

Inspired Physicists

Contents

1	Chanda Prescod-Weinstein	2
2	Tommaso Dorigo	7
3	Stefan Hofmann	9
4	Kerstin Paech	11
5	Peter Steinberg	14
6	Anne Green	17
7	Stefan Scherer	20
8	Christine Dantas	23
9	Yidun Wan	26
10	Waiting for the Apple to drop	31

1 Chanda Prescod-Weinstein

Bee has asked me to talk about why I have chosen theoretical physics, and I am grateful to have the chance to oblige. However, I must ask for your patience because I couldn't explain why without telling you how I came to understand why, so this is written as a narrative. And begin:

A lot of physicists, whatever religious identification they take for themselves, take the opportunity afforded by the Christmas, ne "Winter Holiday," season to go home or travel to warmer climes. Even with the stress of family, people take the time to relax and read a silly book, perhaps something by Dan Brown about physicists. Me? Not only did I not go home to my hometown of Los Angeles, but I actually stayed in Waterloo, Ontario, a considerably colder location! I far surpassed the Dan Brown readers out there, gorging myself on episodes of Grey's Anatomy and Radio Free Roscoe. I was on a self-imposed and very strict break from thinking about physics so that I could think about something else: doing physics.

Before you ask, these two things are not the same. In the same way we might recall the stereotype of the distinction between the one who does and the one who merely dreams about it, I felt that for the last 14 years, I had been maybe living on the fence between the two. Ironically, right about this time, Bee asked me if I would write an entry for her blog about why I do theoretical physics. I told her I would, although I was petrified I was going to end up writing some pretty lies for everyone: inspiration that sounds good but really had done nothing for me. It is my hope that I have side-stepped inspirational-drivel and have instead managed to offer my version of the truth about what it means to do physics.

For the last decade and a half, I have really enjoyed telling the story of how my mom dragged me to see a doc about Stephen Hawking when I was 10, completely against my will, and how sometime during that viewing, a light came on for me. Something similar to Priests who say they "get the call." Luke Skywalker discovering his way with the force. It was definitely a mythical feeling that insisted that I have a copy of Hawking's book immediately as well as plan out my entire career, which I did: an undergraduate degree from Caltech or Harvard (the latter turned out to be the case) and a Phd from Cambridge. (who knew it was so expensive to attend school in England for a USAmerican?) From there, I would continue into a glorious career that would involve discovering the true physics that would eliminate singularities and explain both black holes and the Big Bang.

This is probably one of the reasons that we probably shouldn't let ten year olds run the world: oversimplification leads to a lot of problems. Obviously,

the path to becoming a physicist is not nearly as smooth as I thought, and the earth-shattering moments of "aha" are not just few and far between. Indeed, they are the product of sometimes incredibly painful, scary, and seemingly fruitless persistence and hard work, something I'll be honest and say I didn't know too much about from an academic stand point until the week after I turned 17.

It was at that time, carrying with me an overamplified belief in my ego's ability to hold me up, that I arrived at Harvard and discovered I was one of the least prepared people in the Class of 2003 to earn a degree in physics. Between coming from a political family that had doubts about the role physicists had played in world events to having attended a public school with less than ideal resources (bread board? lab? what?), I was a fish out of water. You can guess that it was a struggle.

Largely thanks to my mother, I persisted. Everytime I tried to give up, she reminded me of how hard I had worked to get to where I am. Mysteriously, my mom just knows stuff sometimes, like the fact that deep down, I wasn't ready to let go. (Mom, seriously, thank you.) The ten year old dreamer that I carried with me helped. Most likely, the stubborn streak that sometimes drives my mother nuts helped. And in the end, the small community of Black theoretical physicists that I ran into during my final years as an undergrad were the ones who made sure I believed I could stay on the path. (Additionally, Harvard Physics admin Carol Davis should be noted here as a strong Black role model who always believed in me and to whom many Harvard BAs and Phds over the last 30 years owe a great deal.)

At this stage, you are thinking that I have made a very nice thank you list and told a very nice inspirational story. Hopefully you're not (too) bored, because that wasn't really the ending. I had the good fortune of being accepted into the doctoral program of the wonderful Department of Astronomy and Astrophysics at UC Santa Cruz. When I made the choice, I was barely a month into my General Relativity class with Prof. Arlie Petters at MIT (a visitor from Duke), and I had convinced myself that while I would never make it as a theoretical physicist, I could at least become an expert in extra solar planets, a growing and deeply-interesting field that I still try to follow. (This assumption was predicated a view of hierarchy in physics and astronomy that I would never support now. The high energy theorists are considered the best and the brightest, but the truth is, I don't think my planet mentor, Prof. Dimitar Sasselov, is replaceable by any of his counterparts in high energy physics. It would serve us well to move on from looking at the world of physics in this way.)

But by the time I got to Santa Cruz, Dr. Petters, another Black physicist,

had turned my head. Not only had I passed my graduate course in GR, but I had excelled. He pushed me to attend the annual meeting of the National Society of Black Physicists, where I met theorists who treated me like I could understand what they were saying. Their confidence in me helped me grow confidence in me. (As many of you have likely read, I am now very involved in that organization, and if you have ever wondered why, it is because of that gift.) So on my second day in Santa Cruz, I walked into Prof. Anthony Aguirre's office and said, "I want to work for you." And he was cool enough to let me.

But still, I questioned. Am I good enough? Why do this instead of doing something more productive, more world-saving? Have I sold out? Why can't I just get paid to read and analyze Jane Austen or the French Revolution like some of my profs at Harvard had encouraged me to do? Why physics? Why did it choose me? Why can't I unchoose it? With the help of a friend to whom I will always be grateful, my questioning lead me back to how I got there in the first place. I wanted to know where Einstein had gone wrong: why couldn't his theory tell us about what happened at the center of a black hole? My friend pushed me to try just a little harder to reach for the answer. So I did. (Meda w' as, Kofi.)

I got lucky enough that my questioning lead me to contact with Dr. Lee Smolin, who eventually agreed to take me on as a Phd student, unofficially at the Perimeter Institute, officially University of Waterloo. Rather suddenly, I packed up my life in Santa Cruz and drove (yes, drove!) to Waterloo, to begin a new life, a new Phd, a fourth year in graduate school. You'd think by now that I'd have everything under control: how to take classes, how to take exams, how to not freak out about whether I am good enough. I am the recipient of a National Science Foundation Graduate Research Fellowship, people have reminded me. The Lee Smolin has undertaken training me as a physicist. Clearly, if there was ever a time to stop questioning and get to work, it's now.

And in a lot of ways I did. I spent all of last August devouring books on quantum gravity, gauge theory, and group theory. But then the classes. The anxieties of performance returned. And I have to admit, the stress beat me down quite a bit, and not all of it is someone else's fault. So everytime someone reminded me of that NSF Fellowship, I wondered why it didn't make me immune to the rough and tumble. The truth is: I knew why. The awards, the recognition, and high grades/test scores are a nice bonus if you can get them but they're not what makes physics happen.

