

Commencement 2014  
Keynote Address

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It's quite a privilege to be able to stand here in front of you guys today, this class of smart and talented scientists and engineers, your friends and family. I've not been to the Harvey Mudd campus before, and I'm actually really impressed by it. It makes me very nervous, actually, standing in front of you here. Everyone is so clever. I feel kind of silly. And short. But that's because of the podium.

You know, I've been racking my brain trying to think of something meaningful to say, really thinking back about what I wish I had known when I was sitting in your position. I actually graduated twice. The first time, 15 years ago, I and 8,000 of my closest friends graduated from the University of Georgia. It was May in Georgia, so it was about 200 degrees, approximately 300 percent humidity. Perfect weather, really, for the black wool and polyester gowns. It was really awful, actually. It was so hot and sticky that nobody was paying attention to what was going on around them and everyone was just trying not to melt underneath these horrible things. You might call it a professional wardrobe malfunction. Which brings me to my first piece of advice for you guys as you move on. Life is too short to dress uncomfortably, so don't do it.

*[Applause]*

Admittedly, sometimes we have to wear our regalia, but how many of you out there are wearing shoes that already hurt your feet, and you're sitting down. You could really use a piece of advice that I got on my graduation day, from a friend's grandmother, no less. She said, "Make sure that no matter how poor you are," and you're going to be poor for a little bit right now, "No matter how poor you are, make sure you have at least one comfortable pair of shoes and a comfortable bed because you're going to spend almost every minute of your life in either one or the other of them, and neither should hurt your back."

Of course, you guys are scientists, and we scientists are known for dressing comfortably, so maybe I should be a little bit more precise in my advice. Probably about 30 percent of you out there are wearing yoga pants right now. That's okay. Nothing wrong with yoga pants, but the other day I was out to dinner in downtown Santa Cruz and there was an adult woman sitting at the table next to mine who was wearing one of those furry onesy pajama zip-up things. Yeah. That is taking dress comfortably too far. Computer scientists, are you with me?

*[Laughter]*

The second time I graduated, it was a much more comfortable affair. It was indoors in a beautiful 350-year-old theater in the Oxford City Center. The graduates, there were about 100 of us, kind of walked in in pairs and went to the front of the place just like this and we had to kneel on the ground in pairs in front of the person who was conferring degrees, who mentioned a few things and then whacked us on the head with a sword. The words were probably deep and meaningful, but they were in Latin, so I don't know. Before the ceremony, we were all put into this little anteroom and they delivered a speech about the ceremony and what it meant. There were emotional highs and lows; there were jokes that some people laughed at. There were probably instructions, but it too was in Latin. So on a scale of one to helpful, it was about a 'no.' Which brings me to my second piece of advice. When you go out there into the world and you have something to say, say it in a way that everybody can understand.

*[Applause]*

You guys are about to enter into the world—some of you starting jobs, others going to graduate school where competition is fierce and nobody has very much time. You're going to have a competitive advantage. You'll have new perspectives, new ideas, new eyes, but you'll also have new legs, like my son, Henry, who's just learning to walk and sometimes gets knocked over by the cat. If you don't want to get knocked over, people have to know you're there. So speak up. But don't assume that speaking loudly or speaking in another language is somehow impressive. Scientists tend to be pretty bad at this. If you have to use jargon, use it sparingly, and never assume that everyone understands what you are talking about. No one has ever complained that a pitch or a presentation was too easy to understand. Your ideas may be brilliant, but if you can't communicate them clearly, your brilliance will go unnoticed.

So here we go. Four minutes in and I've given you two sage pieces of advice. I've got three more. Have you ever noticed how, when you're telling a story or reading a book, everything comes in threes? Three examples, three adjectives, three stooges. Three stooges? Anyway, who knows where that came from, I'm just improvising.

