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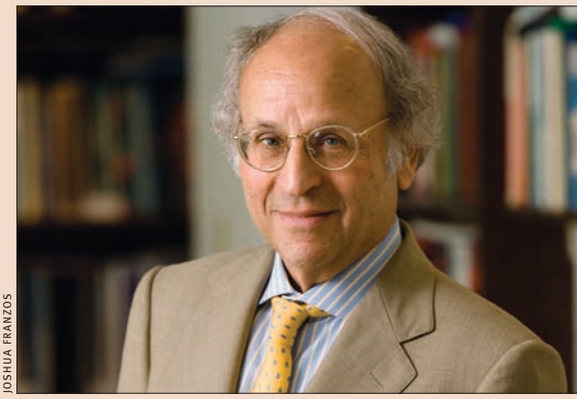
I shouldda taken that left turn at Albuquerque.
—Bugs Bunny


JOSHUA FRANZOS

The next time your iPhone helps you get to where you hope to go, think of Albert Einstein. GPS relies on the theories of both general and special relativity to navigate accurately. (If your self-driving Uber car gets lost, it's probably not because of the space-time curve—the global positioning system already accounts for that.)

Examples of the relevance of seemingly obscure discoveries to our daily lives are legion. For instance, in the 1960s at Johns Hopkins, Hamilton Smith was curious about how bacteria defend themselves from foreigners, e.g., viruses, and he found that restriction enzymes (novel bacterial enzymes discovered by Swiss microbiologist Werner Arber) allow the bacterium to cleave foreign, invading DNA at specific points. That Nobel-prize winning advance, allowing DNA recombination ("genetic engineering"), became the basis for what is now a trillion-dollar biotech industry. Certainly that link was not recognized at the moment of pure curiosity-driven discovery. And more recently, while it seemed that everyone else in bioscience was focused on DNA, Berkeley's Jennifer Doudna, our 2016 Dickson Prize winner, was intrigued by RNA. She's no longer in a lonely field, as her work with Emmanuelle Charpentier showed how a mechanism that bacterial RNA and protein use to fight off viruses, called CRISPR-Cas9, can be applied to edit a genome at specific, chosen sites in DNA, and quite easily. The significance of this discovery to biomedical research and biotechnology (and, incidentally, to the ethics of genome manipulation) has been compared to what the transistor portended for electronics and the discovery of electromagnetism by James Clerk Maxwell portended for television.

These scientists set out to understand our world at the most basic level of cause and effect. The fruits of their labors have changed it dramatically. Regrettably, however, support for pure discovery and invention is fading. Federal funding organizations appear to be shifting emphasis to "translational research" out of concern—perhaps, in part, with a political motive force—that "basic" discoveries are not making their way to the marketplace or clinic fast enough. (Also, no doubt, because pure science often seems so abstract, remote, and difficult to grasp.) But I know of no fundamental discovery in biology that has not ultimately been translated to a commercial and/or clinical application when it was appropriate to do so. Let's not forget—you have to discover or invent something before it can be translated.

Our neighbor, Carnegie Mellon's President Subra Suresh, wrote about the situation recently in a *Science* editorial coauthored with Amgen's Chair and CEO Robert Bradway. They noted that America's investment in basic science in the 20th century established its preeminence in science and cultivated the scientific ecosystem that fosters innovation. But now, just as government dollars for basic science are dwindling, industry is also no longer investing in basic research as it once did. (How sad that the unfettered industry research era of Bell Labs, home to many Nobel laureates, is long gone.)

Pitt has been invited to partner with a new group based in Palo Alto called the Science Philanthropy Alliance, founded by a number of this country's major foundations; the Alliance is championing basic science and advising foundations and individual philanthropists about the critical importance of investing in this area. But more needs to be done at the federal level, not to mention our own Pitt-centric philanthropic level. The United States has always attracted among the best, the brightest, the most creative, and the most curious. We must keep it that way.

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