Western Faculty Profile: Dr. Stan Dunn

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Tell us about yourself.

I grew up in Omaha, Nebraska, at a time when many Americans were afraid that the U.S. was falling behind the Soviet Union (a.k.a. “the U.S.S.R.”) in science and technology, primarily because of the Russians’ successful launch of the first-ever artificial satellite, named “Sputnik”, in 1957. Top American scientists and educators were asked to revitalize and strengthen science curricula, especially for secondary schools. I was fortunate to attend a superb public high school, where these programs were adopted specifically to benefit students who showed promise in science and mathematics. As a result, I was able to take high-level classes with strong experimental components in chemistry and physics from outstanding teachers who encouraged individual thinking and even the original design of additional experiments. My previous schoolroom exposure to science had been pretty uninspiring, but in these courses I discovered the excitement of scientific inquiry. In addition, I took organic chemistry, astronomy, mathematical fundamentals, university level calculus, literature, history, economics,

French, and sociology. We were pushed hard, but I enjoyed it. As I have grown older, I increasingly recognized how lucky I was to have had such excellent teachers.

It is no secret at Western that I have high standards; now you can see their origin. If you want to make significant achievements, you have to aim high. Let me add that during your general education it is better to learn quite a bit about a broad range of subjects, rather than to try to learn everything about a very narrow topic, which can lead to a destructive form of perfectionism and a failure to recognize many possibilities that might come your way.

On the basis of my SAT test scores, I was awarded a full scholarship to the University of Nebraska, Lincoln. Since I had done so well in mathematics, and insurance was such a big business in Omaha, I entered the program in Actuarial Science. By the end of first year, however, I realized I enjoyed science more, and switched my major to Chemistry.

After second year, I got a job in a Biochemistry research lab, initially washing dishes and preparing buffers or growth media, but soon I was doing experiments. While remaining in Chemistry, I started taking Biology courses. I continued a research project involving nitrogen fixation in soybean root nodules until the end of summer after my final year (1973). I presented my results at the American Society for Microbiology Annual Meeting and published them in the Canadian Journal of Microbiology. This was pretty exciting, and I have to admit that there was a certain satisfaction in explaining to some of my professors that the reason I could not take the regularly scheduled final examination in their course was that I would be in Miami presenting my research at a national meeting!

I applied to graduate programs in Biochemistry, and completed my Ph.D. in 1977 at the University of California, Berkeley, where I was supported by a National Science Foundation Pre-doctoral Scholarship. During this work, which was focused on active transport across cell membranes, I became interested in the ATPase of oxidative phosphorylation, now called ATP Synthase. So I took a postdoctoral position at Cornell University in Ithaca, New York, with Leon A. Heppel, a scientist of many accomplishments (e.g. he had synthesized the polyU that Marshall Nirenberg showed was translated into poly-phenylalanine allowing the first-ever codon assignment; he had discovered the existence of the periplasmic space of Gram-negative bacteria as a cellular compartment containing a particular set of proteins; he had demonstrated that active transport systems could be divided into those powered by ATP and those powered by ion gradients; and he had been among the first to study the ATP Synthase of the model organism *Escherichia coli*). Of course, I worked on ATP Synthase. Leon was an encouraging and inspiring mentor, but extremely demanding. Fortunately, I had been advised by previous trainees in the lab that the best way to handle Leon was to stand up to him. This strategy worked well, particularly since I was able to back it up with the ability to think for myself. I

learned a great deal from Leon and we established a very strong and positive relationship. My postdoctoral period was highly productive, which is essential for finding an academic position.

In 1981, I was recruited to Western by a group of Biochemists here, including Bishnu (Bill) Sanwal, Ted Lo, and George Mackie, who had completed his Ph.D. at Cornell in the laboratory next to Leon's. I liked the Department here better than any other I had interviewed with, so after we had received immigration permits in 1982, my pregnant wife Linda, our young son Alex, and I moved to London as "landed immigrants". I had met Linda in a Plant Physiology course at Nebraska, taught by Eric Davies – another excellent teacher and a Canadian. Maybe it was destiny that we would end up in Canada! We became Canadian citizens in 2009, after the U.S. Supreme Court overturned the ban on Americans having dual citizenship. One of the things we love about living in London is that we have more really good friends here than we've ever had elsewhere. I feel fortunate by the way things turned out in my life, and recognize that luck and chance have been involved. My parents taught me to treat other people with respect and to be generous and kind to those who are not so fortunate. I'm not perfect, but I have endeavoured to live my life that way.

What hobbies and Interests do you have?