One thing that I like a lot about my job as a research scientist is that I get to decide every day what I'm going to do with that day. But there are so many different things to do, so many fun projects to be involved with that it's often really hard to make that decision. When I was in grad school, I decided that I was going to adopt a set of rules to help me make those decisions, and I'd like to share that with you next. They're not silly rules about how to look or act, they are more about how to think, how to cultivate the kind of mindset that fosters creativity, and I really think, success. So here goes.

First, take risks. I don't know how many of you are in this position, but when I graduated from Georgia, I really wasn't sure what I wanted to do with my life. I had been intermittently sure since being born. When I was three, I was going to be a kangaroo.

When I was in junior high, I was going to be a doctor, and in high school, it was journalism. By the end of my second year at Georgia, I had 16 different declared majors and my academic advisor offered me \$20 if I could stick with one long enough for him to complete the paperwork, presumably transferring me to a different academic advisor. I was scared to make a decision. I was afraid that if I went down one pathway that I would miss some obviously better or more fun or more exciting thing that was in a different direction. I thought I was keeping my options open, but really I was holding myself back. You guys, as you go forward, are going to have tons of opportunities that come at you, particularly within the next couple of months and years. Do everything. If you have to choose, choose something that pushes you the furthest from your comfort zone.

Your unique education has prepared you for careers at the cutting edge of innovation. This is both good news and bad news. It's good news because you're probably going to find a job, it will pay well, and it will be intellectually fulfilling. It's bad news because whatever you thought you were training for when you started this exercise might not actually exist anymore. Five years ago, when you guys were deciding where to go to college, there were very few mobile app developers or big data architects, and there certainly weren't any Chief Listening Officers for social media outlets. It's hard to imagine where the next five years will go, but it's kind of fun to do so. Will there be a Borg-esque integration of biology and technology or self-driving cars that get rid of traffic congestion? Who knows, but you guys are going to be among the people that are actually making it happen. And it'll be awesome as long as you're willing to take some risks and step outside of your comfort zone. When an opportunity arises, take it.

Second, be in the moment. I am a big fan of technology, but I'm a little bit worried about the consequences of all this mobile connectedness on society. My lab is on the bottom floor of a new building at UC Santa Cruz, and two sides have windows. The other day, my students and I were watching people walk back and forth between classes, and there was one guy who was kind of tall and thin and he was really concentrating on his phone. He was expertly maneuvering between students, and it was really impressive until he walked into a redwood tree. They're not small. But that's not it. He didn't look up. He kind of regained his balance and started forward again and walked into it a second time. Seriously, I'm not making it up. Only then did he look up and kind of glare at the tree, slightly deviate his trajectory and go back to his phone. It's amazing. Really, really amazing.

As you guys know, the present day is a really awesome place to live, particularly for those of us who are scientists and engineers. The world is literally at our fingertips. Our ideas, assuming we can communicate them properly, really can change the world. But what is the point of living in the present day if we're not actually in the present day? We're out to lunch with our friends or sitting together in the sunshine, but nobody's there. Everybody is somewhere else, looking down on the phone. Remember those opportunities I was talking about? You're not going to find those on Instagram. I mean, when new ideas are born, opportunities arise not by taking quizzes to find out what Star Wars character or dog breed you are, but by having actual conversations with living people, live, for real, in person.

One of the things I like best about being able to go to the field every summer is that I am forced to disconnect from the Internet and reconnect with life. There is no Wi-Fi in north central Siberia. A couple of weeks in a tent, on a boat, in the 24-hour sunshine, it's like a hard reboot for my brain and my body. It allows me to refocus on who I am and why I'm doing what I'm doing. I encourage you to find that place for yourself where you can disconnect. The experiences that define you will tend to be those that happen in the real and not the virtual world. Look up every now and then and be present in your lives.

