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Beginner's mind

Several years ago I earned my black belt in jujitsu. Before tying the belt around my waist, the grand master had me don my old white belt, which designates a beginner. He then instructed me to look into a mirror and reflect on what it had been like to walk onto the dojo mat for the first time. The reasoning behind the ceremony is that in order to effectively teach a beginner any given technique, an instructor must be able to break it down into its most basic components. Ergo, it's vital to remember what it was like to know nothing about the technique at all.

The same is true when it comes to communicating science. In my experience, the majority of researchers overestimate how much science—especially physics—the general public is able to absorb in one fell swoop, and they quickly become frustrated at the level of ignorance they routinely encounter outside their rarefied professional circle. The current knowledge gap between scientists and the general public could more accurately be termed a yawning chasm. Cue the all-too-familiar hand-wringing about the sad state of science education in this country. In fairness to the public, more often than not, physicists forget what it was like not having a PhD in their field. They lack "beginner's mind."

Consider all the science people need to know just to comprehend why there is no cause for alarm in the "mini-black holes could destroy the universe" scenario associated with the RHIC facility and the Large Hadron Collider. The average citizen has a rudimentary grasp of black holes, thanks to popular science authors and the seeping of the notion into popular culture. But they probably know almost nothing about Hawking radiation, matter and antimatter, virtual particles, energy conservation, and energy/mass conversion, all of which is necessary to fully comprehend why mini-black holes pose little danger. It seems rather a lot to ask of the average nonscientist, especially if they're distracted by the season premiere of *Grey's Anatomy.*

So how do we reach them? *Grey's Anatomy* and other elements of popular culture just might be able to help. It's easier for nonscientists to grasp an essential physics concept if they can fit it into a familiar context, whether it is a TV show, movie, book, cell phone, iPod, sport, or hobby. This has led to a rash of books on *The Physics of (Blank),* a genre boosted by the 1995 publication of Lawrence Krauss' *The Physics of Star Trek*. Magazine articles detailing the science behind origami, traffic jams, and other common experiences are equally abundant. It's a highly effective strategy for getting general readers to learn a little science.

However, in the scientific community, such an approach is frequently derided as a "dumbing down" of science. This is not an entirely unfounded criticism. Certainly my own books occasionally oversimplify concepts to a point that seems ludicrous to PhD scientists, who are accustomed to far meatier fare. But they are not my target audience. You don't serve a starving person an eight-course gourmet meal they can't even begin to digest. You must wean them back onto solid food beginning with tiny bites of bread or crackers, alternating with small sips of water.

In the same way, to reach a broader target audience, you've got to break the science down into manageable bites. To someone accustomed to sampling the full smörgåsbord of scientific delights, dry bread and water would indeed be an insultingly meager repast. But to the starving person, it provides just the right amount of sustenance to prepare them for one day being able to consume an actual meal.

Once we've weaned the public onto more solid fare, we hope they're going to want to explore more substantial options on the menu at their leisure. But before they can embark on that journey of discovery, they must take those first baby steps. They won't do that unless we find some way to ignite their curiosity by showing them how science is relevant to things they already care about.

So however tempting it might be to roll your eyes in disdain the next time someone asks if quantum computing will enable us to communicate with aliens, practice a little patience. Remember when you used to know nothing about science, and break down your response into the most basic components. Foster beginner's mind.

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