Political Correctness in the Science Classroom (Version #2)

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The original paper was outlined some months ago. Two recent events have led to a change in emphasis in my oral presentation. First, Al Gore was a winner of the Nobel Peace Prize, an honor that will certainly lend legitimacy to the calls for a more political approach towards environmental issues in the schools. I will argue that this emphasis is already distorting the K-12 science curriculum.

Secondly, the testimony in the House of Representatives hearing on "Women in Academic Science and Engineering" that took place on October 17 this fall is an indication of the growing interest in using Title IX as an affirmative action tool for increasing the percentage of women and minorities in science and engineering. Here the greatest impact would be on education and research in the universities. For a summary of the hearing see http://nsf.gov/about/congress/110/highlights/cu07_1017.jsp

In my discussion I am using the term "political correctness" as an umbrella term to refer to a family of epistemological, sociological and political views. In each context I will specify the details of the particular view that is most relevant.

How the Local Cultural Climate Can Affect Science

Because of its reliance on criticism and intersubjective testability, science is the best example we have of knowledge which transcends national and cultural boundaries. Yet science cannot flourish in all cultures. Robert Merton, the sociologist who gave us an excellent account of the norms of organized science, made this point already in 1942 in a seminal paper entitled "A Note on Science and Democracy." Journal of Legal and Political Sociology 1, 115-126.

One of the many lessons of Nazi strictures against "Jewish physics" and the demise of genetics during the Lysenko period in the USSR is that science requires the freedom to entertain hypotheses that go against the entrenched beliefs of the time, even when those beliefs seem to be based on moral precepts or a religious worldview. I hope and firmly believe that the US would never burn a Bruno at the stake for speculating about the possibility of life on other planets or place a Galileo under house arrest for saying the earth moves. But we do know that in America today a university president or Nobel Laureate may be publicly chastised for discussing hypotheses that are deemed politically incorrect! Our scientific community's commitment to free inquiry is robust. Because of their firm commitments to scientific methodology and shared "canon" of organized knowledge of nature, Chemistry departments are not subject to the weird fads that take root in Literary Theory. Nevertheless, because scientific research is more dependent on government funding than are the humanities, scientific research could in principle become even more vulnerable to the intrusion of ideology! Vigilance is called for before the rot sets in.

How "Political Correctness" Can Undermine the Goal of Scientific Literacy

As is almost every aspect of public education, what constitutes "scientific literacy" is hotly contested. (See my essay in *A House Built on Sand.)*There have long been disputes about the proper balance between the goal of having students learn about the *methods* of science and the aim of having them understand the basic *content* of the various scientific disciplines. Although I make my living by working in philosophy of science, the study of scientific reasoning, I strongly agree with E. D. Hirsch Jr.'s arguments for more emphasis on the acquisition of basic factual knowledge; in science this would mean learning about Newton's Laws, Atomic Theory, Genetics, Continental Drift, etc.

Political Correctness enters into this debate in many ways, some having to do with method, some concerning content. The various academic currents described so vividly in Gross and Leavitt's *Higher Superstition: The Academic Left and Its Quarrels with Science* all evince skepticism about the possibility of producing scientific research in today's society that is reliable, impartial, and of benefit to humankind. Some claim that science in a capitalistic, industrial society will generally work to oppress the powerless. Others object to what they see as an analytical, mathematical, mechanistic approach to nature. Did not Francis Bacon, who trumpeted the intellectual and pragmatic virtues of the experimental method, speak of putting Nature on the rack and forcing Her to give up Her innermost secrets? No wonder, they would say, that science has brought us the horrors of nerve gas, atomic bombs, DDT and genetically modified grains! So when such people call for students to learn about the "methods" of science, what they have in mind is an unmasking of what they see as he sexist, racist, classist, entrepreneurial agenda of science.