I have learned a lot from coming to the Perimeter, from working with Lee, who is a very cool dude. Physics happens because of hard work, yes. Physics

happens because of persistence, yes. But physics also happens because of a creative drive and a will to create. If we choose not to exercise that creativity, if we choose to suppress it, or if we choose to narrowly define how it is measured (everyone knows that one's physics GRE score doesn't correlate with a good Phd Thesis, and that it may bias against women and minorities, so why is it still so heavily weighted in graduate admissions?), then physics will not happen.

More and more I repeatedly found myself explaining to people: no one goes to graduate school in physics if they don't love physics because we're just not paid enough to do that, and we could be paid a whole lot more to do something else. Maybe this seemed to become my mantra because I was trying to convince myself, more than anyone else.

One of the things I did over my break was go to the Royal Ontario Museum (ROM). After about 5 hours wandering around with a friend, I ended up in the First Nations exhibit, which displays both old and modern artwork of the people who were here first. I found myself able to recognize all of the Sioux work without reading the placards. This is thanks to a few childhood trips to the sacred Sundance ceremony and many other Lakota-related events with my very spiritual mother. Our different take on the Spirits is something that has caused some strife between me and my mother, but as I was standing in that exhibit I realized that whether I could understand or explain it, whether it was physical or psychological, the connection was there. I was inspired. For the next few days I thought and I wrote about this feeling I was having, and then one day, I understood the feeling: I was ready to stop thinking about doing physics, and I was ready to just do it. And I've been doing it, pretty intensely.

What changed? I figured out why I should do theoretical physics. It'd be easy to say it's because I got the call. Perhaps people could intuit that. But that's only part of the truth. It's also because the fact that renormalization both upsets and fascinates me makes me want to keep reading more (and has turned Kenneth Wilson into something of a personal hero recently). It's because for the first time, I saw that I didn't need to become a physicist because I have always been one. This is the truth that I took from my visit to the ROM.

It is true that being raised with minimal exposure to Western traditions in scientific thought put me at a disadvantage during my early training in physics technique. But that does not therefore mean that to enter into this field of research, I have to cast off the traditions (spiritual and political) of my family to become one. Indeed, I am not required to become Western in my view of how people should be evaluated (in terms of their earning

potential), nor am I required to see physics as a career that I choose or a physicist as something someone becomes if they fit the "right" mold. Finally, I do not have to forget where I came from or who I am to become something else: I can be a queer Black woman who believes in and works for social justice and a physicist, and those identities can be consistent with each other. I'm not sure if I can explain what that will mean tomorrow or the day after, except that I'm going to be very, very busy, sometimes frustrated, and always proud of who I am.

I suspect that my reasons for doing theoretical physics are either something you grok (hopefully you've all read Heinlein), or not. But before you reject it, I ask you to think about it for a while, perhaps a long while, as I did. I'm 24 now, and I'm pretty sure that I'm terrified of 24 year olds being allowed to have any power in the world, so perhaps I've learned a little bit in the last 14 years. If nothing else, I know that it is important to me to take this moment to be thankful to all who have come before me and my ancestors, in particular the ones who survived the Middle Passage. Your passion to survive flows into me and becomes my passion to engage with the world deeply, giving me the will to create.

Chanda Prescod-Weinstein earned her BA in Physics and Astronomy and Astrophysics at Harvard in 2003, an MS in Astronomy and Astrophysics at UC Santa Cruz in 2005, and hopefully will earn a Phd in Theoretical Physics from the University of Waterloo in 2009. The dark energy problem keeps her up at night, as does dancing, thinking about matters of social justice, and a voracious appetite for literature. She highly recommends the book Stranger in a Strange Land by Robert Heinlein for those who did not understand the word "grok." Of course, wikipedia has a cheat sheet, but please, read the book!! Finally, a shout out goes to Prof. Steve(n) Weinstein who said some very useful things about what physics is and isn't over break.

2 Tommaso Dorigo

I was asked by Sabine to write here about why I became a physicist, and to answer a few ancillary questions she supplied as guidance. I am happy to comply, so let me start from the beginning, as I am a tidy person when it comes to writing.

When I was a kid, I used to be a little mathematics genius. I was fascinated by math and its rationality - everything was simple, and orderly, quite unlike the shattering relationship between my parents. Math was a refuge. And quite naturally, from math I came to appreciate most natural sciences, especially Astronomy.

It was only in high school that I started to study Physics and to love it, stimulated by a very charismatic professor of math and physics. To study Physics at the University became a natural choice, but my interest in the investigation of the organization of Nature at the smallest scales was not love at first sight, but a slow process, and my landing in high-energy particle physics was somewhat accidental - I stumbled in a call for summer students at Fermilab, and got hooked!

I realize that telling the story of how I became a researcher does not fully answer Sabine's question of why I am a physicist, but it is tough to do that. After the University I could have decided to become something else, but so many things pulled in the same direction I did not even start to oppose resistance.

So let me make a list of why I chose a career as a physicist, rather than trying to make sense of each bit in a grand design. Computers are my best friends. I am fascinated by science and basic research. I am ecstatic if I can find a pure thought nobody had before, and use it in my studies. I love to teach. And I love to travel!

But of course there is more. I am not driven by a strong ambition - let's say that my objective is to end my career as a inspirational professor of physics. What drives me in my job is rather the attempt at justifying my life in helping the advancement of human knowledge, and I think the best way to do it for me is by doing research in particle physics.

Of course, I find my job fascinating, and just being part of giant and complex projects such as CDF or CMS makes me proud. There is always so much to learn that one cannot get bored. And it is extremely stimulating also because many of the people I work knee to knee with are at least as smart as I am, and it is a full time job to keep my head above the water.

Yes, I am a happy fish. And my philosophy of life comes to the rescue when I feel I am not doing enough, since I subscribe to Oratio's aurea mediocritas:

I do not want to become a general, but just be a good soldier. If they allow me to do my tiny bit to help humanity progress then I feel I have done my duty...

Sabine also asked me about my blog. Why do I spend so much time on it ? I think as scientists we have the moral obligation of doing as much outreach as we can. In today's world there is such a tremendous drift toward irrationality, religious beliefs hindering the progress of a free society, and a continuous barrage fire on the media promoting superstitious beliefs, that if scientists continue to hide themselves in their ivory tower they can only lose the battle. What is the purpose of devoting one's life to the advancement of knowledge, if that knowledge is not shared by many ?

Sure, one could argue that technological advancements are used by everybody even if people do not understand them, but the problem is that as science gets more and more disconnected from the real world the investment that society does will shrink gradually. It took just a few ignorant congressmen to kill a fantastic experiment in the nineties, the SSC. Because of that, we lost 15 years in fundamental physics. So it is our responsibility to educate the future congressmen that could kill important new endeavours.

Keeping a blog, maintaining it and making it interesting and stimulating both to non-scientists and to colleague scientists (their contribution is fundamental to keep the effort going) is a heavy burden, but I have some time to devote to it since I do not teach. So I invest part of my research time in explaining particle physics to whomever wants to listen... So far so good!

Tommaso Dorigo is a INFN researcher in particle physics at the University of Padova. He collaborates with the CDF experiment at Fermilab and the CMS experiment in construction at the CERN laboratory. His research activities are in top quark physics and Higgs boson searches. Tommaso is 40 years old. He lives in Venice with his wife Mariarosa, a teacher of latin and greek, and their two children, Filippo (7) and Ilaria (3). When he is not working (that is, most of the time) he is busy with his many hobbies: astronomy, chess, piano. And of course he maintains the blog 'Quantum Diaries Survivor', where he strives to make elementary physics really elementary, by explaining cutting-edge research in simple terms.

