essay: rob semper

Authentic Science

The search for the workings of the "quantum universe" is one of the most exciting adventures in science today. Recent discoveries concerning



the existence of dark matter and dark energy have upended our fundamental understanding of the very nature of matter. While this ongoing revolution is generating extreme excitement in the physics research community, it is a story that has not, for the most part,

entered the awareness of the broader public to the extent one would have expected.

Of course the usual media representations are present, such as books by scientists and journalists, articles in newspapers and magazines, and richly produced science documentaries. And there have been a few popular breakout presentations on some of the edgier parts of the theory. But in the competitive world of public attention, the story of the tremendous changes in our view of the universe is not getting much traction.

I think that the issue is not just a matter of getting more airtime for this particular story, but rather represents a more fundamental problem in our approach to addressing the public understanding of science. In our presentations to the public we have tended to talk mostly about the results of our thinking and the conclusions of our research. To reach the public in a more compelling way, I think it is imperative that we go beyond just trying to tell the intellectual story. We must talk about the process of doing the science, and tell the human side of the story of research and discovery.

It is not surprising that the work that we do as scientists is so unfamiliar to the public. For most people, the last direct experience they had with the "doing of science" was their participation in a high school chemistry or biology laboratory. Most scientists would agree that this lab experience is as similar to doing real science as eating airplane food is to real dining. To help people experience the world of science we need to go beyond producing books about the grand unified theory or the documentaries on the origins of matter, wonderful as these projects are. We need to create opportunities for the public to experience the process of real scientists doing real science in real places. driven by curiosity, a very human trait. But often when we talk about the work that we do, we lose this personal side of the story. The major questions of the field, as exemplified in the wonderful *Connecting Quarks with the Cosmos* and even more accessibly in *Quantum Universe*, are clearly fascinating to the public and mark a great beginning for an adventure story of scientific discovery. To follow through we need to create a vehicle for continuing the narrative of discovery as our work evolves over the next ten years.

Real science: The story of science is as much about "How Do We Know What We Know?" as it is "What Do We Know?" It is a story of creating detectors and developing software and inventing analytic tools. And yet there has been very little done for the public on the nature of scientific evidence since *The Ring of Truth*, Phil and Phylis Morrison's wonderful book and television series of a number of years ago. We need to develop more discussions about the nature of the process of science and how we go about finding things out.

Real places: In visiting a number of accelerator laboratories recently I was struck again by how interesting these facilities really are. The uniqueness of design, the mixture of electronics and mechanical systems, the variety of support systems needed to keep these instruments alive is really amazing. These labs represent an extraordinary enterprise built and maintained by a talented and committed set of individuals. We need to do more to develop authentic onsite and online opportunities for people to view these facilities.

The good news is that the field does not need to do this work alone but rather can profitably partner with intermediaries who can both support the design of new approaches and can bring audiences to the table. Science museums are ideal candidates for this intermediary role. They are filled with the people who make a living in interpreting science for a general audience. They have scientists, educators, designers, objects, facilities and means of distribution. They develop exhibits, media programs, school activities, outreach opportunities and public events. And they already have a cultivated audience. It is through a working partnership with these agencies of public communication and education that much of this public understanding of research agenda for the field can be completed.

Real scientists: The scientific enterprise is

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