Back when I was at Cornell, I often went trout fishing in the local streams. But now, my main hobby is vegetable gardening, which my Dad introduced me to as a child. Anyone who has taken Biochemistry 3381 knows my love of growing unusual vegetables. My wife and I both enjoy cooking and eating good food. In fact, we belong to two gourmet cooking groups and prepare almost everything we eat from scratch. We attend concerts with various types of music, including blues, rock, traditional, and chamber (the Jeffery series here in London brings in world-famous string quartets and other small groups). We enjoy plays (especially at the Shaw Festival) and movies (especially at the Hyland

Cinema) as well. We still love football, and have held season tickets for the Mustangs' games for many years.

Best and worst memories as a professor?

One teaching experience I particularly enjoyed was during my first year here at Western. Bill Sanwal, the Chair of the Department, gave me the responsibility of running the undergraduate Biochemistry laboratory course, telling me "It will take hardly any of your time." However, I took this duty seriously and rewrote almost the entire lab manual. I also spent a lot of time in the lab getting to know the students, in part as a way of learning about Canadian culture, and I kept in close contact with students who were serious about science. A lot of students from that class went on to graduate school. It was a very rewarding experience.

I haven't had a lot of terrible experiences, but some unpleasant ones were related to students who thought my expectations for either background knowledge or new understanding were too high. However, most students seem to classify me as "tough but fair". Occasionally I have found myself teaching students about a topic, assuming that they had relatively broad scientific backgrounds, and discovering that they didn't. In one instance, I was asked to give a guest lecture on immunoelectron microscopy—the electron microscopic analysis of a protein decorated with specific antibody molecules—in a colleague's 4th year Biochemistry course. I was shocked when, at the end of the lecture, one student asked me what an antibody was!

What influenced you to focus your research on ATP Synthase?

I was always oriented towards understanding bioenergetics—it just seemed interesting. My original fascination with ATP Synthase came from its extraordinary biological importance and this was

reinforced as those of us in the field discovered what an amazing molecular machine it is—a rotary, ion-driven molecular motor—something that could hardly have been envisaged when I started.

What is your favourite aspect about research?

For me a central aspect has been the incredible joy of discovery in basic research. This is a lengthy process that often begins when you obtain experimental results that disagree with what you had expected. First, you have to make sure that the surprising findings were not due to an experimental error. Then you have to start thinking—there's always more than one possible explanation. You try to find clues in the scientific literature and you design additional experiments to narrow the possibilities. Sometimes there is a "Eureka moment" when you have an insight that you are sure is going to be important, or when you become convinced that one of your potential explanations is likely to be correct. More often, though, important discoveries are gradually revealed through many series of experiments published in a number of papers. When you have designed and carried out many critical experiments that could have proven you wrong, yet every one of them supported or extended your idea and none of them refuted it, you feel that you know or understand something that no human being before you has ever known or understood, and that is pretty exciting.

A second aspect is that one of the greatest joys in life comes from working with individuals who are just plain excellent people – productive, hard-working, smart, dedicated and interesting. I've been fortunate to have been trained by such people, to have supervised such people, and to have collaborated with such people. The view of scientists as being so objective as to be emotionless is completely wrong – we have just had to learn to control our emotions in certain situations, such as when experiments fail, which is pretty often. This

can make it difficult for students to enjoy original scientific investigations. Failure is simply a normal part of the scientific process; original and creative ideas will often fail to pan out, which can be discouraging. Fortunately, since the challenges of science are shared with our peers, they will provide support through tough times.

What advice would you give to aspiring biochemists?

Study something you find interesting and love. Set aside time to think hard and deep about your work, but also time to immerse yourself in other activities. The brain works in mysterious ways. Don't be lazy; you are mistaken if you think that things will fall into your lap just because you are smart. Be optimistic, yet realistic. Place value on expanding your abilities and learning a range of subjects; you never know where you will get the inspiration for an original idea. Don't be afraid to take some chances, because that's how you're going to make unexpected discoveries. Finally, remember that your scientific reputation is as fragile as it is valuable; do not put it at risk.

More about Dr. Dunn

Dr. Dunn has held research funding from MRC/CIHR throughout his career and has published many original scientific papers. He is heavily involved in the scientific community, having served on the Editorial Board of the Journal of Biological Chemistry, peer review committees for CIHR, and he has been elected Chair of the prestigious Bioenergetics Gordon Research Conference. He was the founding Director of the London Regional Proteomics Centre. His contributions to Western in teaching, research and service have been recognized through the Dean's Award for Excellence in Research and a Distinguished University Professor Award.

You can read more about Dr. Dunn and his research at <https://www.schulich.uwo.ca/biochem/people/bios/Dunn.html>