Cell PRESS

The wonder of it all: Larry Simpson on becoming a scientist and a teacher

Larry Simpson arrived at UCLA in 1968 after a postdoctoral stint in Brussels with Maurice Steinert, and he has remained there ever since, a permanent fixture in the changing landscape of various departments. He is currently a Professor in the Department of Microbiology, Immunology, and Molecular genetics. His laboratory focuses on understanding the molecular biology of the mitochondrial genome of trypanosomes. He was a Howard Hughes Medical Institute Investigator from 1992 to 2005. He was elected as a Foreign Member of the Brazilian Academy of Science in 1995, as a Fellow of the American Academy of Microbiology in 2010, and as a Member of the American Academy of Arts and Sciences in 2012. Aside from teaching and research, his hobbies include amateur astronomy, playing the violin, and enjoying his vacation house in the Sierra Nevada Mountains.

What turned you on to science in the first place?

When I was just a little kid growing up in Philadelphia, the day I discovered the neighborhood library was a major expansion of my consciousness. As a child, I had an incredible wonder about the world around me and I found that the library had books about all these things. And when I first saw a Dinosaur in the Museum and realized that these terrifying creatures roamed the earth millions of years ago, my mind was made up: I would be a scientist! I somehow convinced them to give me a library card and I decided to read every book from cover to cover and learn everything, and I started with the Encyclopedia. Alas, as the years went by, cruel reality intruded and limited my aspirations, but fortunately did not limit my sense of wonder.

How did you decide to focus on studying trypanosomes?

I am convinced that serendipity accounts for most of your life's directions. After majoring in Biology at Princeton, I went to Rockefeller University for graduate studies and spent my first year reading great books and having dinners with Nobel Prize Winners. Then along came serendipity: I saw an ad on a bulletin board for an 'American Researcher in the Amazon', applied, and spent a summer capturing animals in the Amazon forest and looking for parasites. As soon as I got back to New York, I went to William Trager, the only parasitologist at Rockefeller, and asked to do my Ph.D. in his lab. He gave me as a project to find out what was the enigmatic DNA-containing organelle known as the kinetoplast in trypanosomes. Fast forward almost 50 years and I am still trying to find out what the kinetoplast is and what it does, and I have loved every step of the voyage!

How has your attitude towards teaching over the course of time?

I once joked with a UCLA colleague that 'Evolution' is what you do when you get old. But I now know that is not true; teaching and thinking are what you do. And evolution is the mortar that holds together all biological problems including modern genetics.

Of course, teaching is supposed to be a third of what Professors are hired to do, with the other two thirds being research and community service. When I came to UCLA in the late 1960s, like most young Assistant Professors, I rapidly found that teaching Freshman Biology or even Cell Biology to huge classes was not my idea of fun or intellectual satisfaction, nor was dealing with the huge animals that the flower children always brought to hear my lectures. And my student evaluations proved that the students were also not having fun or being intellectually satisfied.

Fortunately, as the years went by, I finally had enough seniority to create a course covering material I really liked and teach it to upper division undergrads. I decided to teach what I was working on (molecular parasitology) and selected important disease-causing parasites that had been explored at the molecular level, and this meant protozoal parasites such as trypanosomes, *Trichomonas*, *Toxoplasma*, and malaria. The fact that I decided to base my half of the course mainly on trypanosomes and *Leishmania* of course had nothing to do with the fact that I was working on these in the lab (If you believe this, I will tell a Nigerian Prince friend of mine to send you an interesting investment proposal). My teaching skills improved, as did my student evaluations and my state of mind.

Faced with teaching a course on my favorite cells, I began to think long and hard about what the purpose of teaching is. Is it really just to get the students prepared for Medical or other Professional Schools, or is there something more? Thinking back to the wondrous world of my childhood aspirations and several fantastic teachers I had in High School and University, including Colin Pittendrigh, who taught an introductory Biology Course at Princeton, I decided that the real purpose is to stimulate excitement in the subject matter, whatever it may be. Students can always look up the facts, but only if they are excited enough to do so.

What advice do you have for other science teachers?

I could just propose some general suggestions for how to get students excited, but it is always better to show how this was accomplished from the point of view I know best: my own. In my course, I introduce the historical figures who actually discovered the parasites and show that they were very human people who made mistakes and followed false trails, who wanted recognition and had arguments with their colleagues, but had a keen sense of the questions to ask and the experiments to do and occasionally had flashes of brilliance when they made a discovery. I always tie in the discoveries and observations with the concepts that observations require technology and are not

'facts' unless they fit into a conceptual framework, and that theories are never really proven but are finally just accepted.

The adventures of Ronald Ross, David Bruce, Carlos Chagas, and others, are described, always emphasizing the excitement of the 'chase' and the final brilliance of the discovery. I even talked about the possibility that Charles Darwin had Chagas disease and the fact that we might be able to prove or disprove this by performing PCR with Darwin's DNA. And of course, my exhortation for any student visiting Westminster Abbey to try to obtain a 'piece of Charles' was a rather 'large tongue in cheek'. But the students never forgot Chagas disease and, to this day, send me news articles that mention this parasite.

I try to cover the entire disease from the discovery to the syndromes, the effect on Public Health, the diagnosis and treatment, and finally the molecular aspects. I realize of course that learning a certain amount of the scientific 'jargon' is necessary, just as having to learn a foreign language is necessary before being able to discuss the culture. But when the students become excited by the material, learning is always much easier. Photos and interesting anecdotes of the researchers are included so as to humanize the subject matter even more (anecdotes from my own career are also fair game!). And, frequently, I discuss the joy I get from doing research and the fact that knowledge itself is the reward. I remember once ranting about the byzantine organization of modern universities and that departmental names mean little anymore since all hire people working on the same problems with similar methods. But I softened this with the observation that modern society is indeed very altruistic to support universities where they actually pay me and others to do the things we do! And then someone shouted from the back of the room, 'How much?' My repartee of course was 'Not enough'. I guess that my 'knowledge is the reward' suggestion had not made a real impression.

When teaching, I try always to be cognizant of the deeper meaning of the diseases on human society and even human history. For example, the fact that the same trypanosomes that cause African sleeping sickness in humans kill domestic cattle and probably are the reason that wild animals still exist in central Africa. We discuss the moral and ethical implications of this without coming to any conclusions, just opening more questions. And I try to show that research, even undirected research, is the only way to eventually be able to deal with parasitic diseases. For example, the discovery of pathways in parasites not present in the human host opens the possibility of developing rational interventions against the parasite.

Another really important aspect of teaching is to engage the students in a discussion, even beginning with provocative statements. For example, I like to introduce the concept of symbiosis by asking someone 'Who are you?' This leads to my asking if 'you' also refers to the kilogram of bacteria in your gut, the mites in your eye lash follicles, and even the mitochondria and nuclei in your cells. The concept of 'you' leads to the provocative statement that all of the students in the class are walking zoos of symbiotic Eubacteria and Archaebacteria, insect and fungal ectoparasites, toxoplasma cysts in the brains of some who like steak tartar and, oh yes, some eukaryotic cells.

What one thing do you want your students to remember from your courses?

I always tell the students that my greatest hope is that someday one of them would make a fantastic discovery and change the world forever. It isn't the facts that I want them to remember, it's the excitement, and the knowledge that it was excitement and curiosity about the world around us that led to many great scientific discoveries.

0168-9525/$ – see front matter
http://dx.doi.org/10.1016/j.tig.2012.05.004 Trends in Genetics, September 2012, Vol. 28, No. 9