

How to communicate the value of curiosity-driven research

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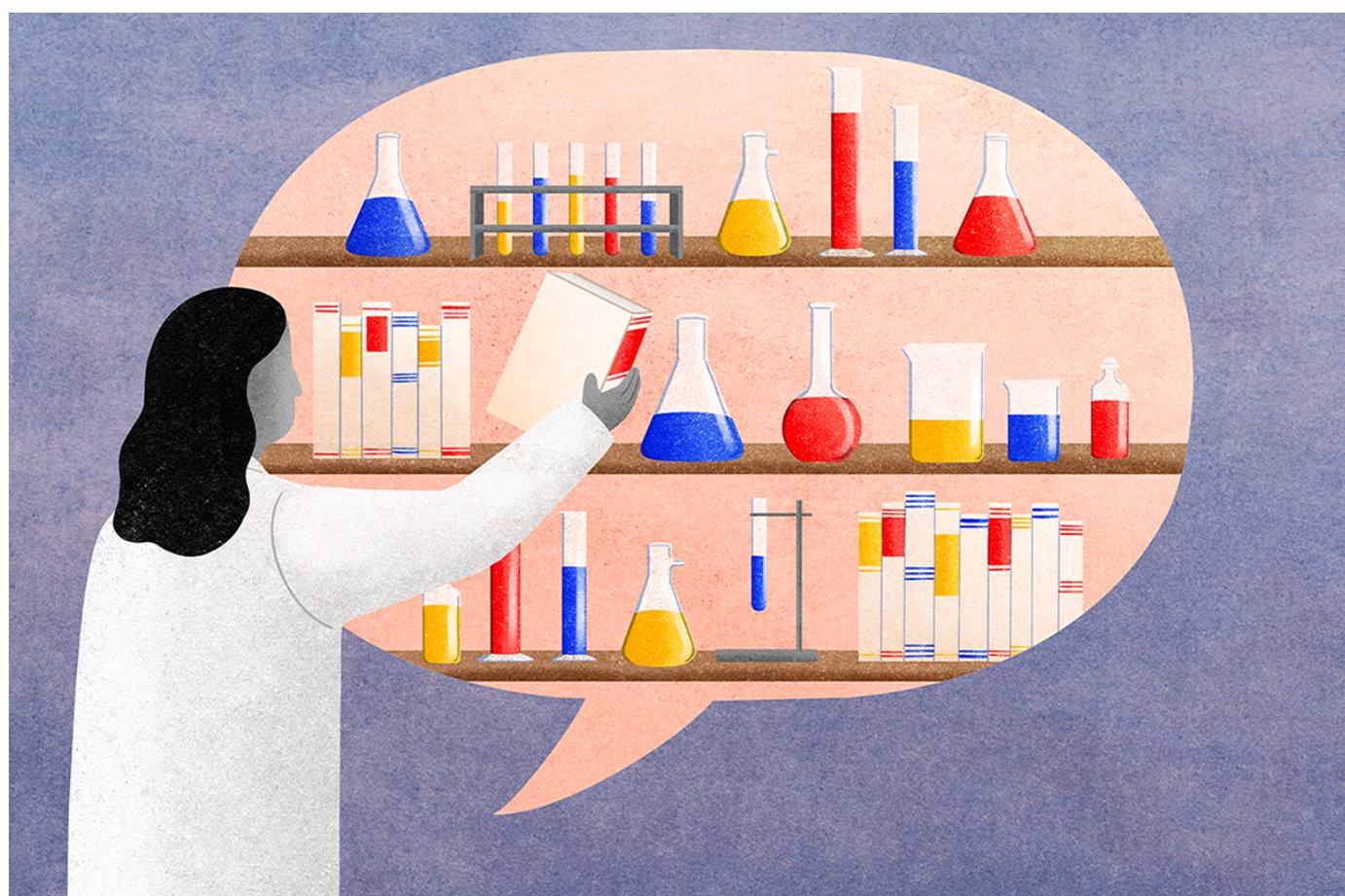
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Community outreach: Researchers must communicate passion and curiosity, connecting with those who share our wonder about the world. But just as important, we must learn to showcase the practical significance of basic research.

ILLUSTRATION BY SUNNU REBECCA CHOI

I feel lucky to be a scientist. I couldn't imagine a better job. "Do what you love, and you'll never work a day in your life," as the old saying goes. I know a lot of other scientists feel this way too.

