Parallel Session 26: Interactions between science communication and science policies.

A HURRICANE OF CHANGE
REDEFINING THE GOALS OF PARTICLE PHYSICS RESEARCH

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Abstract

For the last to decades the goals of frontier high energy physics research have remained the same. This paper outlines the initiative to redefine the goals of the field in response to new understanding of the structure of the universe and the need to build new, very expensive, research installations. The challenge was daunting. The physicists themselves had to be convinced to alter their perception of their own field and policy makers and funding agencies had to be convinced of the excitement and worth of the research.

Key words: Particle physics, policy, communication

Context

For over 20 years the main aim of frontier high energy physics has been the discovery of the Higgs boson. Billions of dollars have been spent on the Large Electron Positron Collider at CERN, the Superconducting Super Collider planned in Texas, Tevatron Run II at Fermilab and soon the Large Hadron Collider at CERN. The Higgs remains elusive.

There is international agreement that the next major installation should be a 30 km linear collider costing some $6 billion. Can funding agencies be persuaded to spend this money using the same arguments as have been used over the last 20 years? I doubt it.

Concurrently, in a development that some have compared to Copernicus's recognition that the earth is not the center of the solar system, the quest to answer the most basic questions about the universe has reached a singular moment. As the 21st century begins, physicists have developed a commanding knowledge of the particles and forces that characterize the ordinary matter around us. At the same time, astrophysical and cosmological observations of space have revealed that this picture of the universe is incomplete—that 95 percent of the cosmos is not made of ordinary matter, but of a mysterious something else: dark matter and dark energy. We have learned that in fact we do not know what most of the universe is made of. A hurricane of change is blowing through particle physics.

Understanding this unknown “new” universe requires the discovery of the particle physics that determines its fundamental nature. Powerful tools exist to bring the physics within reach. With astrophysical observations, we can explore the parameters of the universe; with accelerator experiments we can search for their quantum explanation. Energies at particle accelerators now approach the conditions in the first instants after the big bang, giving us the means to discover what dark matter and dark energy are—and creating a revolution in our understanding of particle physics and the universe.

Objective

The communications challenge is first to convince the physics community of the need for change and to produce a manifesto of this revolution to convey the excitement to policy makers and funding agencies. The style and level of content of this document would be crucial to its success.

Methods

After several presentations at physics conferences1 by Neil Calder and Judy Jackson, the High Energy Physics Advisory Panel HEPAP formed a committee to prepare a report on the scientific challenges facing particle physics. The Committee was made up of leading American physicists and cosmologists, and in the recognition of the importance of the document in communicating to policy leaders, the heads of communication of Fermilab and SLAC, the two major U.S, particle physics laboratories. The aim of the whole group was to produce something different - a scientific report written at a level that non physicists can not only understand but also be enthused by. The final report Quantum Universe2 revolved nine basic questions grouped in three themes, that are very different from those asked 10 or even 5 years ago.

Einstein’s Dream of Unified Forces

Are there undiscovered principles of nature: new symmetries, new physical laws?

2. How can we solve the mystery of dark energy?

3. Are there extra dimensions of space?

4. Do all the forces become one?

The Particle World

5. Why are there so many kinds of particles?

6. What is dark matter? How can we make it in the laboratory?

7. What are neutrinos telling us?

The Birth of the Universe

8. How did the universe come to be?

9. What happened to the antimatter?

The layout, graphic design and illustration of Quantum Universe are also very different from traditional science reports. There is a coordinated program to now present Quantum Universe to the leading policy makers within the United States and to give talks on the report at the world' leading physics laboratories.

Conclusion

There has been a major communication initiative to make policy makers aware of the excitement of this new era in particle physics. The Quantum Universe experience has set a new precedent in involving communication specialists in the preparation of policy documents from their inception.

References

1.WHAT'S IT FOR? High Energy Physics Advisory Panel, Washington September 29-30 2003 Neil Calder, www.interactions.org/pdf/whatfor.pdf

Quantum Universe is available on line, http://www.interactions.org/pdf/Quantum_Universe.pdf