

hello, poindexter!

THE (UN)REMARKABLE DR. CHARLES LIU

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My interview today is with someone whom I definitely count among my favorite people in this world. He is my astronomy teacher, mentor, overall life coach-in-general: Dr. Charles Liu, without whom I probably would never have been given a break in the astrophysics field—considering that when he met me I was without a proper degree or really any credentials at all besides a lot of curiosity—which happened to be (thankfully) the only passport that Charles accepts.

When I enrolled in his class, “Intro to Space Science, Matter and Energy” at the American Museum of Natural History, my professional life left a lot to be desired. I was working at a gallery that was going bankrupt, and had literally no idea what I wanted to do with my life. I hated working at the gallery because the corrupt politics of the art world made me feel sick all the time. I was a failed documentary photographer because I didn’t have what it took to hack it in such a harsh and fickle industry. So what was a girl with a BFA in photography to do? I started frequenting the self-help aisles of the Union Square branch of Barnes and Noble (where, incidentally, I would later find myself on a stage with David Lynch of all people, which is a testament to how my life is as bizarre as it is fortunate) and picked up a book called “Conquering Your Quarter-life Crisis,” which advised me to stop panicking and instead, follow my interests, no matter how seemingly irrelevant they seemed at the time. So in my desperation to find a creative outlet that hadn’t yet been spoiled by academic study, I joined an eighties-music-covers, all-girl keyboard club, despite not knowing how to play the keyboard. I liked The Bangles, and I liked the keyboard. Seemed like enough of a reason at the time.

I also decided to take an introductory astronomy class out of some kind of misplaced nostalgia for the weekly two-hour-long car rides with my dad as he drove me home from my grandparent’s house in Staten Island. My parents were divorced when I was four, so the elder D’Angelo house became the drop off place for my brother and I since it was equidistant between my dad in Connecticut, and my mom in New Jersey. We had plenty to do there while we waited for the other parent to show up. My brother had a pretty bad case of ADD and would be bouncing off of the plastic-covered couch until my grandma satiated him with sugar-free candy. My grandpa would entertain me by carving apple peels off all in one long coiled ribbon. My Aunt Grace and Uncle Sabbe lived upstairs with my cousins Doreen and Ritchie, both of whom were in their teens during my extensive driving years, so it was there that I received a thorough education on the proper application of multi-colored eye shadow and Duran Duran (Doreen) and Nirvana and Contra (Ritchie). Meanwhile, we were all overfed pasta and gravy, which was my grandma’s way of curtailing (what she suspected was) anorexia in my brother and I. Naturally, those visits were the thing I would look forward to all week long.

But what I would look forward to most were the two hours I would have sitting in the front seat of my dad’s car, catching up on school and friends, and listening to him talk about whatever he thought

would interest me. I'm not sure what initially prompted the subject of astronomy, perhaps it was because he was a lapsed Trekkie, but we eventually started having these wonderful talks about black holes and galaxies, and I remember that the first time he told me about it, I was just so in awe...like, 'wait, you mean, I've been living on this planet for ten whole years and you're just telling me this NOW?' He bought me a telescope for my birthday one year and I become obsessed with looking at the moon—I was convinced that I wanted to be astronaut. I started watching Star Trek reruns everyday. But then high school happened and with that event came a succession of downtrodden monotone-speaking science and math teachers who eventually extinguished any sci-hope I had. Math didn't come naturally to me, and I was too shy to ask for help. My grades faltered, I fell behind, and eventually my enthusiasm for becoming a scientist was restrained by my recognition that if you couldn't do math well, than you probably shouldn't do science. I had an algebra teacher who told me as much, and later, a chemistry teacher who confirmed it. Meanwhile, I was getting straight A's in all my liberal arts classes, so it became clear to me what I should go to school for—that is, anything but science.

So when I found myself at 22 years old with no career to speak of, alone with my Quarter-life Crisis book and a few hundred bucks in savings, I decided to revisit that childhood dream of mine, and was lucky enough to get a second chance. I took the class with Charles at the museum, and nearly a year later, thanks to his incessant cheerleading, relentless esteem-building, high-school-academic record-denying and 'you-can-do-it-sink-or-swim!' attitude of inclusion and encouragement, I found myself standing on a podium in the Linder Theatre giving my first talk about astrophysics research I had actually done while interning with Charles and my other mentor, Neil deGrasse Tyson (who I'll also try to interview at some point, he's busy these days with the Nova series.)

