George F. Smoot
Thinking in aeons

John Mather and George Smoot won the Nobel Prize 2006 in Physics for their work on cosmic background radiation. Smoot measured the temperature variation (anisotropy).

PROFILE

- Astrophysicist at Lawrence Berkeley National Lab, University of California, Berkeley, since 1974
- Born in Yukon, Florida in 1945
- His family was closely connected with the law – both grandfathers and his cousin and uncle were judges. However, his father switched from law to engineering in the early 1950s
- Achieved dual BSc in mathematics and physics at MIT in 1966
- Was awarded a doctorate in particle physics at MIT in 1970, then moved to Berkeley
- Proposed to NASA that a Differential Microwave Radiometer be added to the planned COBE (Cosmic Bachground Explorer) satellite in 1974, and launced in 1989
- Announced findings of COBE at the American Physical Society in 1992

How important is an interdisciplinary approach in addressing urgent scientific questions, and how can we foster such collaborations?

This is vitally important and crucial to the progress of modern science. There are a number of ways to do this. The approach that I prefer and am trying is to create a centre adressing interesting science problems requiring interdisciplinary skills and knowledge and with a mandate to address these issues. It is important to have both the incentives - financial and approved research directions (official, peer, and public) — and the proximity including coffee/discussion areas so that personal contacts are made and incidental discussions arise that often lead to other avenues of investigations and ideas.

"The Universe is in a quasi-static equilibrium so that much of its history is irrelevant."

What is the future of the Standard Model if the elusive Higgs boson and the even more elusive neutrinoless double-beta decay are discovered?

I am looking forward to the completion of the old standard model of particle physics with the discovery of the Higgs, but I look forward with much more anticipation and eagerness to going beyond the standard model and discovering dark matter and, hopefully, extra dimensions. The dark matter could be the lightest supersymmetric particle (a beautiful but untested extension of the standard model) or the energy used going into a 'small' extra dimension (the lowest rung possible in the so-called Kaluza-Klein tower). There are many, potentially very intriguing discoveries that could teach us about the world and expand our ideas.

Can theoretical physics help identify guiding principles in biology?

At Lindau there was a lunch involving three physics Nobel laureates and three biology-related laureates at which we tried to see what we could learn from each other, including techniques that could be cross-applied. One participant commented that historically biologists have sought out physicists for their tools and algorithms. However, when physicists saw what biologists were doing and what they could learn, many were put off by the lack of rigor and the shallow understanding. Biological systems are so complex and so poorly observed and measured that biologists had to be satisfied by a high level and rough understanding of what they were studying, while physicists are trained for rigor and precision.

Some physicists, however, stayed and began doing biology, but there was little sign of bringing biological techniques into physics. Due to the advances that physical science tools and approaches are allowing in biology, the depth and rigor of biology is steadily progressing. The biologists at the lunch were more pessimistic about the rate of progress and understanding than the physicists. This might be a function of the biologists' closeness to the difficult issues.

One thing that discourages these biologists is that so much of biology seems to depend on the history of development and evolution. I tried saying one might think this about the Universe, but many times the Universe is in a quasi-static equilibrium so that much of its history is irrelevant. "Weren't there many biological systems that have reached an optimum, e.g. photosynthesis, or specifically the ATP energy-transfer process, so that the historical path was not so critical?" They agreed, although only for a limited number of cases.

At this stage and for the foreseeable future, I think that biology will continue to apply the tools and techniques of experimental physics but not so much the approach and tools of theoretical physics.

FLEMMING, C/LINDAU LAUREATE MEETINGS

Aside from as a Nobel laureate, how do you want the world to remember you?

I do not think the world will remember any of us. When you work in cosmology, you think with a perspective of billions of years. How many people do we remember from 1,000 years ago? How many from 10,000 years ago? How many from 1 million years ago? etc. So now the question is more like that about Ozymandias [from Percy Shelley's poem]. After a thousand or so years nothing is left of the great works but a few broken relics. What will be left in a billion years?

"How many people do we remember from 1,000 years ago?"

The point is not about being remembered or about doing science to win a Nobel prize — you do science because you want to be a scientist. Likewise, you live your life in a way you think is good and good for you.