A METEORIC JOURNEY THROUGH THE YEARS

Interview with Professor Alex Filippenko

BY MELANIE RUSSO

Alex Filippenko is a Professor of Astronomy at the University of California, Berkeley. He has been a part of both the Supernova Cosmology Project and the High-Z Supernova Search team which discovered the acceleration of the universe and the possibility of existence of dark energy. Professor Filippenko has received multiple awards for his undergraduate teaching and has been frequently featured in the media. In this interview, we discuss his journey from a young dreamer to a man who has helped revolutionize what we know about physics and the universe.

Professor Alex Filippenko

BSJ: Can you tell us about your journey from your childhood to the remarkable astrophysicist that you are today?

AF: Well, I will give you the decently short version. I was a science nut from my earliest days. I would play with magnets in the first grade and marvel at the little pieces of iron that would stick to the magnet. I was very interested in being able to control magnetism, and someday I hoped to understand it. In freshman year of high school, I requested and received a small telescope for Christmas. So I took it out that night, looked at the stars, and saw one that was brighter than the rest. When I looked into books and realized that the star was Saturn, it knocked my socks off. It didn't matter that millions of people had seen it before me—astronomy became a growing interest. However, I entered college as a chemistry major, because that interested me more at the time. I took an introductory astronomy course and learned that the large-scale behavior of the universe is dictated by the small-scale interaction of particles. So, I could satisfy all my interests by studying astrophysics. Also, as a chemistry major, you had to take an organic chemistry lab course, and back then, fumehoods weren't so good. I would pass the organic chemistry lab on my way to another class, notice the smoke coming out of the classroom, and think to myself, "Do I really want to take this class? No." As you can see, it was really an act of self-preservation that I switched majors, because as a chemistry major I would have to deal with explosives. I eventually went on to study astrophysics at Caltech, and then came to Berkeley as a post-doc and stayed on as a faculty member. As an astrophysicist here, I was continuing a project with my advisor from Caltech, Wallace Sargent. We were looking at a bunch of galaxies for evidence of a supermassive black hole. Once I stumbled across an exploding star, and that turned me on to another area of research—supernovae. And I became an expert on that. And then I was invited to participate in a

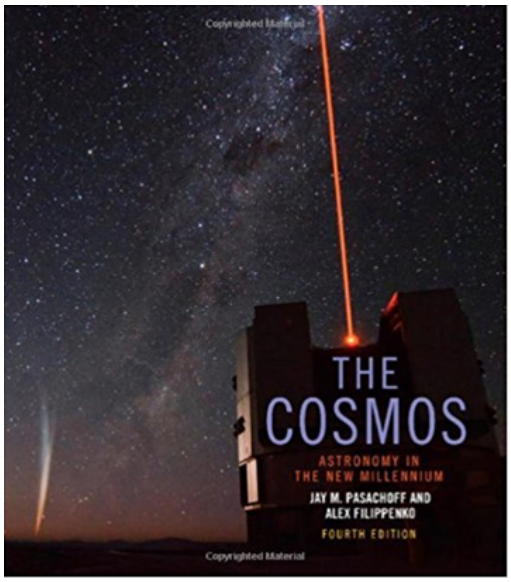

Figure 1: Left: Cover of introductory textbook *The Cosmos: Astronomy in New Millennium,* written by Professor Filippenko and Jay Pasachoff. Right: The High-Z Supernova Search Team receiving the Nobel Prize in Physics in 2011.

project that used supernovae to study the expansion of the universe. I was a spectroscopist and I had access to the greatest telescopes, so I was a natural fit for these research groups. And that, in short, is a summary of how I got here.

BSJ: You worked with two teams to find evidence for the accelerated expansion of the universe. Tell us about your work with these teams.