That internship at the Rose Center for Earth and Space became my ticket into Columbia University, and that's my story to date. I don't usually get to talk about any of this stuff during A.R.S interviews, but I wanted to talk about it on this blog because I know that there are lots of people like me who, once upon a time, wanted to do science but were too convinced that 'math sucks' to persevere, and consequently chose an easier path. But I can attest to the fact that if you work your ass off and take on massive student loans, you can be a scientist too. I think it's worth it. And I wouldn't have realized any of that without a big push from Charles. So thanks, Charles. One day I'll name a celestial object for you, or a song, whichever comes first.

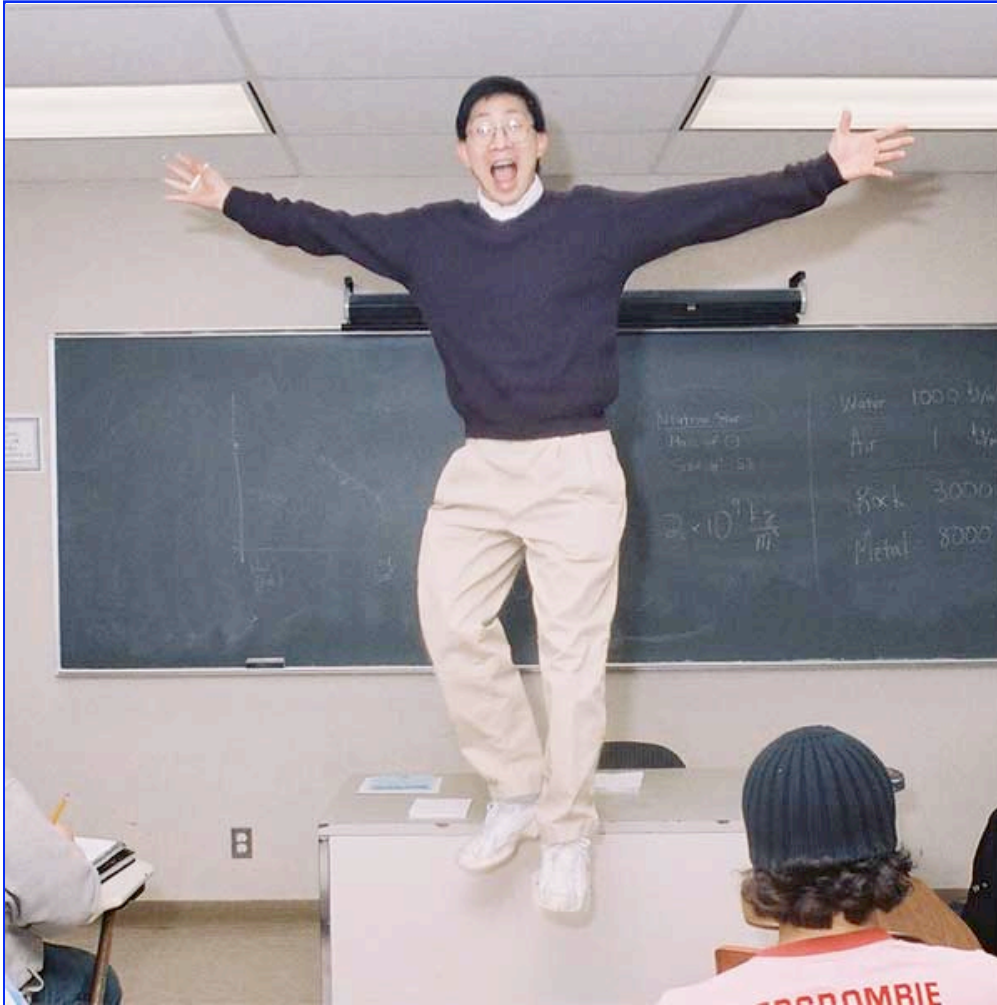
The NY Times recently featured Charles in an article about the CUNY Macaulay Honors College—here is the link:

<http://www.nytimes.com/2008/09/08/nyregion/08honors.html?ex=1378699200&en=5f051c3432eb9a2c&ei=5124&partner=permalink&exprod=permalink>

DESCRIBE YOURSELF, CHARLES...

“Charles Liu is an unremarkable Asian-American man with no substantially distinguishing characteristics. He had the good fortune to meet and marry a college classmate ten times smarter than he, from whom he learned (although she will deny it) just about everything he knows about being a good scholar and educator. He hopes that all of his students will develop a loving appreciation for both scientific and non-scientific knowledge, and an understanding of

the difference between the two.”



