



“Tracracious” is made from accelerator beam pipe; join us for the SPS Congress at Fermilab. See poster at

Scientific Citizenship: Connecting Physics and Society

Questions and Conversations at Fermilab

The theme of the quadrennial convention of Sigma Pi Sigma, at Fermilab this coming November, raises serious issues we might ponder in advance. The questions below are offered in the hope of their being catalysts to the Congress discussions.

(1) How should the physics community reward its members who engage the public, whether that engagement be through popularizations, teaching K-12, serving on school boards, advocating the values of science...?

(2) How can we show school boards, parents, and pupils the difference between "reasoning based on evidence," and having a mind so "open" that one is reluctant to assert anything?

(3) How can we have a conversation with school communities on the different kinds of questions addressed by science and by religion?

(4) How can we usefully demonstrate that science, by definition, seeks only explanations that lie within nature?

(5) In such conversations, how can we maintain the values of science, while showing respect for religion in general, and thereby avoid making enemies of science?

(6) What common ground can we find with those who fear or mistrust science?

(7) Are we better at talking than we are at listening? Do we recognize the limitations of science?

(8) What can we learn from students who are not physics (or other science) majors?

(9) How can we learn to look up and actually see the sky, and encourage our neighbors to see it also?

(10) How can we learn to appreciate the technologies on which society is so dependent, and not take them for granted?

(11) How can society come to appreciate nature, and not detach itself from nature? How can we see that humanity is a part of nature, and not outside or above it?

(12) How can we make a case for the public funding of science—without sounding self-serving?

(13) How can we show the importance of science, not only as a

technological investment, but also as an expression of human creativity?

(14) How can we demonstrate the creative pursuit of knowledge to be a crucial aspect of what it means to be a human being?

(15) How can we demonstrate the values of science, such as its habit of truth, its commitment to follow the evidence, its lack of central authority, its democracy of the intellect, its dependence on and contributions to human dignity?

(16) How can we show that "The Scientific Method" is not a checklist?

(17) How should we answer the questions, "Why should I care about (say) the Higgs boson or dark energy or the geography of Venus?"

(18) Does the larger society need scientists much as scientists need the larger society?

(19) Science lives with doubt and uncertainty all the time. Our knowledge is never exact, but the imprecision can be estimated. How can these lessons about doubt and uncertainty be transferred effectively to a society that too often claims an excess of certainty?

(20) How can we clarify the crucial distinction between "theory" and "hypothesis?"

(21) The spirit of science says "Is that so, eh? What's the evidence?" How can we impart this spirit to society in helpful and uplifting ways?

(22) How can we teach that sometimes it's not about finding the answers, but rather that it's about understanding the questions?

These following insights by those who have thought long and hard about these issues may help stimulate our own thinking:

“If we are anything, we must be a democracy of the intellect. We must not perish by the distance between people and government, between people and power,...And that distance can only be conflat-ed, can only be closed, if knowledge sits in the homes and heads of people with no ambition to control others, and not up in the isolated seats of power. That seems a hard lesson. After all, this is a world run by specialists: is not that what we mean by a scientific society? No, it is not. A scientific society is one in which specialists can indeed do the things like making the electric lights work. But it is you, it is I, who have to know how nature works, and how (for example) electricity is one of her expressions in the light and in my brain.”

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—Jacob Bronowski, *The Ascent of Man* (Little, Brown, & Co., 1973), pp. 435-436.

“...as I listen to the arguments raging in recent years between biologists and creationists over the teaching of biology in American schools, I am shocked to hear voices among the biologists sounding as arrogant and intolerant as the voices of the creationists...[The] biologists, by and large, show no respect or understanding for the human anguish of the parents. The biologists say with a tone of contempt, ‘Your religious beliefs are of no concern of ours....’ This is a tragedy for both sides in the dispute. It is tragic for the parents to have their deep religious convictions over-ridden by a group of arrogant experts. And it is tragic for the biologists to present to the parents a false image of science, an image of intolerance and insensitivity, and thereby to raise a generation of citizens who consider science to be their enemy...”

—Freeman Dyson, “Science and Religion,” *Statement to the Committee on Human Values, National Conference of Catholic Bishops* (1986); expanded into *Infinite in All Directions* (Harper Collins, 1986).

“If, in the public mind, there is a widespread tendency to identify science with destruction..., it is in part because scientists have largely forgotten their duty, as educators, to the public...In England, France, and Germany, there sprang up in the nineteenth century a tradition of the scientist's obligation to interpret his philosophy and his results to the nonscientific public to which, in the broadest sense, he owed his support. At the present time [1952], Albert Einstein is an outstanding exemplar of this tradition, which was notably supported in the past...Most American scientists have retreated so far into the remote reaches of specialization that they have largely forgotten their obligation to the public. It is not altogether the fault of the man in the street if he is relatively unaware of the traditionally humanitarian role of science and the conditions necessary for maintaining it.”

—Melba Phillips, “Dangers Confronting American Science,” *Science* 116 (Oct. 24, 1952), p. 439-443, passage on p. 442.

At the 2008 Sigma Pi Sigma Congress, let us enlarge the discussion about “connecting physics and society” in ways that will far outlive our meeting next November. Various sessions and workshops will provide venues for addressing these issues that are larger than we are individually.

— Editor

CONGRESS WORKSHOPS

* Scientific Citizenship Workshop I: The evolution of science curricula

Adrian Melott, Professor of Physics and Astronomy, University of Kansas; Founder of Kansas Citizens for Science

* Scientific Citizenship Workshop II: Energy efficiency: Benchmarks and the citizen's response

*David Goldston, Scholar in Residence at the Woodrow Wilson School
Julia Phillips, Director, Physical, Chemical, and Nano Sciences Center, Sandia National Laboratories*

* Scientific Citizenship Workshop III: From researcher to representative

*Mike Fortner, Associate Professor of Physics at Northern Illinois University; Illinois State Representative
Louis Lanzerotti, Distinguished Research Professor of Physics, New Jersey Institute of Technology; former School Board Member and Major of Harding Township, New Jersey*

* Scientific Citizenship Workshop IV: Mediating public perception, a physicist's view from behind the camera

Aziza Baccouche, President of AZIZA Productions, Inc.