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How to Stop Winning Nobel Prizes in Science

Washington's vacillating commitment to basic research makes scientific breakthroughs less likely.

By Thomas R. Cech And Steven Chu

In recent days the world learned the names of those men and women honored with the three science Nobel Prizes. The breakthroughs for which these prizes were awarded—the development of blue light-emitting diodes (LEDs), game-changing advances in light microscopes, and the discovery of an "inner GPS" in the brain—have revolutionized light sources, imaging for biomedicine, and our understanding of how our brains create spatial sense of the world around us.

One might think the process of scientific discovery is straightforward, swift and inexorable. In truth, these three words rarely apply to any research, and even less so to fundamental, curiosity-driven research that pushes the boundaries of human knowledge. The 2014 Nobel Prizes provide striking examples.

British-American scientist John O'Keefe 's 1971 discovery of "place cells," neurons that track particular places in the environment, required a decade of dedicated research. Even then, a second major component of the brain's navigation system, "grid cells," were not uncovered until 2005 by the Norwegian couple May-Britt Moser and Edvard I. Moser, who share this year's Nobel Prize in Physiology or Medicine.

The Physics prize was awarded to Japan's Isamu Akasaki and Hiroshi Amano and Japanese-American scientist Shuji Nakamura for two decades of work, beginning with the quest to grow high-quality crystals of gallium nitride, a key ingredient in blue LEDs. Their achievement wouldn't have been possible without work done in the 1960s on semiconductor heterostructures, invented to improve transistors and recognized much later by the 2000 Nobel Prize.

The path to dramatic improvements in fluorescence microscopy took an equally circuitous path. American William E. Moerner, recipient of this year's chemistry prize, began his work on single molecule detection as a memory storage device in the late 1980s. American scientist Eric Betzig and German scientist Stefan W. Hell, who share in the prize, investigated several different approaches to improve the resolution of optical microscopy and their own decade-and-a-half journey was interwoven with the contributions of many others.

The discovery process isn't simple or inevitable. Certainly it involves a creative spark, but it also demands uninterrupted and steadfast effort that builds on knowledge collected over generations. It is therefore worrying that the primary funding source for fundamental research in the U.S., the federal government, relies on systems that don't match the need for steady, sustained support over the long term. For decades, federal funding for basic research has looked more like a roller coaster than a steady march.

This vacillation in the government's commitment to basic research makes strategic planning all but impossible for the nation's research institutions including universities, medical schools and national laboratories, and the companies they partner with.

It also has a devastating effect on researchers. Last year, roughly 16% of scientists funded the previous year by R01 grants—the National Institutes of Health's mainstay research grant—didn't have their grants renewed. This attempt at federal "cost saving" amounts to incalculable hours of potentially groundbreaking research at thousands of labs being left to languish and perhaps lost entirely. Holding scientists to high standards is essential, but investing in projects and then pulling the plug before they reach fruition is wasteful and demoralizing.

Of course, research requires more than just funding; it requires solid and secure infrastructure, cutting-edge instrumentation and outstanding people who believe a stable career in science research is possible. In short, not only must we invest, but also we must generate a framework in which that investment can thrive.

As we honor this year's Nobelists and celebrate their achievements, we should reflect on the long path to discovery and the benefits that research brings. Color LED displays have given us energy-efficient lighting, single-molecule imaging is already leading to new biomedical discoveries, and we now have an answer to the age-old question of science and philosophy of how our brains navigate the world around us.

These research projects in the U.S., Japan and Europe were fueled by steady investments in basic research, the foundation of any Nobel Prize in science. Is America in the position to do the same for the future?

Mr. Cech, a professor at the University of Colorado in Boulder, shared the 1989 Nobel Prize in Chemistry. Mr. Chu, a professor at Stanford University and former U.S energy secretary, shared the 1997 Nobel Prize in Physics.

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