

stitutes a threat to the employment of US citizens.¹ These individuals may be perceived as "scab labor," as Robert Lynch phrased it in his eloquent letter to the editor (February 1991, page 121). Perhaps his observation should even be extrapolated to the abusive practice of using the same "scab labor" instead of native-born members of minority groups in minority-enhancement programs and positions in education, government and industry.

According to one recent report,² enrollment of foreign citizens in US graduate schools is increasing twice as fast as enrollment of US students. What this and similar reports¹ fail to mention is that the influx of foreign students is concentrated almost entirely within groups that are minorities in the US—in particular, Asians. (I myself am a US-born member of an Asian minority.) A recent National Research Council report contains data on the ethnicity and citizenship of US PhD recipients and of PhDs employed in this country.³ Comparing these data, I obtained the bottom line result that foreign PhDs effectively reduced the job pool for black, Hispanic and Asian PhDs with US citizenship by 17%, 37% and 80%, respectively. For white PhDs with US citizenship, the job pool was reduced by less than 5%. *Is America trying to import its "minorities"?*

One disturbing point in Lynch's letter is his comment that native-born Americans don't have the motivation to "expend a decade or so of strenuous effort" to obtain jobs "offering salaries that are laughable." I would be very much surprised indeed if any native-born member of a minority group—or for that matter, any native-born American—having sacrificed the necessary time, pain, money and effort to obtain a scientific or engineering degree, would be anything less than appreciative of being given a chance to earn a "laughable" salary that in all actuality is not that bad and, particularly in the case of minority Americans, is typically far better than anything his or her parents ever earned.

True, higher salaries might provide an incentive to pursue science-related careers for native-born Americans already accustomed to high salaries. However, social repression can be just as powerful, if not more so, a force of motivation. Lynch writes that scientists from developing countries are attracted to employment in American universities because of the opportunity "to enjoy the freedom and luxuries of our open and democratic society." But one does not have to come from a

foreign country to be subjected to a "repressive" environment. Repression comes in many forms: ubiquitously in the visage of poverty and, in the case of minorities, the omnipotent burden of the double standard. The scientific and engineering advances made in this country due to the sacrifice of foreign-born Americans cannot be questioned. What I do question, however, is the underutilization of resources already available in this country to fill our scientific ranks. They should not be viewed as a liability, and they have plenty of motivation.

References

1. For example, see R. Pool, *Science* **248**, 433 (1990).
2. Res. Tech. Management, November–December 1991, p. 51.
3. D. H. Thurgood, J. M. Weinman, *Summary Report 1990: Doctorate Recipients from United States Universities*, Natl. Res. Council, Washington (1991), appendix tables B-2 and A-4.

DAVID S. ALBIN
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11/91

Multicultural Science Essays Assailed

I was startled by the letter (June 1991, page 145) from Paul Engelking of Lowell, Oregon, in which he reported that "Portland State University has proposed to eliminate its undergraduate programs in applied science [and has] marked for suspension [its] undergraduate program in physics." I share certain of Engelking's concerns about the "university experience" absent the intellectual substance and challenge of applied science and physics. However, my reaction also stems from a different, but perhaps related, source in the same locale. [Editor's note: Portland State has "reinstated the undergraduate degree program in physics," according to a subsequent letter (August 1991, page 13) from William Paudler, the dean of the university's College of Liberal Arts and Sciences.]

The curriculum department of the Portland, Oregon, public schools has recently published a document, entitled "Using the *African-American Baseline Essays*," designed to enable its readers "to understand the African-American experience." The essays themselves are essential ingredients in the development of a "multicultural" curriculum in Portland. These materials now form the basis of detailed lesson plans for all elementary public school classes there. According to this publication, "teachers

of art, language arts, mathematics, science, social studies and music are expected to use the *African-American Baseline Essays* as a resource and should infuse relevant content into the adopted curriculum." Other teachers and staff are expected "to use the Critical Topics to guide their presentations of information about Africa and people of African descent." While the concept of multiculturalism in education is worthwhile and important, there are aspects of the Portland approach that also are startling and may interest readers of PHYSICS TODAY.