Here's one example, not the worst but rather influential. The subtitle of one of Hirsch's books on cultural literacy reads *What Every American Needs to Know*. Harry Collin's 1993 book with Trevor Pinch is called *The Golem: What You Should Know About Science.* Cambridge University Press has brought out another Golem book by this sociologist of scientific knowledge, *The Golem at Large: What You Should Know About Technology* (1998) and in 2005 the University of Chicago Press published *Dr. Golem: How to Think about Medicine.* Here is how they deploy the root metaphor:
Science, like the Golem is powerful. "It grows a little more powerful every day. It will follow orders...But it is clumsy and dangerous. Without control, a golem may destroy its masters with its flailing vigour." (p.1)

Collins and Pinch are no dummies and many of their warnings against non-critically accepting the latest newspaper article on cutting-edge science are well-taken. And it is true that at the frontiers of science, there can be conflicting results and personal rivalries may have an influence in the short run. But the take-home message is that scientific knowledge is socially constructed and in our society the interests of a few powerful people will always have the edge over the welfare of the many. I have no objection to a serious study of the funding of science, whether it be by Bell Labs, Dupont, Monsanto, Craig Ventnor's company or the NSF, or the methods of conflict resolution but these topics should be the focal point in beginning classes in natural science!

Feminist critiques of science have also challenged traditional views of scientific methodology. They argue that to make science more "female-friendly" wholistic, naturalist methodologies should be privileged over controlled experimentation with talk of isolated systems and independent vs. dependent variables. After all, isn't everything in nature connected? (See Sue Rosser, *Female-Friendly Science: Applying Women's Studies Methods and Theories to Attract Students,* Teachers College Press, 1990.) Helen Longino, a highly respected philosopher at Stanford, claims that women scientists place a higher value on models that exhibit continuity and are less comfortable dealing with dichotomous concepts and "master narratives." (See my article in *Scrutinizing Feminist Epistemology.)*One implication for science education was suggested on a Listserve by a physicist who wondered whether it would help women students if the wave theory of light were taught before mechanics with its billiard ball collisions and rigid bodies. In a similar vein it has been suggested that Native American students might benefit if calculus, the science of continuous motions, were taught before fractions! But let's get back to more subtle, political intrusions, ones that are probably more apt to succeed.

Even before the recent Peace Prize there was a concerted effort to make the documentary, *An Inconvenient Truth*, an integral part of the science curriculum. In Britain recently a court ruled that if used, it had to be accompanied by material pointing out eleven serious factual errors and emphasizing that it was promoting a controversial political agenda. Before that, I am happy to report, the National Science Teachers Association in this country turned down an offer of 50,000 free copies to be distributed to their members, just as I assume they would have refused to circulate the Discovery Institute's documentary, *Unlocking the Mysteries of Life*, which is intended to make the case for Intelligent Design Theory.

Here are the caveats I would offer to any science teacher who is thinking about incorporating Gore's film into his or her curriculum. Students are already being immersed in environmental issues and values. In Bloomington, kids make art projects out of recycled materials and weave plastic bags into carriers to take to the grocery store. They sing "This Pretty Planet" in music class and watch Discovery Channel programs on the dangers faced by manatees and polar bears. They even color pictures of endangered species in Sunday School. It is certainly appropriate to talk about alternative energy sources in science class and show how acid dissolves limestone, a process relevant not just to cave formation but also to the weathering of buildings caused by acid rain. What should happen in science class is a dispassionate analysis of the various reactions and processes involved, not polemics.

But my caution is not primarily based on the controversial nature of this subject or the high political stakes of the partisans involved in the debates. Rather it stems largely from the fact Environmental science and climatology are not only immature sciences; they are also highly complicated and interdisciplinary; they rely heavily on computer modeling techniques, some of which are controversial. As such, they are largely unsuited for a systematic treatment in introductory science classes. Like it or not, most science is highly structured and can best be learned by starting with the basics. It would be cool to start

with Einstein or quarks but you can't really appreciate those theories without starting at the beginning. As in many other spheres of education, the desire for immediate "relevance" can easily lead to a superficial understanding of complicated issues.

How "Political Correctness" May Jeopardize University Science Education

The launch of Sputnik by the Soviet Union led to an increased awareness of the need for America to devote more resources to science education and scientific research. During World War II the US had benefited enormously from the influx of European refuges. But more young people from this country needed to be recruited into science and engineering. The rise of the Women's Movement highlighted the fact that women were underrepresented in the group of disciplines now known as STEM (science, technology, engineering and mathematics). One of the pioneering sociological studies of this phenomenon was done by Harriet Zuckerman and Jonathan Cole in 1975 and an extensive review of quantitative studies was presented in *The Outer Circle: Women in the Scientific Community* in 1991, documenting the lower numbers of women entering various scientific fields and their higher attrition rates at every career stage. These researchers posed what they called "the Productivity Puzzle." Even when they controlled for factors such as marriage and pregnancy, women on average just did not publish as much as men and took longer at each step of the path to senior scientist. Their tentative explanation was a "theory of limited differences;" at each juncture of their career, women perhaps encountered little setbacks, none of which might remarkable in themselves, but which had an accumulative negative effect.

