project was cancelled after a decade and very substantial expenditure.

Schweber speculates that the generous postwar governmental support of accelerators was partly motivated by possible military applications. Although that may have been so in the minds of some officials, I suspect that few informed people harbored any illusions that the great machines would serve any purpose other than basic science or applications to medicine.

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Memories of Philip Morse

Thank you for the illuminating article "Memories of Feynman" by Theodore Welton (PHYSICS TODAY, February 2007, page 46). Richard Feynman's career might have been substantially different had he not been directly influenced as an undergraduate at MIT by Philip Morse. Each week Morse gave Feynman, Welton, and Albert Clogston the unusual attention of an afternoon of advanced quantum mechanics. Having his own PhD from Princeton University, he is said to have influenced Feynman's choice of Princeton for the graduate studies that resulted in his germinal work with John Wheeler.

Readers may be interested to know that Morse had a distinguished, multifaceted career: He was a founder of the field of operations research, first president of the Operations Research Society of America, president of the Acoustical Society of America, and the first director of Brookhaven National Laboratory. Morse also served as president of the American Physical Society in 1972 and chairman of the Governing Board of the American Institute of Physics from 1975 to 1980. His two-volume *Methods of Theoretical Physics*, written with Herman Feshbach, is still in print more than 50 years after publication.

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American physics implosion

Kannan Jagannathan's review of two recent books (PHYSICS TODAY, December 2006, page 57) with the arresting titles *Not Even Wrong: The Failure of String Theory . . .* and *The Trouble with Physics: The Rise of String Theory, the Fall of a Science . . .* amusingly compares string theorists' faith in their own transcendental insights to the Great Disappointment of 1844, in which religious leader William Miller and his followers renounced worldly goods and awaited the Second Coming. However, the tempest in a teacup surrounding string theory conceals a much larger problem in American physics. That problem is well illustrated by theories that have evolved over the past 20 years to describe high-temperature superconductivity (HTSC).

Since its discovery in 1911, superconductivity has fascinated many physicists. However, by 1980 the field was thought to be dormant; even the quest for higher transition temperatures T_c seemed to have leveled off around 30 K. In 1986 Georg Bednorz and K. Alex Müller announced that they had found superconductivity in a most unexpected place: not a metal, but a ceramic oxide, with T_c near 40 K. Within a few years, transition temperatures had climbed to well over 100 K.

Unlike string theory, HTSC was a field with abundant experimental information—today there are more than 65 000 publications on the topic, about one-third of them patents. Here was a real challenge for theory; no fewer than nine Nobel Prize winners, and many other scientists as well, have contributed theories on the subject. The question they raised most often was, What interactions are responsible for the high transition temperatures—the conventional electron–phonon interaction, as in the metallic superconductors, or something else? Of the nine Nobel laureates, three supported the conventional interaction, while six went for something exotic—usually electron–spin interactions. The experiments are now in, and the majority was wrong—the electron–phonon interaction is responsible.

Few readers will be surprised to learn that so many Nobel laureates were wrong. As they say on Wall Street, prior performance is no guarantee of future success. But now comes the interesting part—the three who were right are European, and the six who were wrong are American. That can scarcely be a coincidence, and it says something about American physics and especially what American professors and graduate students expect from research. Plainly stated, string theory and erroneous theories of HTSC may have a common explanation: Americans have become so self-centered that their physics theories are disconnected from reality, not only when no data are available, but even when experimental data are abundant.

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Retired Scientists Cooperative

The US is experiencing a growing shortage of trained scientists and people with science-related technical skills. It would be expedient to draw on the large reservoir of scientific expertise among the thousands of retired scientists from academic, industrial, and government institutions. Many of these scientists retain their peak competence and would welcome the opportunity to use their skills and knowledge on a part-time or temporary basis. To provide the general public with continued access to the wealth of information held by retired and retiring scientists, the Retired Scientists Cooperative was formed in 2002.