3 Stefan Hofmann

When Sabine asked me to write about my motives for spending so much time with physics and in the physics community, she offered me a nice opportunity to bring those motives back into my consciousness, and to unearth my very own roots in a very human and bold venture.

Curiosity is a universal human factor only to a certain extent. For each individual, the amount of curiosity is never a constant in time. It changes due to physiological and due to psychological processes. While the former might be traced back to our genetic blueprints, the latter are literally medium effects, created by the interactions between the individual and its local social embedding. Interactions might consist of posing questions out of curiosity, not intended to fulfill the listeners expectations, and an induced reaction might consist of digesting the different levels of answers.

When you observe children acting out their curiosity, you might wonder why we should be concerned about curiosity at all? The answer is: in the beginning there is never a lack of questions, but an absence of good and honest answers. Perhaps the most important characteristic of a good answer is that it aims at establishing an understanding, at increasing the depth of perception. In the spectrum of possible responses, the subset of honest answers includes the honorable "I don't know" and answers that do not replace one unknown concept by another, as in: "Why is the dog behaving like this? - It is instinct, period." Unfortunately, bad answers tend to satisfy the appetite for getting to the bottom of things and diminish our curiosity.

Curiosity can be revived in many ways. One path to it lies in the confrontation with questions that come along with a precise framework to formulate and answer them. Those questions can be viewed either as interesting or boring, they might be considered as being trivial or not of general enough interest. However, these kind of questions offer the opportunity to safely conclude to what extent they have been answered, independently of a specific social embedding.

It was this liberating aspect of the analytical school of thinking that fascinated me, together with the solid ground a precise framework offers: solid enough to analyze processes with powerful (although possibly restrictive) methods that do not care about me being a member of a majority or a minority group or about my social status.

This is the positive outcome of my experience with chicken pox when I was sixteen and found enough time and less distraction to work through a book on analysis written for students in mathematics. It was a lucky accident

and my anger is still growing that it had to be an accident. Although mathematics appeared in a new and beautiful light, the intention grew to apply it to something in order to explore its power. This is how physics entered the stage of my interests.

One of my depressing experiences with physics in school is that it has only little in common with the science of physics. You might object that we are being taught some of the basic laws of nature in school, and what else should physics be? Well, the interesting part is not to know some laws by heart, but the whole school of thinking and imagination behind it, the methodology. Surely it is fascinating to rethink and recover the thoughts of the thinkers before us, but at the end of the day we want to have the means to boldly go where no one has gone before us. If we decide not to follow this path, we should do so as free and strong thinkers, not just because we didn't have any real choice in the first place.

But isn't it risky or sometimes even dangerous to question the very foundations of our views of the world? Dangerous for a peaceful mind? Perhaps it is, enlightenment starts often with deconstructing our prejudices, with the first step towards a dark abyss. It is not too difficult to take these fears serious. What seems harder to imagine for many is how frustrating it can be to live in a world constrained by ignorance. Ignorance is a brutal prison for our mind and psyche.

For me physics was and still is the key for breaking out, or at least the hope for a life after ignorance.

Stefan Hofmann is a cosmologist at Perimeter Institute for Theoretical Physics, where he thinks hard to shed some light on the dark side of the Universe.

4 Kerstin Paech

"Why did you become a physicist?" That was the quite simple question from Bee that I find very hard to answer. But I will try my best to do so. Probably answering this question is so hard for me because I feel an entirely different person started making this decision about 10 years ago.

The first occasion I remember today that may have set me on track (or maybe just foreshadowed it) becoming a physicist was when I was about 10 years old. I started wondering what made the world going and why things happened. For my grandmother - I spent a lot of time with her as a kid - the answer in the end would be "God". Unfortunately, when I was around 10, this answer did start not making sense to me anymore. Even worse, it was the source for even more questions and confusion that I found to be very troubling back then and none of the grownups would really answer. Over the next years I looked for an answer in a lot of places and from a lot of people, but I didn't get an answer that would satisfy me.

Some years later, my curiosity found a great playground: science fiction. Although it didn't answer anything, it asked questions that were not so different from my own. Good science fiction is as much about the science part for me as about the fiction part - where here fiction for me means to explore existential questions about our existence and the very limits of our existence. Not all science fiction does that, but my favourite ones do.

And with science fiction there came an interest science. So I went listen to public talks about Astronomy and Astrophysics, started to read popular science books. It started with Special Relativity went on to the Standard Model.

However, this fascination with fundamental physics didn't translate to my interest in physics I was supposed to learn at school. Sure, it was kind of interesting how a refrigerator works, but what was about the really interesting stuff? In 11th grade then, everything changed - I got a new physics teacher - Alfred Schmitt. He showed us a hint of what physics is like, he showed us the structure of it all and it actually started all making sense. So, although I was an average student in physics at best, I chose it to be one of my two majors for the final to years of my high-school education (In the last minute I changed from majors English and Sports to Math and Physics).

And with the end of high school came the question: What's next? Although I was really thrilled about physics and the entry in our final yearbook read: "Greatest dream: Working at CERN" I was not sure at all if this was what I really wanted. I had the two options laid out for myself: Should I become a Physiotherapist or study Physics? I was absolutely uncertain if I could

take up this challenge, but my curiosity won (my husband would probably say that this is not surprising at all, because I am the prototype of a nosy person).

The first years as a student at Frankfurt University was like life on the fast lane. I found that my high school teacher had prepared me extremely well for what I would find at the university - at least physics wise, it didn't keep me from wondering if I could really make it.

I soon started peeking in to research, I went to CERN (can you believe it???) in the summer after the second year to get some hands on experience with the NA49 experiment. I was overwhelmed with all the new impressions I got. I found it real mind-blowing. After that summer I decided to go for theoretical physics, I felt it to be my real calling.

Unfortunately, there is no real fundamental theoretical physics division in Frankfurt. You can either decide for theoretical solid state physics or for something that is called "structure of elementary matter", but effectively is heavy ion physics. Maybe an interesting field of research, but for sure not a very fundamental one. Leaving Frankfurt to go to another University was not an option back then. So I stayed and chose heavy ion physics, because at least there were quarks and gluons involved. And a lot of people there gave me the really strong impression that fundamental physics is not really worthwhile and heavy ion physics is as good as it gets in physics. Over the time I lost my calling, I settled for less than I had started for. And it was only much later I realized it and that is when I became the person I am today. I don't feel the kind of curiosity in my daily work anymore. I still like my job, but it is not my passion anymore. It's a little like growing up and with growing up the wonders slowly fade away.

But then... I found new wonders, sometimes in unlikely places. I found that Physics was not the only path I would choose - why do I have to choose anyway? If I had met different people, had stumbled upon different impressions, I maybe would have found a fascination for Anthropology, maybe for Philosophy, maybe for Computer Linguistics, maybe for Psychology, or maybe - if my grandmother had had different answers - Theology. After all "We create the meaning in our lives. It does not exist independently"¹.