The first of the "Critical Topics" developed for science in "Using the *African-American Baseline Essays*" is that "science is a culturally driven process leading to information based on a particular scientist's point of view." This statement apparently derives from the preface to the essay "African and African-American Contributions to Science and Technology," by Hunter H. Adams III. (Adams is described as a research scientist, historian and consultant who has been at the Argonne National Laboratory since 1970. Adams is cofounder and associate director of the Life-Ways Sciences Institute.) According to Adams, "this process of investigation called science is not value neutral, nor is it culturally independent; furthermore, there can be no ultimate objectivity. Why is this so, when neutrality and objectivity are believed to be an inherent and defining feature of science? Well [here Adams quotes from a "privately published" work by a "theoretical social psychologist"], 'science is the formal reconstruction or representation of a people's shared set of systematic and cumulative ideas, beliefs, and knowledge stemming from their culture.'"

Among the subtopics for science in "Using the *African-American Baseline Essays*" is this, for physics: "Early African writings indicate a possible understanding of quantum physics and gravitational theory." In his subessay "Egyptian Cosmology/Time in the Egyptian Mind," Adams suggests that "many of the philosophical aspects of quantum theory in contemporary physics" are alluded to in a treatise called *The Book of Knowing the Evolutions of Ra*, contained in a papyrus written at Thebes about 2300 years ago. "The House of Wisdom—Egypt's Premier Science Academy"—another subessay by Adams, in which he tabulates "a few examples of the discoveries that have been inappropriately claimed," including the "law of gravity" attributed to the "European discoverer" Newton rather than

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the "Islamic[-African] discoverer" Al-Khazin. Adams notes that "the science contributions of the Islamic-African science tradition are relatively unknown in the Western world because of the lack of humility of many Medieval European scholars who diligently imitated, copied and plagiarized the works of many Islamic scientists." Adams attributes the following "discoveries" to Islamic rather than European scientists: refraction of light (Ibn al-Haytham instead of Newton), air and its weight (Al-Khazin instead of Torricelli), principles of astronomy (Al-Battini instead of Copernicus, and Al-Biruni instead of Galileo) and the scientific method (Al-Biruni instead of Bacon).

The public school system here in Prince George's County, Maryland, has adopted the *Portland Baseline Essays* for their "potential relevant content and issues that may be infused in curriculum," for their use "to develop a knowledge base," as "part of ongoing study groups both within and across disciplines" and as bases for lesson plans in kindergarten through fifth grade. I have raised with the present public school administrators and educators of my children several issues pertaining to the absence of balance, accuracy and scholarship in the *Portland Baseline Essays*. The stakes are high not only for physics and other academic disciplines but also for effective multicultural curriculums generally. Perhaps it is time for knowledgeable scientists, educators and organizations (such as the American Institute of Physics and its member societies, in particular the American Association of Physics Teachers) to scrutinize such materials and to offer constructive alternatives.

KENNETH FOX
Bowie, Maryland

ADAMS REPLIES: While Kenneth Fox probably does have some genuine concerns, they are masked by his misleading historiography and his inflammatory summarizations.

Perhaps the most controversial (to some) aspect of my essay is its brief discussion of epistemological, ontological, axiological and sociological aspects of science—something needed, but rarely provided, in public elementary, junior high and high schools. This discussion was crucially necessary to establish a context for presenting the "scientific" knowledge of persons of African descent, because not only is the scientific method as it has been understood for the past 150–200 years in the Western world not always congruent with the historical knowledge quests among African peo-

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ple (as well as Chinese and Indian people), but even more importantly, the public's understanding of science is not always congruent with the reality of the scientific experience. Fox questions the veracity of my statement "This process of investigation called science is not value neutral, nor is it culturally independent; furthermore, there can be no ultimate objectivity." Like so many ill-informed or disinterested people involved in science, he still believes the myth that value neutrality and objectivity are the inherent and defining features of science.

My statement is neither radical nor on the fringe or pseudoscientific. For example, the 1989 National Academy of Sciences publication "On Being a Scientist" states: "Researchers continually have to make difficult decisions about how to do their work and how to present it to others. Scientists have a large body of knowledge that they can use in making these decisions. Yet much of this knowledge is not the product of scientific investigation, but instead involves value-laden judgments, personal desires, and even a researcher's personality and style." The authors also point out that "historians, sociologists, and other students of science have shown that social and personal values unrelated to epistemological criteria—including philosophical, religious, cultural, political, and economic values—can shape scientific judgment in fundamental ways." I would add values regarding gender and ethnicity.

In my essay I outlined the role and type of values and the personal, social and ecological contexts in which African people of ancient Egypt performed their "scientific" knowledge quests. Their theoretical and applied "technics" revolved around a strong moral and philosophical integrative framework known as "Ma'at." Fox avoids discussing that topic.