One consideration that influenced the formation of the RSC is the fact that men and women at 65 years of age are still vital, strong, capable people. Bradley Hyman of Massachusetts General Hospital conducted a study of a group of 60- to 90-year-olds; his results indicated that aging in healthy people is not associated with mental decline. Responses may slow down, but the power to think does not change with age. Some people even show an increase in mental abilities in later years. John Morris, director and principal investigator for the Alzheimer's Disease Research Center at Washington University in St. Louis, came to essentially the same conclusion.

The RSC currently has some 200 scientists listed, in fields including chemistry, biochemistry, life sciences, physics, engineering, environmental science, astrophysics, geology, oceanography, mathematical physics, and theoretical chemistry. Following are some examples of activities that could be undertaken by members of the cooperative.

▶ **Academic teach-in**. A university in Massachusetts wants to instruct its physics students in astrophysics but lacks the funding to retain a full-time professor. An RSC astrophysicist could conduct several lectures, or even a full-semester course.

▶ **Scientific verification**. A research scientist at a university in New York wants to use electrophysiological measurements to verify his radioactive chloride flux measurements across membranes but does not have the expertise. An RSC scientist would either train the scientist in the technique or perform the needed measurements.

▶ **Industrial teach-in**. A plastics company in New Jersey wants to explore the commercial aspects of an experimental synthetic resin in the formulation of flexible plastics. An RSC scientist would study the problem and give a presentation on the findings.

▶ **Community teach-in**. A community on Long Island in New York wants to learn about the effects a proposed wastewater treatment plant will have on the ecology of local beaches and waterways. Or perhaps a community in Vermont is plagued with high cancer rates. Appropriate RSC scientists would study the problems and present their findings.

▶ **Scientific editing**. An RSC scientist could edit scientific papers or technical manuals for individuals and organizations that lack such publication experience. This service would be extremely useful for scientific authors who are not native speakers of English.

Retired scientists who are citizens or permanent residents of the US are eligible for membership in the RSC. For more information about the cooperative and its membership application process, see our website, http://www.retiredscientists.org.

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Some elements go cubic under pressure

In the August 2007 issue of PHYSICS TODAY (page 24) a Physics Update item mentions recent work, by Dominik Legut and coworkers, proposing that the simple crystal structure of polonium arises from relativistic effects. The piece states that polonium is the only element with this structure. That is not true: For 20 years or more, the structure has been known to occur in phosphorus at pressures above 10 GPa, in calcium above 32 GPa, and in arsenic above 25 GPa. Since those elements are all much less heavy than polonium, it seems unlikely that relativistic effects can be sufficient to account for their simple cubic phases.

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An item in the August 2007 Physics Update section states that "polonium, with atomic number 84, is the only element with a simple cubic crystal structure." In the 21st century, that statement is a bit extreme.

Selenium, in the same element group as polonium, has an allotrope[1] with simple cubic structure, as described in a text by Jerry Donohue.[2] Perusal of his book will also illuminate simple cubic structures of other elements.

References

1. B. D. Sharma, *J. Chem. Educ.* **64**, 404 (1987).
2. J. Donohue, *The Structures of the Elements*, Wiley, New York (1974), p. 385.

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Legut replies: Richard Nelmes and Brahama Sharma are right that some other elements exhibit the simple cubic structure under high pressures and perhaps in thin films at elevated temperatures (see reference 1 in Sharma's letter). However, that point was not the goal of our research. When we wrote in our article that polonium is the only element with the simple cubic structure, we meant that it is the only element with that structure under ambient conditions. We hope readers of our article do understand that "under ambient conditions" is implied.

For phosphorus, calcium, and arsenic under high pressure, we doubt that their simple cubic structure would be due to relativistic effects. The atomic numbers of these elements are too low. Most probably, at high pressures, the Gibbs energy of the simple cubic phase becomes lower than the Gibbs energy of the original phase without involving relativistic effects.

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Corrections

September 2007, page 55—Equation 1 should read $\mathbf{Q} = 1/2\,\langle 3\mathbf{II} - \mathbf{1}\rangle$.

August 2007, page 52—The name of the Vishwa Hindu Parishad was misspelled. ■