Kerstin Paech graduated 2005 in Frankfurt/Main (Germany). Currently she is a postdoc at MSU, working on Heavy Ion Physics. She is a great fan of Hobbes (the tiger, not the philosopher), in her free time she enjoys to cook and she hates fast food with a passion. Her favourite SciFi TV Shows

¹Quotation from a B5-episode

are "Babylon 5" and "Farscape", her favourite SciFi books currently are "Altered Carbon", "The Swarm", and "The Sparrow".

5 Peter Steinberg

As a child, many people noticed that I had aptitude in mathematical things, and even I noticed a persistent fascination with all things mathematical and technical. This was despite being surrounded by a family much more into art, design, and all that (my grandmother collected art, my father was an art history major turned city planner, my mom is a licensed architect, and my sister a trained painter, etc.). Ultimately it was a combination of two people, my grandfather and my father, who nudged me towards what would be my career. My grandfather was a businessman, but one with a tinkerer's disposition (keeping a functioning woodshop and darkroom in a Lake Shore Drive apartment) and longtime fascination with most things physics, e.g. Einstein's relativity, and math/logic, e.g. chess, for which he unsuccessfully tried to get me to sit still long enough to play against him. My father had some early success with math and science in school, but followed a different career path. And yet, he was always dropping interesting things in my path, be it my first computer at age 9 (after I consumed all of the computer magazines he left around the house), or trips to Fermilab as a teenager to see the accelerator. Somehow the mystique of being a physicist ended up as part of my DNA (both physical and mental).

That said, the path from age 11 to age 18 was one of budding math/physics/computer geek, to puberty, and thus a channelling of said geekiness into musical pursuits (piano, then guitar, then bass, then recording with friends, playing in bands etc.) to the utter neglect of my technical abilities. In the pursuit of, well, the attentions of the opposite sex, I somehow decided that music, art, and other creative endeavors were my way out of a somewhat annoying adolescence.

So I end up at college at Yale, all set to tackle the big questions of western civilization. But, I had no idea what the western canon really was (my school was excellent but a bit disorganized, or maybe it was just me that was a bit disorganized...) and somewhat overblown views of my abilities to express it. So, like all intellectually precocious, but completely pretentious, young men, I gravitated towards philosophy and literature as my way to encounter those big questions. And I was terrible at it, at least relative to my better-prepared, and generally more urbane, peers.

And then the pivotal event: a week after starting classes freshman year, my grandfather passed away after several years in and out of hospitals. Not only was he the grandfather who taught me so many things (from the concept of relative motion to how to twiddle with a color print) and whom I could spend all day with – and did throughout my youth – but he was the first person in

my family to die. That is to say, up to that point death had been something very abstract for me, despite friends having lost parents and grandparents along the way. It was always something that happened to other people, so I had no sense of what it meant to feel loss. That wasn't a problem anymore after that, since I found myself heartbroken for the next several months (and it didn't help to think that I was performing at a mediocre level, at best, in most of my classes!)

But what was a problem (but an amusing one in retrospect) was that I had stumbled into taking an introduction to Greek philosophy, more or less by accident as the result of a passing remark by my faculty advisor, who was more or less randomly assigned to me upon entering college. R.I.G. Hughes turned out to be a well-known philosopher of Quantum Mechanics, but I had no idea at the time, when he seemed more like a well-meaning but somewhat oblivious old English guy with a beard (and who taught the second semester philosophy overview, and terribly, if i remember right). Anyway, don't give a 19-year old in mourning the Phaedo to chew on, with all of Socrates' ruminations on body and soul, life and death. While I was hooked on the the subject matter and the intricate arguments, I was getting genuinely obsessed with mortality and its discontents, both pertaining to my grandfather, whose disappearance I had a hard time accepting, and to myself, for obvious reasons.

Unfortunately, freshman philosophy classes are great on questions, and are not so great on answers. I had a sense that I was never going to get what I needed. Thus, I remember a conversation my grandmother in her kitchen a couple of months after my grandfather died. She taught me a clever way to clean my glasses (I had just gotten my first pair after realizing that I couldn't see the blackboard from the back of the room) and probably chatted with me about her firm belief that our souls were some kind of "energy" that moved on to "dimensions beyond our ken" (I always loved that phrase). This was a conversation we'd had many times as I was growing up, as she wasn't at all bashful about her more mystical beliefs. But this time, something hit me. I had to know where my grandfather went, and thus where I would go when my time came. And I instinctively felt that this was a *scientific* problem. OK, I had some fairly desperate ideas: to become some sort of scientist that would actually observe what happens to our "energy" after we die (not exactly an original idea, e.g. Innaritu's "21 Grams"). But I at least decided that I had to try and understand what was known, so I could get a better grasp on what wasn't known, or perhaps what could never be. So that was my Moment, the precise space-time event where I decided to become a physicist.

From there it wasn't a straight path, to be sure. But that's another, much longer and more complicated story.

Anyway this sounds like a somewhat childish, and even non-scientific, reason to become a scientist. But I know I'm not alone in finding that Death is a powerful thing to wrap one's mind around, and something which can drive one in unexpected directions in life. Just consider Ronald Mallett, whose memoir *Time Traveler* was also done as a fantastically-gripping radio piece on *This American Life*. Here's a kid who loses his father (a TV repairman) at age 10, and spends the rest of his life trying to build a time machine a la H.G. Wells – and does, in a fashion, after becoming a professional physicist along the way. I was riveted while listening to that radio piece, when I connected with the same yearning, and the same sense that there was a way to deal with the issue that was not based on religious faith, but on actually looking around and engaging with the physical world. Maybe it's not surprising that I do particle physics, often described (inaccurately) as a "time machine" to the early universe. I certainly know that if my work didn't at least *feel* fundamental to understanding the nature of space, time, and how matter experiences it, I would probably be doing something else. Probably at a bank.

But in writing this, I'm torn between deciding that my Moment was the end product of a series of chance events (even R.I.G. Hughes suggesting I take that philosophy class), or something more like a directed random walk (i.e. I somehow knew all along that I'd end up the way I did). Maybe chance favors the prepared mind, indeed, so I can't help feeling glad for all the nudging from my dad and grandfather (and my mom too, who kept reminding me of my childhood aptitudes). I like to think they would be glad about it too, if they were around to chat about it.

Peter Steinberg is a Physicist at Brookhaven National Laboratory. When not working on current and future experiments involving colliding nuclei at BNL and CERN, he blogs at Entropy Bound, documenting his continuing efforts to understand sprawl of urban life, and to find the perfect dumpling, and maybe some bookshelves.

6 Anne Green

Why did I become a physicist? My usual answer to this question, especially after a few beers, is either "the career opportunities are far better for second rate physicists than third rate musicians" or "the film Top Gun" (the female lead has a PhD in astrophysics and I've got a bit of a thing about Tom Cruise....). The serious answer is a combination of the usual curiosity about how things, in particular the Universe, work and a somewhat unhealthy obsession with doing difficult things just to prove that I can.

