

DMS Class Day 2008

Micah Benson

Graduate Student Speech

Distinguished guests, administrators, professors, families, friends and members of the class of 2008!

I am honored and humbled to address you on behalf of the graduate school. My name is Micah Benson, and I am graduating with a doctorate from the molecular and cell biology program.

Back in grade school, the word SCIENTIST evoked images of a wiry-haired slightly manic geek decked-out in a white lab coat and coke bottle glasses swirling beakers full of colored and bubbling fluids. The beakers generally contained the ingredients for constructing a baking-soda volcano, Frankenstein's monster, or something that went 'boom.' This image was fairly well reinforced by Professor Frink on The Simpsons, or Bill Nye. Although fun to watch, I had little desire to emulate these lofty role models, and I would be surprised if any of my peers did either. I was far more interested in maneuvering X-wings past Imperial Cruisers.

So how did we end up here today, about to accept a piece of paper declaring us to be *bona fide* scientists? There is a strong likelihood that we all had an early fascination with how life works. I remember eagerly awaiting National Geographic Magazine and being awed by the articles on really strange looking marine life, a fascination that led to my early declaration that I wanted to be a marine biologist. I'll wager that many of you had a similar reaction to the weirdness of life. Maybe you searched the sky for birds, collected insects, or spent hours reading books on horses.

Regardless of how this passion initially emerged, we are sitting here today at least partly because, at some point in our lives, we made a decision to study the processes of life.

Over the past few years and at all sorts of social occasions, I could count on being asked THE QUESTION. The question came from friends, my peers within the Dartmouth community, casual acquaintances, life-long friends and even family. I am willing to wager that most of you who are about to receive a PhD have been asked THE QUESTION as well.

When someone asks what I do, I generally say that I am in a doctoral program and am training to become a scientist. This leads to a PAUSE. My questioner thinks for a second, says 'neat' and then follows with THE QUESTION: so what DO you do? What do you DO as a scientist?

I take a deep breath and say "huh." As crickets begin chirping in the background, I contemplate how to answer. I fill the silence with a couple of "ummmms" followed by a "well" while I think: "On one hand, if I am excited about immunology, then I should be easily able to express that interest. On the other hand, the language and beauty of immunology does not easily tolerate being condensed to a sound bite. My choices are clear: give my audience a sound bite, or risk boring my audience with lengthy and unintelligible scientific gibberish. So I pick something short and sweet and answer: "I work in a lab trying to figure stuff out."

Two points emerge from THE QUESTION and my response to it, with both illustrating the state of science in today's world. The first point is that it is fair to say that most people do not realize what scientists do on a day-to-day basis. We all know that construction workers build our homes and cities. Businessmen build companies that provide goods and services. Teachers prepare the next generation for their lives. Physicians treat our ills, and what we don't learn of this profession from our own firsthand

experiences is filled in by the dramatization of physicians on television. The model scientist in pop culture is typically depicted in TV shows such as CSI as forensic scientists running DNA tests and declaring who is guilty. For many, what scientists do, and thus what their contributions are to society, is largely unknown.

The short answer in describing what I and my colleagues have been doing for the past few years is, at some level, exactly as my glib statement first suggested: we work in lab and try to figure stuff out. To expound on this, we use the scientific method for turning the unknown into the known. We wade through massive amounts of data, read an enormous volume of scientific literature, and construct novel hypotheses based on this knowledge. This is the fun part because the only limits are one's own creativity and the sky. Scientists then design experiments for testing hypotheses, with creativity again playing a major role. The act of conducting the experiments can take years and a lot of work and an incredible amount of money. The data gathered from the experiments then lets us decide whether our hypothesis were correct or incorrect, or whether a new hypothesis needs to be constructed in order to adhere to the newly gathered data.

During my second year of graduate school, at a time when I was just getting my feet wet in lab, my thesis mentor, Randy [Noelle], had a party at his house. As the evening was winding down, I distinctly remember something that Randy said during a conversation we were having about science. He said "Science rarely works. We are often wrong." I was surprised. This was the opinion of one of the worlds' pre-eminent scientists. I soon found out that he was right. There are often many ways to test a hypothesis through experimentation, with only one way being correct. The trick is finding the correct way. Because of the technically sensitive nature of the experiments, there is little room for error

during this process. Finally, even when all is said and done and the experiment has been performed, hypotheses are often incorrect. Because of this, science is one of the few professions where you can be considered successful even if you fail most of the time. This element of research certainly creates an emotional rollercoaster for the conductor, with frequent lows and exhilarating highs.

The rationale for why we do what we do was elegantly captured in an essay recently sent around the department. The thesis of this essay is that scientists crave feeling stupid. Scientists are constantly on the edge of what is unknown as research, by definition, is immersion into the unknown. Because of this existence on the edge, scientists simply don't know what is going on because they have not yet figured it out, hence the feeling of stupidity. Once scientists make a discovery, they eagerly jump with both feet back into the unknown.

To quote Michael Schwartz, who penned this essay, "Focusing on important questions puts us in the awkward position of being ignorant. One of the beautiful things about science is that it allows us to bumble along, getting it wrong time after time, and feel perfectly fine as long as we learn something each time." Early during my time in lab, I realized that being a scientist is somewhat analogous to a scene depicted in the movie *Dumb and Dumber*. At the end of this movie, Jim Carrey's character Lloyd finally asks his romantic fixation "what are the chances of a guy like you and a girl like me... ending up together?" Her response was "Not good." Lloyd presses on..."You mean not good like one out of a hundred?" She replied, "I'd say more like one in a million." Lloyd calculates his odds and exclaims, "So you're telling me there's a chance? Yeah! I read ya."

While a one in a million chance grossly exaggerates the chances of success in science, Lloyd's undying optimism is similar to that required by

scientists in order to keep plugging away at the tough questions. What keeps scientists coming back to lab every morning and what keeps them in lab late at night is the satisfaction they get when they finally figure things out. This high cancels all the lows previously encountered and occurs because the scientist just made the unknown known and added something tangible to human knowledge.

If you recall my answer when asked what I do, I said:

“I work in a lab and try to figure things out.”

While true, it brings up the second point I would like to make: we, as scientists, need to explain our discoveries and contributions to the world. We need to do a better job at explaining why projects we work on for years and decades can directly impact human welfare, despite repeated failures and in spite of the expense. In this way, people may gain an appreciation for our contributions to society. Because of this honor we are about to receive, we are now the gatekeepers of science. It is our job to travel into the vast abyss that is unknown and to then report back to the rest of world what exactly is going on in there.

All of us will use our accumulated knowledge in one form or another during the next step of our careers. Some of us will become teachers, and will relay complex ideas to society's next generation. Some of us will become lawyers and will interpret science for the legal system so that science may be applied for society's benefit in a fair and just manner. Some of us will go into business, where our scientific knowledge will be the key to running a company that may bring the medical benefits of science to the bedside or that harnesses science for the betterment of society in

another way. Finally, some of us will continue to walk on the edges of the unknown and will report back to society what exactly is going on.

I thought about what I could say in regards to concluding advice. As you are my peers, there are few kernels of wisdom I can impart from my experiences, as we have shared them. All I can do is make two suggestions. First, there will be moments in your life when you will have a chance to be a mentor to someone. For many of us, this will happen when we become parents, and for all of us, we will be teachers in some way or another. I ask that you accept this responsibility and do it wisely, as someone out there has already done this for you. Second, remember that much of the world is indeed broken, and we have inherited the responsibility to make it a better place. Thank you for your time.