At Work: Immunologist Jayanta Chaudhuri

Jayanta Chaudhuri

Immunologist Jayanta Chaudhuri studies the mechanisms of immunoglobulin gene diversification. We spoke to him in 2006.

Born in Calcutta, India, I began to develop my first interest in science in high school. Biology and Mendelian genetics — essentially the story of how life evolved — were very interesting to me. An uncle of mine who lived in our family household was a surgeon, which meant that I was exposed to medicine, as well as basic science. However, after witnessing a couple of surgeries, I very quickly realized that medicine and all its blood were not for me.

After high school, I went onto Presidency College at Calcutta University, where I majored in chemistry. During my undergraduate years, I met and was mentored by a number of inspiring teachers. By the third year of the program, we were allowed to do some hardcore biochemistry, taught by an excellent teacher. I was hooked. Life is essentially made up of three basic building blocks — carbon, hydrogen, and oxygen — all of which come together to form life in its almost infinite variety. It was an idea that I found endlessly fascinating.

I graduated with my Bachelor of Science in 1988 and went straight into the master's degree program in biochemistry, also at Calcutta University. There, my teachers gave us a broad perspective of biochemistry, molecular biology, genetics, and immunology.

In India, this sort of education is more theoretical than hands-on bench research, so after receiving my master's in 1990 I applied and was accepted into the doctoral program in the Department of Developmental and Molecular Biology at Albert Einstein College of Medicine in New York.

Transitions — Personal and Professional

At Einstein, Umadas Maitra became my mentor, exerting an enormous influence on my career. In his lab, we studied a very basic process of protein synthesis — how molecules called tRNAs carry amino acids to sites on ribosomes where proteins are synthesized.

It was during this time that I received real hands-on lab experience, learning how different what you read in science journals often is from what you do at the bench. It took me a good six months before I could walk around the lab without bumping into things.

Dr. Maitra, who is a very patient and understanding person, knew how to deal with each individual personality in his lab. Working for him, I helped to identify a protein that is required for the interaction between ribosomes and tRNA. This was followed by our identification of initiation factor 1A (eIF-1A), without which protein synthesis would not be possible. The resulting publication of this work was one of my first major publications, which was, of course, very exciting.

The personal side of the transition from India had its own challenges, too. I missed my family, with whom I was close, and I missed the sport of cricket. Baseball, at first, wasn't a good enough substitute, though I did grow to become a Yankees fan — even after eventually moving to Boston for my postdoc. Fortunately, New York City and Calcutta are very similar. They're both large, vibrant, cosmopolitan places. In fact, Calcutta is also referred to as "the melting pot."

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Boston-Bound

After seven years at Einstein, I received my PhD in 1997. At the time, one of my thesis advisory group members was Stewart Shuman, who is now a lab head in the Molecular Biology Program here at SKI.

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>
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In early 1998, I moved to Boston to do postdoctoral work in Frederick Alt's laboratory in the Department of Genetics at Harvard Medical School. Dr. Alt's lab researches B and T cell development, specifically focusing on a process called gene rearrangement — the process by which the cell cuts and pastes DNA during lymphocyte development. The work involved a combined study of immunodeficiency, DNA repair, and B cell tumors.

Since I had been trained as a biochemist, I realized that the system the lab was working on was ripe for a biochemical approach. As there was no biochemist in the lab at the time, I decided I could make a real contribution.

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AIDing Science

Fred was a wonderful mentor. He provided me, both technically and intellectually, with everything I needed in the lab, which was a very vibrant environment. The work became especially interesting in 2000, when the activation-induced cytidine deaminase (AID) gene was cloned for the first time in a lab, in Japan. This was something that scientists had been trying to do for quite some time. The AID gene plays an important role in class switch recombination, somatic hypermutation, and gene conversion in B cells. Without these processes, the immune system cannot work to its full effectiveness.

Once the Japanese lab identified and cloned the gene, there was a great rush to discover exactly what it does and how it functions. As a result, in my work in Fred's lab, I tried to decipher the gene and its functions, using both in vitro assays and mouse work. There were more than 20 labs around the world trying to make the same discovery, which meant there was a great competition to publish first. Nothing worked for us for the first two years, but then, two-and-a-half years into the project, we succeeded, eventually publishing our results in 2003.

Yet, there were still many questions left about the AID gene: Why does it mutate? What gives the protein its specificity of interaction? These are the questions I wanted to continue to pursue in my own lab.

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Next Stop: SKI

Choosing to come to the Sloan Kettering Institute to continue my research in the Immunology Program was fairly simple. I chose SKI because it offered me the best resources — both intellectually and practically. Intellectually, there are few other institutions in the world that can match the intellectual firepower here. The ones that do match it tend to be too big and unwieldy. Additionally, I had known of James Allison, the Chairman of the SKI Immunology Program, and I was excited to be a part of his efforts to expand the program.

The other real bonus about coming to SKI is the chance to experience interactions with members of other departments and disciplines. For example, I regularly interact with members of the Molecular Biology Program and the Cancer Biology and Genetics Program, as well as other programs. There is rich ground here for cross-fertilization, which is one of the keys to success in today's science world.

My SKI lab got off to a good start when I was recently awarded a Damon Runyon Cancer Research Fund Scholar Award. Funding began on January 1, 2006, and will run through 2008. I have already hired a research technician, Shaheen Kabir, and two postdocs, who will join us shortly. And, of course, we will have the assistance of graduate students from the new Gerstner Sloan Kettering Graduate School, where I am a faculty member.

We are now taking the next steps toward understanding the AID gene, which has important potential implications that involve both immunodeficiency and B cell tumors. We know from our work and the work of other labs that if an individual has too little of the AID protein, they will be immunodeficient. And if an individual has an excess of the protein, there will be a predisposition to developing B cell tumors.

From what we know, most of human B cell lymphomas are due to aberrations in the AID pathway. So, while our work is basic science research, Memorial Sloan Kettering Cancer Center is the best place to take insights from the basic science side of things and translate them into investigational approaches in the clinic.

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