Physics definitely wasn't something I just fell into. I grew up on a farm in rural Somerset in the south west of England. Neither of my parents have a degree (or even studied maths or physics beyond the age of 14), and only a small handful of the people at my not particularly academic school made it to University. By the time I was 15 I was spending most of my spare time playing various musical instruments and singing. Although I loved music, and lots of people assumed that's what I'd do with my life, I never really considered it seriously as a career choice. It took hours of practice for me to be even half-way competent and I didn't actually like listening to classical music.

The other obvious option was maths. For a theoretical physicist I'm not a great mathematician, but at school I could easily do anything the teachers threw at me. I was reasonably good at physics too, but didn't really enjoy it; it was too practical and too boring. Thanks to a number of television documentaries and the one popular physics book in Shepton Mallet town library, I began to develop a fascination with cosmology and astrophysics though, and convinced myself that physics at University would be more exciting. I toyed briefly with the idea of studying maths and astrophysics, or physics with music, but the "come and have a go if you think you're hard enough" appeal of straight physics at Oxford eventually won.

I've got mixed feelings about my time at Oxford. I unwittingly ended up at one of the posher colleges and, with my country bumpkin accent, Dr. Martens boots, purple hippy clothes and very short orange hair, really didn't fit in. The main college physics tutor, Ian Aitchison, was great though and I became good friends, and had a healthy academic rivalry, with the other physicists in my year.

Physics did get a lot more interesting, and by my final year I'd decided, thanks largely to a Scientific American article on inflation, that I wanted to do a PhD in early Universe cosmology. I had, however, heard about Part III of the Cambridge maths degree and, given its reputation for being tough and egged on by my friends, I wanted to do it. At that time students from

outside Cambridge could get funding to do part III, at the discretion of the education authorities where their parents lived. Somerset happily provided discretionary funding for people to go to agricultural college and study small animal care, but not, I discovered, to go to Cambridge and do part III. My tutors also tried to gently convince me that highly mathematical theoretical physics wasn't what I was best at and that me doing part III wasn't a great idea. The decision was sealed though when I got offered a PhD place at Sussex University to work with Andrew Liddle. Sussex was initially fairly low on the list of places I wanted to go, and back then Andrew wasn't yet particularly well known outside of the early Universe community. But having visited Sussex and met Andrew I was certain it was what I wanted to do.

At the end of my PhD I was fortunate enough to get a three year PPARC postdoctoral fellowship, which gave me the opportunity to follow my scientific nose and, slowly losing my pure theory obsession, I wandered from inflation to WIMP detection, via primordial black holes and micro-lensing. I then spent two very happy years as a postdoc in Stockholm before returning (semi-reluctantly) to the UK on a five year advanced fellowship.

Sabine suggested that I also write about the things which trouble me about physics, and I can't resist the opportunity to stand on a virtual soap box and rant about two of my favourite (physics related) topics.

The first one is the "harder the better" obsession of many theoretical particle physicists. At the risk of sounding like an evangelical born again Christian or a reformed alcoholic-there's more to physics than doing hard-core theory at the most famous institution possible! Which brings me to some pieces of (unsolicited) advice for PhD students and postdocs. Studying and working at "good" places is important if you want a long-term career in research. But the definition of "good" should include "where there are people who you can learn from and collaborate with" and not, necessarily, "a famous place which will impress your non-physics friends". And rather than following the herd, charging around writing papers on whatever is this month's hot topic, try and find your own niche working on problems that interest you and which you can make a significant contribution to solving. Not only is this more fun (and if physics isn't fun, why bother when you can get paid far more working in the city?) it's probably better for your long term career prospects too.

The second is the "diversity" issue. Most physicists are male, white and middle class. A lot of time and energy is spent on the first of these issues, a (very) little on the second and virtually none on the third. While I realize that things were very different in the relatively recent past, I firmly believe

that being a woman hasn't hindered my career to date at all (in fact it's the possibility of being the unwitting recipient of positive discrimination which keeps me awake at night). My family and school background, on the other hand, have made the path to becoming a physicist slightly more tortuous than normal. I had to fight a to be allowed to study "Further Maths" as an additional subject at school (a fairly standard thing for would-be theoretical physicists in the UK to do, but pretty much unheard of where I came from). My parents were always very supportive with practical things (for instance taking time off work to take me to University open days) but physics and academia are a complete mystery to them. I once mentioned studying mechanics. My mum's bemused reaction was "but I can't imagine you with your head under the bonnet of a car"! And the postdoc job search is stressful enough without having to explain to concerned parents that a series of short term positions is the standard career path, and not the beginning of a road to nowhere. Like many other physicists I'm involved in various outreach activities, but I think all too often we end up "preaching to the converted"; giving talks at "nice" schools, where going to University is the default choice. There's a large fraction of the population for whom this isn't the case. We should be doing more to try and make contact with them, and get over the message that studying physics is not only fascinating but also opens the door to a range of careers.

Anne Green is an astro-particle physicist and has a faculty position in the Particle Theory group at the University of Nottingham. At the moment she is particularly interested in the dark matter distribution on sub-galactic scales and its experimental and observational consequences. She currently spends her spare time ironman training, playing the piano, listening to nu-metal and emo and traveling to interesting/unusual places.

7 Stefan Scherer

After following the guest posts of our inspiration series for some weeks, Sabine pointed out that despite being a contributor of this blog, I haven't told my story. So, let me try to explain, how did I come to be a physicist, and what does it mean to me?

Sometimes I ask myself, am I a physicist? I have studied it, I have even a PhD in physics, but I am not currently following a research or academic carrier. Now, this is a situation shared by many physicists - probably more than in other sciences. Many of them find jobs in software, or, especially in places like Frankfurt, in finance. I have been very lucky, finding a job where I am keeping touch to what is going on in the science, at the crossroads of two passions of mine: physics and books. I currently work in the editorial office of a multi-volume reference work covering all areas of physics. So, I am keeping contact to physics more than most other physicists outside academia. Point I want to make, being a physicist is not so much a description of what you do, but of the educational path you have taken, and, first of all, of a certain curious, and at the same time analytic, way to look at the world around us. On the other hand, when I look back and try to see why and how I became what I am now, there are many contingencies that have brought me where I am, and many junctions that may have lead to other directions.

When I was a kid, there may have been signs that I may become a scientist, but not specifically a physicist. I was very curious about nature - my mother was amazed that I could name all the birds in the big garden around our house, and even accurately draw pictures of some of them. Later, I remember, I was fascinated by the TV series of Jacob Bronowski and Carl Sagan, and vividly read the accompanying books my parents had offered me. As a teen, I discovered the volumes of the TIME-Life Science Library series my father had subscribed to years earlier, and I read again and again about Matter, the Planets, or Mathematics, understanding a little more every time. And I was quite frustrated by the Scientific American, which I found extremely interesting, but which was way above my head. All this may have qualified me for very different paths, and indeed, in high school, when thinking about what to study later on, I sincerely considered many options: For some time, wanted to go into computer science, following the steps of my uncle, and learning more about artificial intelligence which was very much en vogue then. But I also was thinking about studying archaeology, and even to become an interpreter - after all, I could learn foreign languages with ease, and the institutions of the European Union in Strasbourg, Luxembourg, and Brussels were not far away from the place where I

grew up.