When I explain what I do to other people, I naturally tend to focus on what I find exciting about my research. Personally, what drew me to neuroscience were the big questions: How does consciousness emerge from three pounds of brain matter? What is the biological basis of memory? Can we build artificial systems that mimic the function of the networks in our brains?

In my experience, a large segment of people are genuinely interested in these fundamental questions. Fascination with science isn't limited to scientists—it's what keeps the Discovery Channel and *Scientific American* in business and even catapults the occasional science book to the top of the bestseller list. Some of the most interesting conversations I've had about the Big Questions—mind/body duality, the nature of free will, what psychedelics or dementia tell us about the "self"—have been with people outside of academia.

But I have come to realize that the pure pursuit of understanding for its own sake doesn't resonate with everyone. Many people outside of scientific circles view research as an abstract ivory-tower endeavor, far removed from daily life. Such people often dismiss the pursuit of understanding for its own sake as a waste of time and money. Specifically, they see it as a waste of *their* money—the money they as taxpayers spend—a perception that leaves them particularly irked.

Even within science-adjacent fields, this attitude is quite common. To my surprise, many doctors fail to see the value of curiosity-driven research. "Stop wasting your time (and *my* money) studying Gila monster venom, and just focus on curing disease X." For them, the only research of any value is applied research, directly targeted at finding a treatment for a particular malady.

This is understandable. Taxpayers have a right to expect that their money is being well spent. The burden of proof is on us—researchers—to explain why what we do is valuable to society. It is incumbent upon us as scientists to learn to communicate the importance of basic science to everyone and anyone who will listen.

Scientists must recognize the economic and political realities of today's world. The U.S. National Institutes of Health budget hovers just under \$50 billion—less than 1 percent of the \$6.75 trillion total federal budget. (Most of the budget goes to the military and to entitlements such as Social Security and Medicare—the federal government is sometimes described as "an insurance company with an army.") Still, funding for science dwarfs funding for many other worthy pursuits—the NIH budget is more than 100 times the \$200 million allotted annually for the National Endowment for the Arts, for example. It is thus reasonable to ask how we as scientists should justify this investment. Why should funding science—especially basic, curiosity-driven science—be a societal priority?

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The answer lies in the transformative power of basic science. It is often the seemingly most arcane investigations that have the greatest impact. Consider the example of Thomas Brock, a microbiologist who in the 1960s was curious about how life could survive in nearly boiling water. From the geysers of Yellowstone National Park, he identified a new species of thermophilic bacteria, which he named *Thermus aquaticus*, now more widely known as Taq. Brock wasn't seeking a medical breakthrough, but his pure scientific curiosity enabled biochemist Kary Mullis a decade later to isolate the heat-stable enzyme that became the foundation of PCR—a technique now crucial to molecular medicine, DNA sequencing, diagnostics and forensic science. Or consider how researchers studying Gila monster venom discovered a peptide that affects blood glucose, which eventually led to the development of medications such as semaglutide (Ozempic) that have revolutionized treatments for diabetes and obesity.

In neuroscience, fundamental research into neural circuits led to deep brain stimulation for depression, and the cloning of the Calcitonin gene-related peptide gene in 1982 set in motion discoveries that, nearly four decades later, yielded transformative treatments for migraine: erenumab (Aimovig) and rimegepant (Nurtec). Perhaps most dramatically, work in computational neuroscience reaching back over 75 years laid the groundwork for artificial neural networks and the current artificial-intelligence revolution.

Skeptics often push back and question why, if basic science is so valuable, we can't just count on companies—startups and big pharma—to fund it. The answer here is that only government and nonprofit funding can truly support the long arc of scientific discovery. The profit-driven pharmaceutical industry and venture capitalists operate on a time horizon of years, seeking returns within a decade or two at most. Yet the path from fundamental discovery to practical application often spans multiple decades—far too long for most commercial interests. Thomas Brock never profited from his discovery of *Thermus aquaticus*. Furthermore, many scientific breakthroughs yield knowledge that, while tremendously valuable to humanity, cannot be easily monetized. This crucial gap can be filled only through public funding that prioritizes curiosity and knowledge for its own sake, investing in the unpredictable nature of discovery that has repeatedly transformed our world.

As scientists, we must learn to convey two distinct messages. First, we should communicate our passion and curiosity, connecting with those who share our wonder about the world. But just as important, we must learn to showcase the practical significance of basic research, demonstrating how

seemingly arcane investigations yield transformative applications. By presenting both messages effectively—the value of scientific curiosity and the impact of practical applications—we will strengthen public support for the long and winding road that is scientific discovery.

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