Fox apparently finds the inextricable linkage between the history of science of the Western world and that of the Eastern world extremely troubling. James Burke's PBS television series and books *Connections* and *The Day the Earth Changed* clearly show how science and technology's developmental course has been nonlinear, serendipitous and interwoven in the histories and lifeways of different cultures over time.

If Fox means to insinuate that I claimed Isaac Newton plagiarized his theory of gravitation, I can only say that nothing could be further from the truth. But no matter what people discover, create or innovate, they stand on the shoulders of giants before

them. No reputable historian could deny the significant influence Egypt had on the development of science and philosophy among the ancient Greeks, or the later impact the scientific and technological discoveries and inventions of the inheritors of that Hellenistic tradition—African and Islamic scholars—had on European science following Europe's "dark ages." I would recommend that Fox review Seyyed H. Nasr's *Islamic Science: An Illustrated Study* (Westerham, 1976) and Martin Bernal's *Black Athena: The Afro-Asiatic Roots of Classical Civilization*, volumes 1 and 2 (Free Association Books, 1989, 1991).

Fox lastly categorically dismisses all the Portland *Baseline Essays* because of their "absence of balance, accuracy and scholarship." I would hope that those "knowledgeable scientists, educators and organizations" that Fox patronizingly suggests should "scrutinize [multicultural curricular] materials and offer constructive alternatives" do not follow Fox's path toward divisiveness, but rather bring a strong measure of intellectual honesty to the task. The Organization of American Historians, in a recent position paper, acknowledged history as an interpretive discipline. In this case, whose interpretation of the history of science or of any ethnic group's knowledge would be the authoritative one? Who would decide? Could there be one "correct" view for all time? Who would decide which people and organizations would have the task of developing alternative views? Who would decide which "constructive alternatives" to the *Baseline Essays* would be adopted, and who would determine their content?

In conclusion, what is called for is more intellectual humility and less knee-jerk reaction to information that is not congruent with one's learned social history and education. As Lorenzo Simpson, professor of philosophy at the University of Richmond, poignantly observes in his article "Science, Language, and Experience: Reflections on the Nature of Self-Understanding" (*Man and World* 16, 25, 1983), "we must risk who we think we are, what we take the meaning of our experience to be, in order to be in possession of who we are."

The *Baseline Essays* are currently being reviewed and revised, as was always planned. The biographical data given could be misinterpreted: I am an independent research scientist at the Lifeways Sciences Institute in Chicago, not at Argonne National Laboratory.

HUNTER ADAMS III
Chicago, Illinois

1/92

Culture, Values and the Wish to Learn Science

The letters and articles on the dismal situation in science education in this country (mostly by people who have never taught high school science) deserve, I think, a few comments from one who has been in various systems, from Catholic schools and suburban public schools to inner-city schools and schools in Nigeria, since 1956.

I agree with most of the criticisms of science education in this country: It is dull, test oriented, theoretical and text oriented; it lacks "hands on" work; and so on. And I don't believe that students are just too "lazy" to do the work demanded in a serious science course. There is another factor that is overlooked: *Perhaps some students just aren't interested in science, no matter what we do to capture their interest.*

I am thinking of two groups that are often focused on: women and minorities. No matter how much fun science is in primary and middle school, there comes a time when serious choices have to be made. The question is, Just how relevant is science as a *career* to women and minorities (or, for that matter, to males of the "majority")?

My female students have usually been my best students in physics and chemistry, especially among my minority students. By "best" I mean they have the highest test scores and do very well in the lab. But they don't continue in science. While physics may be "interesting" to these students, it is also—especially on the theoretical level—quite irrelevant: a game played by overgrown adolescent males (as is math). There are more important things in life. And the large percentage of women in the health sciences bears witness to this attitude.

Minorities have other concerns (and not just socioeconomic) that do not make quantum electrodynamics and the Super Collider very relevant. In every system I have taught in, there is a religious value system that the students (and their parents) see as inimical to science. As a former Jesuit priest I have encountered on every level the question "How can you be religious and teach science?" Almost every year a minority woman will present me with a little "gift," usually a tract on creationism. And you don't have to be a fundamentalist to be critical of science. One professor at a Midwestern university reported that close to 50% of his science education students thought that creationism was a "reasonable alternative to evolution."

There are few examples of real