In fact, I do not remember how and why I took the decision to inscribe in physics. In the year before Sabine left Germany, she made a video for the Christmas party of the physics institute in Frankfurt, where she interviewed people about all kinds of things - it was a lot of fun! When she pointed the microphone at me, I replied without hesitation to her question that I had studied physics because of Supernova 1987A. Though this sounds like a good answer, it is most probably one of those reconstructions which our memory creates at hindsight to provide us with a straightforward story. On the other hand, there is for sure some truth to it, since I had developed a big interest in astronomy at that time, and the Supernova was a prime event in that year. There was no astronomy department in my "hometown" Saarbrücken university, so choosing physics probably was a logical step.

Saarbrücken is a small university, with the physics department focussing on condensed matter physics. I was quite impressed by the course on theoretical physics offered by Arno Holz, and after following closely his seminar on topological defects in condensed matter physics, it was clear for me that I would join his group for my diploma. Unfortunately, Arno Holz didn't live to see me finish my thesis. In a sense, his untimely death pushed my path through life in a new direction: The lecturer who took care of us students had close connections to a scientific publisher. He had translated several books, and was then looking for support with the translation of a text on the electronic structure of materials. With my faible for books, I thought this was a very interesting job, and did it. Indeed, I liked it so much that after my diploma, I decided to look for a position in publishing. I had luck and found a post with a publishing house in Frankfurt, where I immersed in the then new technologies of electronic media and prepared the German edition of a HTML based physics course.

Working with the quite small Frankfurt publisher, it was inevitable to learn to know Horst Stcker, who was not only one of the "star authors", but had his office at the institute for theoretical physics just across the street, and looked in quite often. When he learned that for my diploma I had worked on phase transitions, he asked me if I would not be interested in investigating the phase transition to the quark-gluon plasma, and getting a PhD in his group. I then knew next to nothing about quarks and QCD, but this was an intriguing option to learn some cool new stuff, and to do some real research. So, over the next long years, I shared my time between the publisher's desk and the physics institute. And this not only earned me a doctorate, it literally widened my horizon: The institute in Frankfurt is quite big, and has collaborations and connections worldwide. There was a

constant stream of postdocs and guests from all over the world, and I am really happy that I have had this experience to get to know all these people. And, of course, that I met Sabine, who's now my wife.

This may not have been a very typical career path, but somehow, I think, it fits with me. Still like the teen who was not sure what to study, I have many interests, and get manifold inspirations from friends and people I am interacting with. However, what intrigues me now especially in physics, that's the unity, the same principles and fundamental patterns which show up again and again in such a wide area of subjects, from condensed matter over molecules and atoms to the nucleus and elementary particles. This is just fascinating, and seeing and understanding such connections doesn't lose its thrill the more I know and learn. Being out of university now, I am happy that I have friends who keep me up to date - and that so much information is now available through the internet. There it still is, the endless frontier, and I am just curious and eager to know what it will show.

8 Christine Dantas

Try to conceive nothingness.

It is not the modern physical concept of the vacuum, full of energy, and giving rise to ephemeral virtual particle/anti-particle pairs. Nor it is like a blank panorama, something like a flat space-time devoid of matter, since there is no energy, no time, no space, and no mind – for whatever definition it is worth –, since even self-conception is not allowed for nothingness.

Nothingness stands more elusive than the concept of God. It reigns separate from any possible concept or entity, it is devoid of any realization – even of itself; it does not belong to anywhere nor anytime to "this world" (or to any other possible world) – yet, to our intellect it is "there" somehow.

Why exists everything, instead of nothingness? Nothingness should have been the rule. Or perhaps it is, but we do not realize it. We **do** wonder that, before being occasionally constituted into living forms, we **were** nothing, and when we die, we will be **nothing** again. But is it the same thing?

Perhaps, in fact, nothingness reigns. Perhaps, as paradoxical as it may seem, everything is in fact, nothingness revealed to us. And hence, there is no creation, but some odd, inconceivable delusion.

Those rather metaphysical questions bothered me for a long time since a very young age. Such questions do not belong to physics, but it seemed clear to me that, somehow, I could only understand them through science (and to a certain extent, through philosophy), but not through religion.

I mention religion because I was ten years old when I realized that, after staring, every week, during several years, half an hour or more at the image of Jesus Christ in a church of my school (I studied at a Catholic School), repeatedly and full-heartedly in my mind asking for Him to appear before me – if he really existed –, and not receiving even a glimpse of response back, I could only conclude He did not exist. My intentions were the purest possible, and He never came. Why He would not come before me? I started to become more and more defiant in my requests, until I decided I would no longer pray before sleeping.

It was a hard time for a little girl, very shy, and scared to talk about these events to anyone else. I was very lonely in this mind endeavor, but it was not so terrible that it happened that way. At least, as I see it now.

I was (and am) exceedingly impressed by the fact that I exist, that the Universe exists, and this fact imparted on me, and perhaps substituted the common idea of God deep inside me for something else that even today I don't know what it is. Perhaps, it is nothing after all, but I do not know for

now.

Back, during that time, I discovered science-fiction books, and consequently, popular science books. I would say I had two great teachers during this period: Isaac Asimov and Carl Sagan. From reading their books as a teenager, I decided to be a scientist.

It was and is hard to be a scientist for several reasons, but I will spare the reader from this. I will only mention two things that bothered me most for some time. First it was to find out that not every scientist was turned into a scientist for similar motivations that I had (I mean, the search for a deep understanding about nature). Second, that it is hard, very hard, to get a job as a scientist. Specially if you are too romantic and do not see why a large number of papers is "almost" all that makes a career (being very socially driven also helps a lot). My romantic view of science (that what matters is the value of your work and thoughts) is perhaps the most "misleading" and lasting impression that I carry from my childhood's conceptions and endeavors. We do get old and learn something about the "world out there" and adjust as time goes by. But the most important thing to me is to learn not to get corrupted and remain faithful to your own deep motivations.

So every question in fundamental physics concerns me, intrigues me, and it's unavoidably part of my own questionings. Many physicists would not agree on this and would have a much more impersonal posture and highly different motivations and aims. It is not that I think they are wrong (apart from those that look for stardom), but if I am to be entirely faithful to what I am and think, science goes beyond models, numbers, theories and even brilliant ideas. It is about a deep endeavor – as Carl Sagan wrote once: it's about atoms thinking about atoms. And although we need models, numbers, theories and ideas to "think" over them, what matters at the end is the fact that nature is understandable at all – as Einstein would add. To understand nature, even in our tiny human steps, requires exquisite intellectual conditions and a life effort of many minds.

Apart from the difficulties, I cannot think of any other activity as intellectually pleasant as the scientific research, except perhaps for music, to which I had devoted myself for some time (as a soprano). I did not chose a scientific career because I was good at maths and physics (I was average, and did much better in composition and arts: in fact, I wrote many science-fiction short stories and poems when I was younger and a SF book, unpublished, entitled "Laplace's Demon"). I chose it because I know of no other convincing and objective way that I could attempt to *understand* something about the Universe and about myself.

Having "acted mostly" as an astrophysicist until now, I really never con-

tributed to the fundamental questions that so much bother me, since I only had the opportunity to look at some tiny details that nature uses to show us on the sky. All I hope is that I still have the time to put my whole energy into fundamental physics. That is my ongoing lifetime aim, even though I am largely unsure on what I really can achieve.

