The benefits of particle physics

Basic science research, by definition, is done to better understand the fundamental nature of the universe. Although there is plenty of evidence that investment in basic research brings long-term returns to the economy far greater than the initial investment, tight economic times bring questions of "What is this investment getting us right now?"

The benefits arising from particle physics research are myriad, but usually reported anecdotally, not in the economists' and policy makers' preferred terms of quantifiable economic impact. So what does it mean for the economy that particle physics technology has led to life-saving medical treatments and equipment? What does it mean that computer hardware and infrastructure are improving faster than they would otherwise, or that the tires on our cars are cheaper, safer, and greener due to the use of accelerator technology? What does it matter that particle physics produces a highly trained, expert workforce that contributes to science, industry, and commerce, in ways far beyond basic research? To be honest, we can't yet quantify these impacts with anything but the roughest of estimates.

Photo: Reidar Hahn, Fermilab

We do know that investment in particle physics represents a significant outlay. For example, the US Department of Energy has contributed about $600 million to the Large Hadron Collider over the past decade. Over that period, that sum could have paid for a mere three or four top-level CEO salaries at $15-$20 million per year. Instead, it has employed hundreds of US physicists and engineers, provided work opportunities for thousands more, and invested in US industries that supplied LHC components. These industries are now better equipped to produce high-tech equipment and services needed by other areas of US society, especially in medical fields. How do we quantify those benefits?

Funding agencies can justify their investments more easily when they can point to concrete numbers to show how these investments affect the economy. Although those agencies are convinced of the value of particle physics in the long term, they don't yet have a shorthand description to demonstrate to their constituents that their decisions to support basic science result in net contributions to the economy. Particle physics needs to commission an independent, authoritative, transparent economic impact study to help funding agencies make their case: that investment in basic research returns much more than scientific results and benefits society in many concrete ways.

The particle physics community is convinced the assessment will be very positive. And that assessment won't even take into account the value of discovering answers to the most fundamental questions humans can ask about the universe.

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