The shaman uses magic formulas within the structure of his spell; the scientist uses mathematical formulas within the structure of the scientific method.

They serve a similar function in their societies. Certainly their world views differ: The shaman believes in spirits and demons, while the scientist believes in gluons and quarks. (I sometimes think the amount of faith required must be very nearly the same.) But both seek to harness natural forces in the interest of humanity. One might almost say that the wizard was the scientist of his time.

One significant difference between the shaman and the scientist lies in their accessibility. The shaman's rituals were largely public, as were the results: Either the rain came or the drought continued; either the patient recovered or he died. But the scientist conducts his rituals in the privacy of his lab, revealing the results at his discretion, and then usually to a circle of initiates in arcane publications inaccessible—or incomprehensible—to the general public. This remoteness adds to the aura of mystery that surrounds the public perception of the scientist. No wonder that the modern tribe, with as much faith as ever in the power of its shamans, is a little nervous!

BRENDA B. COLIJN
6/88 *Dublin, Ohio*

"The Physicist as Mad Scientist" seeks to blame the poor image of scientists on an ignorant public in the thrall of sensationalist writers.

Well, sensationalism does exist, and the public does have a poor image of the scientist, but Spencer Weart's assertion that one follows from the other was in no way demonstrated. Additionally, I found his implication that the base masses are incapable of independent thought to be rather arrogant.

Perhaps the public is not quite as ignorant as Weart believes. Perhaps the public disregards the smokescreen of modern conveniences and sees instead just a few relevant facts that define the soul of the scientist.

For isn't it true that physicists continue to create devices whose sole purpose is to destroy the Earth? Is it not also true that engineers design projectiles whose sole purpose is to butcher human flesh? Are there not biologists who concoct formulas whose sole purpose is to impart virulent disease?

One could say that scientists are no different from the rest of the human race in their motivations. I would say that with great power comes great responsibility.

Surely science is the world's second-oldest profession.

NORM SIMMONDS
8/88 *Valencia, California*

Chinese Students in the US: Home Unfree

The news story by William Sweet (June 1988, page 67) gave a report on the brief history and the future of the China–US Physics Examination and Application program. The story also discussed the future of Chinese students in the United States and touched on the sensitive issue of whether they would return to China after completing their studies here. I would like to take this opportunity to offer some of my personal views on the issue, which may or may not be shared by other Chinese students.

As a student from the People's Republic of China, I have frequently been asked the question "Are you going back to China?" Lately, I have been asked, "How many Chinese students will eventually return to China?" The answer to either question is not clear to me at the moment, in spite of my deep affection for my country. Two major factors influencing my decision are the lack of career opportunities and the disrespect of basic civil liberties.

As stated in Sweet's news story, the Chinese government has made clear that its long-term economic development plan is to emphasize small-scale enterprise and de-emphasize basic scientific research. The government's current reform policy, in my opinion, overemphasizes the commercial profitability of research activities and therefore will seriously undermine basic research in physics and other sciences, as well as the general technology base. As a result of this, even those fields, such as condensed matter physics, that the government has singled out for support will suffer severe drawbacks in the long run. The government has ignored criticism from a great number of concerned scientists both inside and outside China. Should the government carry out (and I think it will) such a so-called "reform policy," it will effectively diminish the research opportunities for those who wish to do independent basic research without immediate commercial benefit. I was told a little over a year ago by a fairly high-ranking government official who was touring campuses in the United States that the government did not encourage students to do postdoctoral

continued on page 129

CRYOGENICS
CRYOJANIS
JANISGENICS
or simply
JANIS

No matter how you say it, **Janis Research Company** is still the "WAY TO GO" for all low temperature requirements

JANIS RESEARCH CO., INC.
2 Jewel Drive
P.O. Box 696
Wilmington, MA 01887
U.S.A.

Tel: (508) 657-8750 • Telex: 200079
Fax: (508) 658-0349

WOO SIN ENTERPRISE, INC.,
SEOUL KOREA • Tel. (02) 583-5696/7

Circle number 15 on Reader Service Card

continued from page 15
research abroad, and that was because, as he bluntly replied when pressed, China didn't really need sophisticated physicists, so graduate students like me should return after finishing their doctoral work. I was puzzled by his answer. Why should we return if the country does not need us? Well, it didn't take too long before I puzzled out what he was really implying. It seems that the government cares more about exercising its control over students abroad than worrying about the "brain drain."

