Photo: Richard Northrop, University of Chicago

The new HEPAP

We are at a time of extraordinary scientific opportunity, when the prospect for making major advances in elementary particle physics is greater than it has been in at least three decades. Our observations so far almost guarantee that new phenomena will soon be discovered at the TeV energy scale, first at the Tevatron or Large Hadron Collider and then hopefully in much greater detail at the International Linear Collider. We don't know what these new phenomena will be–new kinds of particles, new dimensions of space, or something not yet imagined. But they will surely change our understanding of the universe.

There are also recent important discoveries that we are just beginning to investigate. We now know that most of the energy in the cosmos is in the form of dark energy and dark matter; what they are isn't clear, but they almost certainly will be understood in terms of elementary particles and fields, as part of the quantum nature of the universe. We have discovered that neutrinos have mass: as we study them further, we may learn about the physics of the early universe. And we still have much to learn from both quarks and neutrinos about the matter-antimatter asymmetry that allows the existence of galaxies and stars. Other astrophysical problems also have deep elementary-particle-physics connections.

These phenomena are waiting to be explored at a time when the importance to society of research and training in the physical sciences is increasingly recognized. Last fall, the National Academies released the report *Rising Above the Gathering Storm*, and earlier this year President Bush introduced the American Competitiveness Initiative. Although the major focus is economic competitiveness, the proposed increase in physical science funding could also improve the outlook for high-energy physics–if we make the case for our science.

The initial budgetary signs are positive. The President's FY07 budget request includes an 8 percent increase in the Department of Energy's high-energy physics program and a 6.6 percent increase for the National Science Foundation Physics Division. The latter includes $15 million to reinforce university-based elementary particle physics research. On the other hand, the budget increase is by no means assured.

There are also uncertainties on our side. The worldwide high-energy physics community strongly supports the International Linear Collider. How much will it cost, how much R&D will be needed before construction can begin, and how soon will the governments of the world provide construction funding? We will have a much better idea when the ILC Reference Design Report is presented in about a year's time.

These opportunities and uncertainties require us to plan carefully. We must use realistic budget assumptions for our reports to be credible in Washington. Balance is important; for example, between our long-term goal to fully explore the TeV scale and the need for a healthy shorter-term program. We have to clearly recognize the expansion of our field to include dark energy, dark matter, and the use of observational techniques. Our science is defined by the questions we ask, not the tools we use. We must develop a US program within the worldwide context, acknowledging the difference between complementary and duplicative experiments. Our resulting plan will be dynamic, shaped by new discoveries and new ideas.

The new 20-member High Energy Physics Advisory Panel (HEPAP) began its work at a meeting in Washington, DC on March 3–4. Our goals are clear: First, we will help DOE and NSF make the case for doing the research that will provide the answers to our exciting scientific questions. Second, we will help the agencies design the optimal program given the available resources, which are limited. Subpanels will continue to carry out in-depth studies of specialized areas. The report of the National Academies' EPP2010 committee will be particularly important because its membership extends far beyond our community. HEPAP's Particle Physics Project Prioritization Panel (P5) will have to stitch all of this together within budget constraints. HEPAP will review the results and make the formal recommendations to the funding agencies.

It is much too early to know what the outcome will be, but we must carry out the process carefully. Our future depends on it.

Mel Shochet

Melvyn J. Shochet of the University of Chicago is chair of the new High Energy Physics Advisory Panel, which provides the Department of Energy and the National Science Foundation with recommendations on the US national program in experimental and theoretical high-energy physics research. More information is at www.science.doe.gov/hep/hepap.shtm