4 links I like:

<http://www.quarkdance.org> : **this site combines two of my favorite things in life: physics and peppy music!**

<http://www.harvardgleeclub.org> : **my favorite choir!**

<http://www.whrb.org>: **the best place on the internet for orgies!**

<http://www.research.amnh.org/users/cliu/rabbliu> : **okay, I'm a little biased here, but this is the page where my wife Amy occasionally posts pictures of the food and meals she prepares. All the pictures are unenhanced. Verily, one way to a man's heart is definitely through his stomach!**

Heather: (in italics from here on): I wanted to ask you in about the state of science education. What do you think needs to be done to bring more students to science at a college level?

Charles: (in bold from here on): Great question. I've thought about this in a lot of different ways, and here's the thing. I've always felt that science education is a little bit like art education.

Because there are certain fundamentals about art. “This is a painting, this is a canvas, or this is a camera...” but then the results are liked by some, or appreciated by some, and not liked and not appreciated by others. So some art students get into photography, some into painting, or some into sculpture. And even within each discipline, its different. Some photographers really appreciate still life, others try to put together landscapes, and still others choose something more abstract...so in a way, science education has suffered from a commonality—a lack of a recognition—that there is as much diversity and interesting differences in the pursuit of science as there are in the pursuit of the arts.

That’s a great metaphor, and I totally agree...

Yeah, I think that’s really important for people to realize, and I think teachers have suffered because curricula have been designed around the idea that all science is based on things that are concrete and absolute and certain, and Heather, you’re a researcher, so you know that that’s not true! You know that some people say, “Well, what is this index? You didn’t calculate it right...you gotta do it this way, or that way.” Unless we give students that same realization, they’re never going to take it to the next level of what being a scientist really means. They’ll just know that science is a bunch of facts in a big fat book that they have to memorize and then regurgitate on an exam, and then they’ll just forget it like any other facts that don’t seem relevant to their lives, or don’t seem interesting, or don’t seem somehow beautiful. It is very hard to communicate that on a basic level. On a high school level, it’s hard sometimes to see how you can bring interesting, exciting information into a classroom, and to get people as fired up about science as you get them fired up about their favorite music. It’s not easy.

Well, I remember you, the first day of my introductory astronomy class at AMNH, literally singing and dancing about nuclear fusion at the front of the classroom...I believe it was something from the band, They Might Be Giants...

Ha, (singing) “The sun is a mass of incandescent gas...” Right?

Yeah, there needs to be more of that!

Yes, I think that would be cool. Obviously, I try to practice what I preach. The way that I teach science is the way that I would like science to be taught, the way that I would have liked to learn science. But I also think—and this is important too, because I think about my own experience, and even though I got the so-called ‘traditional education’—the kind that might have turned me off, I still maintained and preserved and had that passion and joy for it; I’m trying to understand why that was the case...

Well, you were kind of the oddball at Harvard, right?

Well, not just at Harvard but pretty much everywhere that I had gone...I brought a little too much joy into things sometimes, and I did very much spend a lot of time talking to people who weren’t scientists about my science. As a graduate student at Arizona, I took time to go talk to the public and I was somewhere between gently advised and strongly criticized for expending too much of my time having so much time with this, with people, when I should be doing things like studying, or standing in front of the computer, or sitting in front of a telescope, that kind of

thing. So it was a personal joy and attitude that I brought to it, that I have kept all this time. And so I just have so much joy talking about this stuff maybe because I had so much joy learning all this stuff...and maybe that can be institutionalized into our teaching? Maybe not. I don't know how. I mean, one thing is for sure, nations like China, Taiwan, India—places we supposedly look up to as having great science education—they don't even attempt the pretence of making things fun and interesting. They just do drill and kill all day long, for most of their secondary school education you memorize...'here's a formula, here's how you solve the formula,' then you go on. And they produce great scientists too. So there isn't just one insert...

Well, maybe needing to make science education more 'fun' in order to attract more students to the field, indicates that our nation is actually intellectually weak...like what Edmundson said in his essay, "On the uses of a liberal education." Perhaps needing all education to be akin to 'lite entertainment' means that we really are a nation of babies compared to the rest of the world?