This account, which has never been seriously challenged (see J. Scott Long, ed., *From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers,* 2001), was not very satisfying either to feminists who were looking for explanations in terms of identifiable patriarchal practices, or to reformers who were seeking quick solutions to the problem of recruiting and retaining more women and minorities into science. Puzzlement and frustration grew over the decades as more and more women entered law and medicine and to some extent the biological sciences while the numbers in the "hard" sciences climbed very slowly. What *were* these limited differences that Zuckerman et al. had hypothesized?

There were many suggestions: too many Barbies and not enough Legos, too few female role models and mentors, lack of childcare at professional meetings and unrealistically short maternity leaves, a chilly climate fostered by sexist colleagues and supervisors, discrimination at the post-doc and hiring stages, etc. Yet these same barriers were being surmounted elsewhere. The conclusion was that there must be something intrinsic to science that made it unattractive to women. (The parallel possibility, that there was something intrinsic to women that made them not be attracted to science, was too politically incorrect even to occur to most people!)

So what was wrong with science that women didn't take to it? Some argued that women had different "ways of knowing" that were superior to those prevalent in science as it is practiced today. Others argued that "organizational and professional rigidities" hinder

women, who in general prefer "a flexible workplace, flat organizational structures, and an emphasis upon teamwork and cooperation." (Henry Etzkowitz and Namrata Gupta, "Women in Science: A Fair Shake?" *Minerva* (2006) **44**: 185-199; quote on p. 193) The authors just cited even propose the establishment of women-only graduate departments in science. But the more popular plan is to somehow shake up the existing "rigid" university science programs using existing legislative devices.

Although I have been involved in the NSF grants procedure I didn't realize that there is already on the books a way to give preferential treatment to women and minority applicants. A 2004 GAO report on Gender Issues reports:
"NSF, as part of its formal evaluation of grant applications, uses a 'second criterion,' the impact of the project on U.S. society. [There are] two merit criteria: first, what is the intellectual merit of the proposed activity; second what are the broader societal impacts of the proposed activity." (GAO-04-639, p. 24)
Although this second criterion has generally been used for enhancing research infrastructure or promoting teaching, this report points out that it could also be used to fund research proposals by women and other underrepresented groups. One can only wonder how this sort of "affirmative action" would impact women scientists who had a successful NSF proposal. The question would always arise as to the role the "second criterion" had played in the award.

The most recent strategy for using the law to increase the number of women in science is to invoke not just Title VII (which guarantees equal employment opportunities) but also Title IX, which calls for gender equity in education. Title IX has certainly increased the number of women participating in organized sports in colleges and universities. The plan now is to apply Title IX procedures to science at the undergraduate, graduate and post-doc level. (See again the 2004 GAO report entitled "Gender Issues: Women's Participation in the Sciences Has Increased, but Agencies Need to Do More to Ensure Compliance with Title IX" at www.gao.gov/new.items/d04639.pdf and Gretchen Ritter's testimony at the October 17, 2007 hearing at gop.science.house.gov/hearings/research07/Oct17/Ritter.pdf)

The application of Title IX to sports was controversial but it worked by having separate women's and men's teams. No one suggested, as far as I know, that equal numbers of men and women should play varsity football. But how would this model apply to physics? Or would it be good enough if there are extra women "playing" biology to compensate for the few women physicists? There is some support for this strategy amongst scientists. In an article in the May, 2006 issue of *Chemical Engineering News* with the ambiguous title "Sex, Lies, and Title IX", Richard Zare chair of the Stanford Chemistry Department strongly endorses the idea of setting up "Title IX measurables, quantitative measures that help us judge progress in achieving equity." Describing himself as "a recovering racist and a recovering sexist," he believes that it is through Title IX that American science can recruit more of the best and brightest young minds.

I share the concern for recruiting more young people into science but I worry that so-called recovering sexists like Professor Zare will too easily fall for the proposals of

radical feminists, social constructionists and post-modernists, who would weaken the traditions and norms of science in a vain effort to appeal to young women who have other stronger aptitudes and interest while discouraging candidates who happen not to belong to the groups privileged by Title IX.