The second factor influencing our decisions whether to return home or not, namely the lack of respect of basic civil rights, is perhaps more important to some of us. The views of Fang Lizhi [former vice president of the University of Science and Technology in Hefei, dismissed in early 1987] are widely shared by the vast majority of Chinese students both at home and abroad. While Fang's call to us to speak out and to live up to our responsibility as scientists has had a tremendous impact on the Chinese student community, many of us are more concerned with some of the specific issues confronting the daily life of every Chinese citizen. In practice, there is no freedom of speech, no freedom of association, no freedom of travel, not even freedom of thought, even though these basic rights are nominally guaranteed by our constitution. In many respects, our ability to work as scientists inside China is intimately related to the degree of political democratization. For instance, traveling abroad is strictly regulated. While travel restrictions are considerably looser for those with privileges and for established senior scientists, it can sometimes take months or even years for young researchers with few connections to be permitted to visit another country. These travel restrictions ought to be completely abolished, for they seriously reduce channels of communication between researchers in China and the rest of the world. Many of us fear that we may never be allowed to visit the US or to attend international academic conferences once we return home.

Moreover, as physicists, freedom of speech and freedom of thought are of vital importance to us, since we are trained to challenge things that are irrational and not to accept any "traditional" dogma without critical examination. The fact that China has not been able to produce research worthy of consideration for a Nobel Prize is not unrelated to the fact that independent thought deviating from the official line has been suppressed. It reflects the so-called "tradition" of following the standard. It is debatable, however, whether this lack of creativity can be attributed solely to government policy. Nevertheless I contend that the government should move beyond verbal promises and take decisive actions to improve the living conditions of intellectuals in the middle class, not just those with high rank. It must allow diversity of thought, even "perverse" thought, and fully recognize the individual. Until China's government alters its fundamental attitude toward the intelligentsia, both economically and politically, any attractive promises it makes will be met with deep suspicion.

Some of us are eager to contribute our scientific knowledge, as well as what we have learned of Western culture, to the modernization of our country. Some of us wish to stay abroad, for various reasons. For example, those who have aggressive personalities and strong motivations for success in their scientific careers may find it difficult just to survive the relatively close society in China, where individuality is yet to be fully recognized, let alone pursue a vigorous scientific career. Because they adopt Western life styles more easily and tend to be more self-centered, they are often condemned as having been corrupted by bourgeois liberalism. They are most likely to be resented by colleagues and treated with suspicion not only by their political supervisors but also, and perhaps more frequently, by the people in their immediate surroundings. Unfortunately, such scientists are the people that my country needs most if China is to catch up with the developed Western nations and regain its position as a world power. In any case, it is a citizen's basic right to choose a place to live if one can, and the government does not necessarily have, in my opinion, the right to prevent citizens from traveling abroad at their own expense. The only sensible policy is to create an atmosphere in which scientists and intellectuals are free to voice their opinions and exchange ideas with their colleagues both inside China and abroad. It is the government's duty to improve the poor living conditions of intellectuals and to guarantee every citizen the basic civil rights granted by the constitution, rather than to impose various limitations aimed at controlling students abroad. Any coercive policy is doomed to fail.

7/88 NAME WITHHELD BY REQUEST

SSC Costs: Compare and Contrast

Each issue of PHYSICS TODAY adds another chapter. Virtually every colloquium, seminar or even conversation inevitably turns in its direction.

Five billion dollars (or is it $4.2 or $6.3 billion?) is a large expenditure and apparently of great concern to many. But is it really the figure of merit for the SSC?

Spread over the 8- to 10-year projected construction period, the project can be viewed as costing approximately $500 million per year, a relatively modest sum, especially to those of us jaded by a $5.2 billion nuclear plant that won't open, multi-giga-dollar submarines and aircraft carriers, and a Stealth bomber rated at $500 million per flying wing. In addition, the $250 million estimated yearly operating budget (1988 dollars?) seems positively trivial.

The academic arguments have been amply aired and debated and seem fairly straightforward. When the subject came up at the meeting of physics chairs in Arlington, Virginia, on 19–20 February, I was pleased to add my name to the significant support expressed by that group. If the project is vetoed, one might contemplate, in a decade or so, a subscription to the relevant organ of the Physical Society of Japan for timely reports on the Japanese Super Collider located 50 miles south of. . . .

GERALD A. FISHER
San Francisco State University
6/88 *San Francisco, California*

One aspect of your insert (May 1988, page 70) briefly describing the seven remaining proposed sites for the SSC caught my eye. Only one site was characterized as having a life-cycle cost slightly higher than those for other sites, one had a cost about equal to the average, and the remaining five had below-average costs. I couldn't help being reminded of Garrison Keillor's "Prairie Home Companion" characterization of Lake Wobegon, "where all the children are above average."

ROBERT VANDENBOSCH
8/88 *University of Washington, Seattle*

Of Particles, Pyramids and Piper-paying

Having just finished reading the Letters column in PHYSICS TODAY of May 1988 and the articles on space science, I happened to pick up Aristotle's *Politics*. In book V, chapter 11, I read the following: "As examples of works