AF: The expansion of the universe was first proven by Edwin Hubble in the late 1900s. Everyone expected that expansion would be slowing down, because everything pulls on everything gravitationally. The question was: would it slow down so much that it would stop, and re-collapse in on itself, or would it slow down only gradually—like an apple thrown at a velocity equal to Earth's escape speed—in which case it slows down but still eternally expands? Those were the theories we were working with. But, in fact, it was neither of these things, and, actually, in the last 5 billion years the expansion has been speeding up. So this is what we discovered.

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BSJ: Data shows that when we look out into the stars, everything is moving away from us. Are we some sort of a center point, or is the expansion relative?

AF: When we saw this, we thought, do these galaxies not like us? Do we smell? Is it something we said? Are we from Stanford? *(laughs)* Or are all these galaxies lactose-intolerant because they are all moving away from the Milky Way? Get it? *(laughs)* But no, we are not some sort of a central position. Picture a bunch of ping-pong balls on a rubber hose. If you stretch the hose, you will see that no matter which ping-pong ball I'm on I would see the others move away. So, we are not special.

BSJ: What is like to be an astrophysicist? What's a day in your life?

AF: Oh, it's fantastic. You get to explore the workings of the universe, pose questions that are of genuine intellectual interest, and try to come up with ways to answer them. And in your own way, you're always trying to contribute to the advancement of knowledge in science. You can't expect to make a gigantic discovery, but occasionally that happens!

BSJ: You're the expert on science popularization. How many TV shows/documentaries have you been on?

AF: I think about a thousand. Including weather channels. They ask me about the weather patterns on other planets and want me to explain what it would be like if such weather patterns were observed on Earth.

BSJ: What are your top qualities that make you so good at what you do?

AF: Well, I guess I'm very enthusiastic. I wear my passion on my sleeves. Students react well to that. There is nothing worse than a lecturer who may be very strong in their field but presents information in a dry way. Preparation and clarity are also very important. I deliberately attempt to realize that what I'm presenting is difficult and spend time thinking of analogies and ways to make the material more comprehensible. I also make time for my students—like yesterday, when I held a two-hour bull-session on quantum physics which ended up being three-and-a-half hours. And the week of finals, I'll be doing another one. Even though that's 10 extra hours that I'm not being paid for. I'm happy to do it. I also add little bits to my lectures—I wear those weird T-shirts (yes, it's a gimmick, but some students get excited to see what T-shirt I'll be wearing next). I also tell a lot of jokes, and update students on current astronomy events.

BSJ: Do you believe in a god?

Figure 2: Professor Filippenko wearing one of his well-known science T-shirts.

AF: My god is the laws of physics, or whatever it is that produced the laws of physics. I don't think there is anything particular that is guiding us or the laws of physics. And no, I don't believe that there is any sort of spirit overruling us, but I also don't think that any type of science could ever prove or disprove that hypothesis. I think we are the result of 13 billion years of evolution, and yes, it could be extremely rare that this sort of thing occurred, but in an infinite universe, it will have occurred many times. In a finite universe, maybe we're just the only ones. But in an infinite universe, everything that can happen will happen, many times. We still can't answer why there is something rather than nothing, and I'd rather allow religion and science to coexist and agree to be friends. When it comes to religions, I respect all the good they've done, but I have a problem when they start to enforce their beliefs on others.

BSJ: Do you believe that there is a multiverse?

AF: Well, once you've produced one universe, it's hard to see why it would be limited to one. And if it's not limited to one universe, why would there be three, or eight? In other words, what limits our universe? Nothing. The only way to detect this would be to observe two universes collide, but we don't have such technology yet.

BSJ: What advice do you have to aspiring scientists?

AF: Study hard, work hard, be enthusiastic, and take advantage of opportunities that fall in your lap. Most importantly, don't be hard-going when things don't go as planned. Research is not a linear process. Don't be disappointed if in your own view you're only making incremental advancements. That's what most scientists do, and it's only the lucky few that have the brilliant breakthroughs à la Newtons and Einsteins. Don't compare yourself with Newton and Einstein—they lived in a different plane of existence. Set your sights high, but be satisfied with whatever steps you are taking.

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