

Faculty Spotlight—Dr. Phil Danielson

Interviewed by Hannah Stanley and William Moody

1 WHAT ARE YOUR TEACHING INTERESTS? WHAT IS YOUR TEACHING PHILOSOPHY?

My teaching interest is focused on anything having to do with molecular biology. What interests me in a broad sense, is the use of DNA technology or advanced protein technology. But more specifically, I'm very interested in how these 21st century technologies impact human health. The classes that I teach such as immunology and virology and infectious disease focus a lot on the technologies we use to diagnose and to treat diseases. I also teach a course called human molecular biology that focuses on how we use technology to personalize medical care. I'm very passionate about that part of science, which is the interface between pure science and the elegance of our technologies and how it impacts people in the real world.

One part of my teaching philosophy is that I strongly believe that you should expect and push your students to achieve more than even the students themselves think that they're capable of. It has been my experience that if you push students to achieve more, you'll push them beyond what they think is the limit. When someone believes in you and inspires you, usually you can achieve more than you thought you could.

2 WHAT SPARKED YOUR INTEREST IN THE FIELD THAT YOU WORK IN?

I was very fortunate that when I was an undergraduate myself, I had a really incredible professor, Jeanne Bowles. She made science very interesting, approachable, and accessible. So I would say my experience as an undergrad has shaped a lot of my current teaching philosophy. When I think about what a teacher should be, what a teacher should bring to the classroom, and how courses should be structured, I think that courses should be so much more than just memorizing. I think that you have to not only be knowledgeable about what you teach, you have to not only like what you teach, but you have to actually love what you teach. The excitement and passion that you have should be evident to the students who come into your classroom. If you are truly passionate about your field, everyone around you will know. Before I came to the University of Denver, I spent

time teaching at the juvenile prison in Golden, Colorado. That was a tough group of kids but I really enjoyed teaching them about science and finding ways to get them excited about science too.

3 HOW DO YOUR INTERESTS IN WHAT YOU TEACH IN THE CLASSROOM CORRELATE TO THE RESEARCH YOU DO?

The classroom is an introduction to a field where students can learn the way that we approach and solve problems. Research is taking the next step in which a student is in an environment where they can solve problems in an open-ended way. In research, you're giving students an opportunity to apply knowledge they learned in the classroom to a real-world problem. In laboratory research, the ultimate answer that you're searching for is not known. This is a surprise to a lot of undergraduate students when they first get to the laboratory because they want to know what answer they're looking for. But the truth is, we don't know what the answer is, and that's the purpose of doing research. I have found this aspect of research to be very exciting for a lot of students because they see that they might be the only person in the world who's looking at this specific problem for the very first time.

4 WHAT WOULD YOU CHANGE TO IMPROVE HOW WORK IN YOUR FIELD IS DONE?

When you're the research director of a lab, what you discover very quickly is, especially in molecular biology, research is extraordinarily expensive. Therefore, in order to do research as a professor, a lot of time is spent chasing dollars. I spend a lot of time and effort writing grants and trying to get money to conduct the research. If I could change anything, I would come up with a way of having research funding that didn't require professors to spend so much time chasing after grant money. Most proposals that you write don't get funded. It's a very discouraging activity in some ways. If there were a way for money to be better distributed, or to produce scientific instruments that weren't so expensive, that would be ideal.

5 HOW HAS THE PROCESS, OR THE PROFESSION OF RESEARCH CHANGED OVER THE PAST FEW DECADES IN YOUR FIELD?

Over time, the biggest change of molecular biology is that research has become less tedious. Many of the materials such as solutions, chemicals, and proteins, would require that you prepare all of it in the laboratory. There was a lot of monotonous work such as sterilizing and removing contaminants from water. In my field, this aspect has changed a lot in the past 20 years. Nowadays, you don't have to start your week of research by figuring out, how you would make a certain solution. Most chemicals are now bought commercially and they're pre-prepared. As a result of this, I spend more time doing what I call higher level thinking. I now get to spend more time thinking about the science that I'm doing instead of getting all the dishes ready.

