can reliably provide for our energy needs.

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STEM solutions through college collaborations

David Kramer's story in the November 2011 issue of PHYSICS TODAY (page 22) cited the five-year goal of the Association of American Universities (AAU) to implement changes in science, technology, engineering, and mathematics teaching. However, the issue of improved STEM education and participation goes beyond institutional members of the AAU and beyond pedagogical changes.

Currently, 65% of graduating high school seniors in the US decide to attend college, and of those students, 30% matriculate to a two-year college.[1] As the cost of higher education continues to increase, students are relying more heavily on two-year colleges to meet their educational goals.

Community colleges currently enroll 44% of all undergraduate students in the US[2] and are often overlooked by four-year STEM programs as potential partners for a solution to problems in STEM education. As the two-year steppingstone becomes more common, that important and formative first experience with STEM courses generally happens at two-year colleges. Support and collaboration between the two-year and the four-year institutions are vital.

Collaboration between community colleges and universities offers exceptional opportunities and benefits for both institutions. On the community-college side, a four-year college or university can provide access to research facilities and labs not available in a two-year system. A collaboration could also allow for faculty of two-year programs to remain engaged in their field and to continue to develop their research skills.

For a four-year college or university, the benefits of collaboration derive from the diversity of the student population—including underrepresented minority groups and nontraditional learners whose cultures, backgrounds, and experiences can be assets. Additionally, NSF and other external funding agencies look more favorably at institutions that actively incorporate community colleges and their students.

The broader impact of the interactions is that they create not only a pipeline to higher education but a reservoir of greater knowledge in the community as well. Community-college students who benefit from a collaboration with a four-year institution can pass along their enthusiasm, experiences, and knowledge to peers and family and create a larger social base of understanding of scientific issues.

The successful teaching of STEM courses at all education levels is not only through theory and pedagogy but through concrete formative experiences and partnerships.

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Timeliness of the 2011 Physics Nobel Prize

Yousaf Butt questioned whether the Nobel committee had been premature in awarding the 2011 physics prize "for the discovery of the accelerating expansion of the universe" to Saul Perlmutter, Brian Schmidt, and Adam Riess on the basis of their work observing distant type Ia supernovae (PHYSICS TODAY, February 2012, page 10).

The decision was assuredly based on additional corroboration. Not only were subsequent corroborative supernovae Ia data published by other groups,[1] but further evidence has accumulated.[2] Studies of the cosmic microwave background and large-scale structure,[3] baryon acoustic oscillations,[4] and cosmochronology[5] all support accelerated expansion and dark energy and have rendered the conclusion virtually unassailable, notwithstanding claims that the intrinsic motion of distant objects overlying the Hubble flow might cast doubt on the interpretation of the Perlmutter-Schmidt-Riess observations. The case for accelerated expansion in an Einstein-de Sitter-Lemaître "inflexional" universe has now been made irrefutably in numerous texts and in a continuing flood of papers dealing with dark energy, the cosmological constant, quintessence, and so on.

The discovery of the accelerated expansion of our universe's spacetime has vindicated the presence of a cosmological constant in the field equations of general relativity and the consequent reawakening of interest in the role of antigravitational repulsive pressure in general-relativistic cosmological theory. It has also driven the examination of new vistas in astronomy and astrophysics. It has led to fresh insights into possible multiverses, extra dimensions of spacetime, and generalized aspects of particle physics, and it has brought a new scientific reality to the latest insights into cosmology.

The award of the 2011 Physics Nobel Prize in timely recognition of that fundamental progress and consolidation of our basic understanding of the cosmos is therefore well justified.

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Thoughts on concentrated solar power

By viewing the potential of and the problems with places we would most like to see concentrated solar power plants work (PHYSICS TODAY, July 2011, page 21, and December 2011, page 10), we can overlook areas that may have greater chances of success and of providing real benefits. Large inland deserts are tempting as "wasted space" waiting to be put to use, but they have neither the needed process water nor a ready demand for the power produced.

Many tropical locations have days of sunlight comparable to desert areas; ready access to ocean water; and a population that would benefit from cheaper energy, fresh water, or both. (With abundant solar thermal energy, we can obtain from ocean water all the fresh water that is needed for the power plants and for other uses.)

Islands in particular should be considered. In many cases, consumers might be happy to have cheap but interruptible power if the alternative is unaffordable power.

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■ **Andrew Ochadlick's letter** on the history of solar hubs and the "risks" in pursuing them is insightful. It is particularly important to point out the need for water to clean any solar radiation collection surfaces to maintain efficiency. I do, however, want to express concern with the implications that come from continuing to characterize Lewis Strauss's comment as an example of a "grossly inaccurate energy-related" prediction.

In a 1954 speech to science writers, Strauss, then head of the Atomic Energy Commission, said,

> It is not too much to expect that our children will enjoy in their homes electrical energy too cheap to meter, will know of great periodic regional famines in the world only as matters of history, will travel effortlessly over the seas and under them and through the air with a minimum of danger and at great speeds, and will experience a lifespan far longer than ours as disease yields and man comes to understand what causes him to age.

The speculation Strauss made about the future has been selectively quoted over the years, by people who are skeptical about or opposed to nuclear energy, as reflecting the view of the leadership of the commercial nuclear power industry. That is not true. Since President Dwight D. Eisenhower's Atoms for Peace speech to the United Nations in 1953, which launched the fission-based commercial nuclear power industry in the US, the industry has recognized that economic competition with fossil fuels would be difficult. See, for example, the 1954 analysis by Theodore Stern,[1] who became a Westinghouse senior executive vice president for electric power.

Some believe that Strauss, the US government lead for all nuclear R&D, had fusion in mind for "electrical energy too cheap to meter." In any case, if a utility decides not to meter a service—for example, water to New York City before 1985—it does not necessarily mean that the cost of providing the basic infrastructure for the service is cheap.

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