I did not go very far in terms of what many scientists consider as a successful career. If I had followed some prescribed path or formulae, perhaps I would have gone somewhat "far", but would have reached nowhere in terms of what I was initially motivated. And such a "nowhere" certainly would *not* be any closer to the "nothingness" that impelled me first of all! So, what can I say? I have been more or less faithful to myself and I am happy.

So here it is, a little about why I chose science as a career. This text, I would say, reflects the most abstract and nebulous part of my motivations, and just for this reason, I thought it was more interesting to focus on. Thanks, Sabine, for the challenging invitation.

Christine Dantas is a Brazilian astrophysicist working at the Instituto de Aeronautica e Espao. She is interested in foundational questions in physics and cosmology. Recently, she found out that she cannot really escape from the blogosphere, so gave in and set up a new blog, Theorema Egregium. She is married, mother of a lovely boy, and in her spare time, she listens to Bach and walks the dog.

9 Yidun Wan

Why did I become a physicist? This, as normally a question for successful people, appears to be really hard for someone like me, who is still a PhD candidate with no splendid past. This is a hard question also because one can hardly answer it objectively and mathematically. However, being invited by Sabine Hossenfelder to write my answer as a guest post on her famous blog, it is my pleasure to try my best to say something, which may not be an satisfactory answer as expected by the host.

Prior to my story, I would like to spend some time on the word "physicist". Why? In English, one refers to physicists as those who do research in physics, including professors, researchers, postdocs, graduate students. However, the Chinese translation of a "physicist" (and more generally, a scientist) is not merely someone, who researches in physics, but one who has contributed to physics noticeably. The Chinese counterpart of a "physicist" in English should be a "physics researcher". Therefore, considering my situation, the question I am to answer should be better understood as "why did I become a physics researcher".

If I say that I simply have followed my destiny to become a physicist, you may laugh and think I am perfunctory, since this does not sound like what a physicist should say. Nevertheless, I am just telling the truth in an efficient way. To tell more details, it is better to first outline my history. Fourteen years ago, I began my undergraduate study in China. After four years, I obtained my first Bachelor's degree in Computer Science. One year later, I got my second one in Economics. Then I started to work in some Chinese company. Six years ago, I landed on the U.S.A. and continued my study in Computer Science as a graduate student. After one year and a half, I had the opportunity to switch to physics. Hence, I took a master's degree in Computer Science and quit. In the next two years, I had been doing research in applied physics (though theoretical calculation) in Canada, which brought me a master's degree in physics. Right after this, my world line extended to doing theoretical physics at the Perimeter Institute; now I still move on in the same direction to explore the physical nature till the singularity of my life. Having read my brief history, you may take off now if not interested in any more detail.

So ladies and gentlemen, let us begin a time travel along my world line back to the past. In the summer of 2002, I often wandered around in the campus of the University of Pennsylvania, since a critical junction of my life came to me, which put me in front of two choices: to do research in Neural Networks towards a Ph.D. in Electrical Engineering, and to move to the University of

Ottawa in Canada and begin my academic career as a physicist. Although the former option might be able to bring me a good life with stable job and income, I chose the latter one, as you already knew. There were two reasons. The first reason, obviously, was that I could then start to realize my dream of being a physicist. (I haven't explained why I love physics, but it is coming, just be a little bit more patient in the time travel.) The second reason was related to my personal life; my girlfriend, who became my wife in that August, was to do her master's study at the University of Ottawa, so the only way for me to keep us together should be getting into the same university. The only shortcoming of going to the University of Ottawa was that I could not do pure theoretical physics but the so-called "theoretical" Fiber Optics, since the physics department there had only research groups in applied physics. Therefore, I decided to be enrolled in the master's program only in order to move to some other place where I can do theoretical physics later. Luckily, after two years stay in Ottawa, I successfully obtained my master's degree in physics and was admitted by the University of Waterloo, and joined the Perimeter Institute to pursue research in Quantum Gravity under the supervision of Prof. Lee Smolin. Since then I have been on the right track and become what I am now: a physicist.

Life is very unpredictable and is thus fascinating; a decision, which is apparently not perfect at the moment of being made, may turn out to be perfect at a later time. Take my decision of going to Ottawa as an example; it was not perfect for sure at that time because what I truly wanted to do was theoretical and fundamental physics. However, as soon as I entered Perimeter Institute, I realized that decision was so right. Why? Before I came to Ottawa, I actually had no any real background in physics and advanced mathematics; all I knew about physics and math was what I learned from my first year undergraduate physics course, some Electromagnetism I learned by myself, calculus and some complex analysis. With such a weak background, I would easily wash out quickly if I directly jump on some graduate program of pure theoretical physics. During the 2-year stay in Ottawa, I took graduate courses like "Quantum Mechanics", "Mathematical Methods in Physics", "Statistical Mechanics", and "General Relativity", and did a great job. Interestingly, I had no any problem of understanding Quantum Mechanics. The reason, I guess, was that I never learned Classical Dynamics systematically before I encountered the quantum one. Besides taking courses, I spent a lot time on learning useful math and physics by myself. Moreover, I also did some experimental physics, which input some concrete cognition of physics to my brain. In summary, having worked hard in that two years established me a relatively ok background in physics, which was

of great help to me in my first year at PI. Every time when I look back, I am grateful to my experience in Ottawa, and hence to my decision made in the summer of 2002.

Our itinerary of time travel may be mis-programmed in the computer of our spacecraft; we now stop at my childhood. Anyway, let us accept this and turn around our craft to continue our trip from here to its future. I am not very confident of my memory about very early years in my life. So we would better to start from my second year in elementary school. I remember in that year every student in my class was asked to write an essay about his/her ideal. My essay looked like a science fiction, in which I imagined the world of twenty years later, and more importantly I was a scientist, but not a physicist in particular. Frankly speaking, this does not mean that I really wanted to be a scientist at the moment. Part of the reason was that I might be too young to understand what a scientist exactly is. The other part was that "being a scientist" was a common ideal of many Chinese children at that time, since we were taught to believe that making scientific contribution to our country and even the whole world is a sublime and holy career. However, I knew that I was definitely attracted by two mysterious entities: the universe and the being. I just had been able to tell which one, the universe or the being, I was more interested in until I met a book, "the First Three Minutes" by Steven Weinberg, which influenced my life to a large extent. I clearly remember it was in some day during my first year in junior high school when I borrowed the book (certainly the Chinese version) from the civic library of my hometown. "The first Three Minutes" vividly elaborated the story within the first three minutes of our universe, from which I first got to know that our universe originates from a singularity through a Big Bang in about 1.3 billion years ago. In fact, I was not able to understand the physics in the book and did not even know who Weinberg was; nonetheless, I was completely captivated by the splendid and gorgeous scene of the early universe illustrated by the book. At the meanwhile of reading the book, astonishment, doubt, and excitement had been always possessed me; the strong eagerness to fully understand everything in the book in some day spurred me to take to be a physicist decoding the universe as my life-long ideal.