6 DESCRIBE YOUR CURRENT RESEARCH IN LAYMAN'S TERMS.

My laboratory focuses on the development of new technologies for forensic testing. We've developed new tools that laboratories can use in criminal investigations. There are a couple of major areas that we work on, one area is called the bodily fluid identification. In criminal cases, especially in a sexual assault case, it's important to be able to detect the presence of different body fluids that might indicate that a sexual assault or rape took place. Currently, if a person or a woman is the victim of rape, typically, the woman has about three or four days after the assault to go to the hospital and have samples collected before we no longer have the ability to detect DNA. My laboratory has developed technologies that enable us to very confidently detect the presence of a trace of body fluids, like seminal fluid in a woman, even at eight or nine days after the assault. These new technologies give us a longer window of collecting useful information after a victim reports an assault.

The other area we focus on is the analysis of samples that have very low levels or quantities of DNA. The area that I work on currently is looking at the ability to test gun cartridge cases. In the United States, where guns are very common, recovering cartridge cases from crime scenes, especially with murders and shootings, is pretty common. The problem is that the success rate for analyzing them for DNA is usually about only 5 or 10 percent. My lab has developed new technologies to be able to detect the DNA on bullet cartridge cases, and we're successful 50 to 70 percent of the time. I love this area of research because it's very applicable, and I can see where people will benefit from this which very rewarding to me as a scientist.

7 WHAT IS THE MOST FRUSTRATING ACTIVITY IN YOUR DAY TO DAY WORK?

The most frustrating activity for me is writing progress reports. Since research is funded by either the government or by private foundations, it is understandable that the organizations that give money want to know what kind of progress you're making. If you have more than one funding agency, you can find yourself writing progress reports every month. These reports are usually 15 pages or more that describe what we did this month, and what the results were. This is an important part of research, but it takes up so much time that it can be kind of frustrating.

8 IF YOU COULD GO BACK IN TIME AND GIVE YOURSELF ADVICE BEFORE YOU BEGAN YOUR CAREER WHAT WOULD IT BE?

I am very fortunate that I love what I do. When people ask me what I love about my job, I tell them that I get paid to play. But, if I were to give myself some advice, it would be to spend some more time not working. There are lot of other great things to do in life other than work, and so I would say to take some more personal time. Overall, I am very happy with where I'm at in life.

9 WHAT ARE YOUR THOUGHTS ON CORONAVIRUS? HOW HAS IT BEEN AFFECTING YOU?

At the University of Denver, it has affected all of us and the biggest change is teaching via Zoom. That's been a challenge for me because I love teaching and interacting with my students. While we can do that via Zoom, it's definitely more challenging. I have been trying very hard to find a way that I can interact with my students and create that sense that, even though we're all in different places, we're all together.

Something that I have told everybody about Coronavirus is that there is so much misinformation. On the Internet, and even on the news, there is information which is incomplete or might give people the wrong impression. I've told people that this is clearly the most serious pandemic I've seen in my lifetime. But, having said that, it's important to put it in perspective. The Coronavirus pandemic is much worse than the seasonal flu. But, it's not as bad as the 1918 Spanish flu that killed tens of millions of people around the world. I always told my students Coronavirus is not the zombie apocalypse. I'll send an email out when a zombie apocalypse happens. It's important to remember that we are going to get through this. We have to keep a level head and take reasonable precautions. Social distancing and

Phil Danielson

hand washing are both really great things to be doing. While the chance of death is very very small for people in younger age groups, it is important to maintain precautions because there are other people that are at higher risk.

I don't think that when this is over that we're going to quickly return to the old normal. After coronavirus, I think things will change. I think people will think twice before shaking someone else's hands or hugging, and this will change how we as humans interact with each other. I think it will change universities as well and how we teach. I think in the university's case, things are going to be better. This has encouraged faculty to figure out how all these technologies work, which for some of them this was all new. I think this is going to be an improvement for those faculty who embrace these new technologies.