 2010-2011 Science & Technology Policy Fellowship Class.

During the 2-week AAAS orientation, I gleaned as much wisdom as possible from the program's lineup of distinguished science policy experts, journalists, and elected officials. As for the other fellows, they were all intelligent, personable, politically conscious scientists who loved science but felt a desire to contribute to science and society from outside the laboratory. Nearly halfway through the orientation program, I distinctly remember feeling as though I was in a room with

210 of "my" people. After orientation, the other congressional fellows and I then set up interviews with the congressional offices that interested us and returned our e-mails and phone calls. I interviewed with seven offices, including those of Congressman Ed Markey, Senator Al Franken, and Senate Majority Leader Harry Reid. My interview experience with all three offices was very positive, but when making my decision, I thought back to the advice given by former fellows who still work on Capitol Hill. Their advice was to find an office where you click with the people because those are the people with whom you will be spending many hours each day. Not only did I feel that I clicked with the staff in Reid's office, but I truly appreciated the fact that Reid has a personal request that the office must always have a scientist on staff. Luckily, they decided to bring me on board, and I began working as the Science Fellow and de facto science and public health advisor in Reid's office in September 2010.

Within the 180-person office, I became a member of the senior legislative staff, handling public health, STEM education, and various science and technology-related issues. Like other members of Reid's senior staff, I was expected to simultaneously assess how any particular issue in my portfolio might affect the office, the state of Nevada, the Senate Democratic Caucus, and the national interest as a whole. A typical day would consist of attending senior staff meetings within our office, meetings with other health staffers from Senate offices, and meetings with advocacy groups and constituents. I wrote briefing memos for the senator on health and science issues, and about twice a week I would accompany him to meetings related to health or science issues and serve as his support staffer. In this capacity, I would call subject matter experts, outside organizations, and conduct the necessary research in order to become a mini-expert on whatever health or science issue that the senator had to address that day. I needed to know all aspects surrounding an issue so he could be just as knowledgeable in his meeting.

Currently, I am an AAAS Science & Technology Policy Fellow at the U.S. State

Department, working in the Office of Science and Technology Cooperation. In this position, I have the opportunity to revisit and build upon the experience with international scientific cooperation that I began in South Korea by helping to create the science policy used for international partnerships between the United States and other nations. Ultimately, my goals are to grow in my science policy career and work with and learn from the multitude of like-minded people who want to see sound, solid science have as much influence on science policy as possible. Yet, shortly after joining Reid's office, I remember think-

ing that I would have been woefully underprepared for the fellowship had I received it 1 year earlier when I was unemployed, desperately seeking a position in science policy, and frustrated with my lack of success. I felt as though I would have been underprepared because that period tested nearly every plan, self-assumption, and belief that a career overachiever could possess. Instead of being thrown off course, going through that period provided me with a much better understanding of who I am, what I want, and where I want to be — even if the path to get there was not the one I had planned.