Oh-ho! Them's fighting words! I'll tell you what we're a nation of—we're a nation of plenty, of wealth, of choices. Even if we're not the millionaires sitting on the top of the hill, our nation really is, for all intents and purposes, paradise. Nothing is closer to paradise for a typical American, compared with living just about anywhere else in the world. Yes, many of us don't have jobs, and many of us live in difficult situations, and struggle day to day, but we really are blessed with the opportunity to choose to do just about anything we want. And there are people at every level willing to help us if we're willing to try. And so that level of comfort, of plenty and choice, often makes us want to find the things that we enjoy doing, and just do that and be done with it. In a nation like India or China, whether or not you get a house for your family, for example, is dependent on whether or not you win a gold medal at the Olympics. In this country, what is the only reason you go out and get a gold medal? It's because you want to be the best in the world—because it's the most fun thing for you to do. And you go and take gymnastics lessons because you have the chance to do it, and you have coaches who want to help you, and sure, there are endorsements along the way...but really, the fame goes away, everything goes away, and in the end what you have left is the fact that you have a gold medal. And that's why you did it. That's why you compete.

Why do science? You do it because you like it, because its neat, and you want to make discoveries about the world, the body, about the universe. These other societies see science as a path to something, and it's a tough path, and yet they're willing to put aside their personal comfort because they need to.

For the people who get great science education—in the end, it's all about motivation. You could be motivated positively or negatively, but in the end, if you follow that motivation and work really hard, you will succeed. In this country, it seems like we all need positive motivation to do science. So given that culture, that national psyche, our educational process should probably adapt to it, and say, "alright, lets make science something that people want to do" as opposed to saying, "ok, if you do science, you can earn a good living, so do it hard." My worldview may not be the standard worldview of most scientists. I have so much fun doing what I do, and as I said, I've received everything from gentle advice to strong criticism that the way I'm doing it isn't right, but you know what, its right for me, so I advocate the possibility that it might be right for others as well.

Well, your teaching method is certainly one of the things that helped to recruit me to the field. What are you working on right now?

My current work has to do with galaxy evolution. Galaxies are to the universe the way that cells are to the human body...just as doctors study human cell function to understand how the human body ages, so too, by studying galaxies and how they change over time, I am hoping to understand how the universe has aged since the big bang. A particular topic that has currently been submitted into the astrophysical journal to try to see if it works properly is to understand a certain class of galaxies which are forming stars at a furious rate—ten hundred times faster than say, the Milky Way. But they're usually small galaxies, and they're spread out throughout the universe, and quite rare. Some people call them "compact narrow emission line galaxies." They're anywhere from 1 to 10 billion light years away, and they're the fastest moving, changing, and aging galaxies in the universe, so trying to understand them is a challenge. Up to this point, only a few dozen galaxies of this kind have been studied at a time, but the COSMOS survey has produced a sample of more than a hundred of them which are useful to study as a whole. I'm trying to understand how they've aged and how they've contributed to the creation of new galaxies, how much they inject into the universe in terms of new stars and new energetic processes, and hopefully we'll get a sense of one important aging process in the universe.

I'm also studying one particular galaxy that collided with two small galaxies a billion years ago, and is still in the process of coalescing into one new giant galaxy, and recently my colleagues and I detected what we think is a supermassive black hole in the center, and are trying to understand how that got produced. Its one of my favorite single objects in the whole universe, its called G515, but my friends decided to nickname it 'Flagellen' because it looks like a microorganism with a little tail on it.

I will definitely Wikipedia G515 now— that sounds so cool! What is a typical day like for you?

Well, this is part of my typical workday, I talk to people, but my days are really different from day to day. One day I will teach several classes, another day I will sit in front of a computer analysing data for 12 hours, or write computer code, papers, or grant proposals. About a couple weeks out of the year I'm actually at a telescope or working with a telescope from remote distances, manipulating and gathering data, looking up at the stars...one of my favorite times is going up to a telescope when the weather is nice and when I'm doing a long observation I have a few minutes to go stand outside on a catwalk and just look up at the sky, and see, and hear, and just experience that night sky that you could never see in New York, but just is such a cool part of being an astronomer...

For me, its kind of an equivalent feeling to one I imagine that a priest would have when entering a cathedral... I become emotionally overwhelmed by a sense of wonder and purpose. And whenever I become so frustrated by my homework, its nice to know that all I have to do to avoid giving up, is just looking up.

Yeah, I think so! For one moment, you really feel like you're part of the universe and its part of you.

[Permalink](#)