And finally, do something. If anybody has been paying attention to the raging debate about whether de-extinction should happen, that is the bringing back of extinct species, you will know that the media has declared that I am cloning the passenger pigeon. The passenger pigeon is an extinct species of North American bird. It's been extinct for about 100 years. Actually exactly 100 years this September. It's most famous for flying in flocks of billions of individuals, large enough to darken the daytime sky for hours as they flew by, and then they were gone. I'm not cloning the passenger pigeon, for two reasons. First, it's not possible. Second, it's a terrible idea.

*[Laughter]*

It's not possible to clone extinct species. Cloning requires intact living cells. No extinct species, even frozen mammoth mummies dug up from Siberia, have intact cells. It's not possible. No cells, no clone. Biotechnology, however, might have another solution for bringing extinct species, or at least traits belonging to extinct species, back to life. We can sequence the genome of the passenger pigeon. We can compare that to the genome of its closest living relative, the band-tailed pigeon, which is common around here. And then we can go into that band-tailed pigeon genome and actually make all of the edits in that genome necessary to turn that band-tailed pigeon genome into a passenger pigeon genome. And then, sprinkle in some magic science dust for the sake of brevity, use that to make the passenger pigeon. Or billions. Which brings me to why it's a terrible idea.

Can you imagine driving around in your car when all of a sudden a flock of a billion birds flies overhead? You might think you're in a Hitchcock film. You might regret having recently washed your car. Seriously, though, it is tough to imagine the environmental consequences of bringing back a billion passenger pigeons. Since they've been extinct, cities, towns, farms, highways have all grown. Other species have come in and taken their place. Where are these birds going to go in this very changed world? It's hard to imagine that would work without mayhem. The mammoth, however, might be a different story. The Siberian tundra is very low in productivity and can't support very many grazing herbivores. I have a friend, Sergei Zimov, who runs a park in northeastern Siberia. He calls it Pleistocene Park. His plan is to bring back all of the Pleistocene animals like mammoths and woolly rhinos and giant bears and giant beavers. Seriously, there was a five-foot-tall beaver here. Bring all of those things back to Pleistocene Park and have people come and visit them and, you know, kind of like Jurassic Park but without the disaster. Hopefully.

So far, Sergei has populated his park with bison and horses and musk ox and four species of deer. And he's noticed something. Where these animals are grazing, where they're rooting up the ground and recycling nutrients, they have transformed that tundra into rich grassland. They have, in fact, made their own habitat. But that's not all. Sergei has discovered that during the winter, the soil beneath this grazed grass is ten to fifteen degrees Celsius cooler than the soil beneath the ungrazed grass. This means that the soil is frozen, and all the carbon that's in that soil is actually trapped there, whereas the carbon in the thawed soil is released into the atmosphere. Imagine this on a bigger scale. The atmosphere right now has about 850 gigatons of carbon. Scientists estimate that there are nearly 1,400 gigatons of carbon sequestered in the Arctic permafrost right now. If we can bring back mammoths, or maybe elephants that have been genetically engineered to live in Siberia, could we keep some of that carbon in the ground and perhaps slow the rate of accumulation of greenhouse gases?

It's hard to imagine that genetically engineered animals would be the solution to the climate crisis, but they are a form of possibility, and one that brings us hope. And if you've been paying attention at all to what's going on out there, hope is something that we're remarkably short on these days. De-extinction is kind of an insane example, but an example nonetheless of some type of biotechnology or technology that you might use to be able to change our future. Strategies for dealing with climate change and the extinction crisis and all the other crises we hear about today tend to focus on preserving the status quo. But why should we be satisfied with the status quo? Since we can, why not use science and technology to actually make the world a better place to live, not just a better-than-the-experts-predict kind of place? As you take your skills out into the real world, I urge you to intervene. Passivity and cynicism are passé. It's time to get involved.

This is my last bit of advice to you, Harvey Mudd Class of 2014. Do something. I don't care if your thing is biodiversity, conservation or nanotechnology or Internet securities or curing cancer. Find your passion and be an active participant in your life. Look up every now and then. Be hopeful. But by all means, have fun. Congratulations again and thank you for paying attention to me. Good luck to you all.