Irony of ironies, I did not appear to be very talented in physics when I was a child, and even when I was a teenager. My talent in literature (of course the Chinese one) and arts seemed much better than that in physics. This situation drastically changed only after I went to university, the South China University of Technology. The consequence was that I did not choose physics, but rather computer science as my undergraduate major, although

to be a physicist had always been a dream hovering in my head. Another factor caused me to major in computer science was my parents, who made the decision for me; this was pretty natural in China, at least at that time. During my undergraduate study, China was experiencing a rapid increase of her national economy; various enterprises, domestic or multinational, emerged; people became richer and richer. This big tide of economy also impacted me; I felt that to be a good businessman sounds not bad at all. Interestingly, to be adapted to the development of the our country, my university offered a new program, which allowed excellent engineering students to also major in International trade towards a Bachelor's degree in Economics. I, one ridiculously forgot his ideal at the moment, joined the new program. After graduation, I successfully found a job and planned to establish my own business in the near future. Nevertheless, soon I realized that was not the life I really liked and wanted. Watching the night sky decorated with shiny stars, the ideal of to be a physicist woke up in my mind; I decided to go abroad to look for my dream. Therefore, after having worked for about half a year, I resigned and went back home to prepare for TOEFL and GRE, which are required by most American and Canadian graduate schools. I had to choose computer science again so that I could successfully be admitted by American universities, because applying for graduate study in physics in the States from China without a physics background was hopeless and it ought to be easier to switch major after getting an American degree. Unfortunately, at the end of 1999, my visa application was rejected by the US Consulate in Guangzhou, China; I tried another two times in sequence, but they were all rejected. In the next year, I had to re-apply for universities and also took some time to refresh my memory on advanced calculus and geometry, and general physics. After had painfully waited for almost a year, I finally got my US visa in the end of 2000. I then went to UPenn and began my life in North America.

Since we have already read my past related to physics after 2000, our time craft should directly fly back to our current time. Thanks everyone who joined our time travel! I would like to talk about why I selected quantum gravity, in particular Loop Quantum Gravity as my research area; however, this is not a short story, which can be clearly narrated within such a guest post. Anyway, what I wrote above should be sufficient to answer the question "why did I become a physicist".

I think my world line behaves like a damping oscillator along time, which although turns aside often from the way to be a physicist, eventually converges at being a physicist. So again, I have to say: "I simply followed my destiny."

Yidun Wan is a Ph.D. candidate affiliated with the University of Waterloo. He works on Quantum Gravity at the Perimeter Institute for Theoretical Physics, under the supervision of Prof. Lee Smolin. He blogs at Road to Unification and also maintains a personal webpage here. He is currently working on unifying matter with Loop Quantum Gravity.

10 Waiting for the Apple to drop

I just sat down with the best intention to write a lengthy blah on Clifford's question what inspires me. Now that I sit here, hands above the keyboard, I am facing a problem. It's not that the question is too difficult, it's too easy to answer. I get inspiration everywhere. Reading books, seeing movies, taking a walk - ah yes, also from scrolling through blogs. Most of all by talking to my friends and colleagues. The problem is now that I'm too inspired not to shamelessly use the opportunity of writing a guest post for Clifford. So let me redirect the question to your opportunity to use your inspiration.

Had you been born some thousand years ago, your life would have been pretty much determined by where and when you were born, and whether you happened to be a man or a woman. You'd have spent most of your time striving to survive. Undoubtedly, you'd have considered your generation very progressive, still you'd have worked hard to make a better future for those coming after you. And of course our generation says since then we've made a lot of progress! But what is it? Is it a 6 lane highway, 50 different Jelly Bean flavors, the size of a 2 GB USB stick, a life expectation of 80 years, plastic surgery, weblogs for everybody?

In my opinion, a society's maturity is measured not by the development (alias shrinking) of more and more technological gadgets, but by its ability to let (wo)men follow their passion. Progress is what makes our life easier. It is what gives us more time, more freedom. It is our understanding of nature that has allowed us to spend less time on the struggle to survive, and given us the opportunity to live. It has given us the freedom to follow all the stray thoughts that came with the evolution of the homo sapiens' large brain: the everlasting wish to find and understand our place in the universe that we are part of.

A search that everybody of us undergoes in his or her own way. Some find their place within the circle of their friends and family. Some in teaching, painting, constructing the cities of the future, writing down the untold stories, influencing our lives with every tiny single step, inspiring the next generation. And of course I'm completely biased here, but for me the front of all our search today lies in theoretical physics, in our task to answer the questions where we come from, why the world is as it is, what we are made of, and what limits the laws of nature set to our efforts to shape the world. I find it kind of ironic that during the last decades this ancient desire of men to just understand had to be more and more justified by the prospect of material output. Nowadays, governmental funding goes primarily into

applied sciences, ideally into military applications, many of which fulfill the only purpose to blow up other people's efforts to build the cities of the future. What a progress! Have we struggled so hard to make room for basic research just to question its relevance now that we have the opportunity to pursue it? Its like one of these confused moments when I eventually get up and drag myself into the kitchen. Just to find that I've forgotten what I wanted to do when I get there (see: woking).

Of course I do agree that fundamental research is the door towards technological progress, but that's an argument you've heard so often I don't want to elaborate on it. It just makes me sad that we theoretical physicists need to justify our relevance through the prospect of patents, the claim that our search might eventually result in something you could order at futureshop.com. And then go ask yourself what's the economical relevance of knowing that the stars are not holes in the celestial sphere, and that there are incredibly many solar systems just like our own. It's not a cellphone with a ringtone melody from Robbie Williams that changes our view of the world.

If I ask myself how that has happened, I've largely to blame the scientific community itself. Being supported by the taxpayers, by those that provide the basis for our survival, we have neglected to share our insights with the society that we are part of. It is only now that we begin to feel the outcome of this missing communication that we remember our task. But what I find equally bad as leaving unclear what we do, is leaving unclear how we do it. A fact that I notice in every email from someone who has found the theory of everything and wants me to have a look at it (see: osbaston). And though I appreciate this evidence of inspiration, I've to say inspiration is necessary, but not sufficient.

As every other part of our lives, theoretical physics has been specialized into many areas, and it requires education to contribute to the front of research. Technical knowledge alone also is not sufficient, but it is definitely necessary. See, if you want to move into a cave, you don't need to worry about many details. But if you were to build the city of the future, wouldn't you better hire architects that have learned how to take care of the details. Like, the house not falling into pieces if you slam the door?

Theoretical physics in the 21st century isn't done by lying under a tree waiting for the apple to drop. It's a tough job. It's for a reason that the education takes so long. The difficult part is not having an idea, but to connect it to reality. The hard part is to make it work. The hardest part is to see it fail, and to start all over again. I as many of my colleagues have gone through phases of doubts. Doubts whether it's worth it, doubts whether he

or she is good enough, intelligent enough, patient enough, stubborn enough. Today, you have a vast number of options for your life. The wish to make the right choice, accompanied by the anxiety to make the wrong choice, and the responsibility for your own happiness. All that is a burden that comes with the freedom of our modern civilization. Every Yes' implies a No', every decision is an exclusion of possibilities. The better you know what you want, and what you get, the easier it will be for you to find your way. I think that Clifford's and other science blogs can provide you with a good impression of what it means to be a theoretical physicist today. If you think theoretical physics is the right place for you, then follow your passion.

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