West were more or less equally represented. The majority of the Arab attendees were from the host country, Egypt, but there were also some from Jordan, Morocco and elsewhere.

The presence of Palestinian physicists from various West Bank universities was especially noteworthy. Contact with them was first established by Fubini and Devoto, with the help of Denis Hill, a schoolteacher in Switzerland. The Palestinians' attendance was facilitated by the Israeli government because they had to travel through the Israeli city of Elath, which is normally closed to Palestinians. But through the strenuous efforts of the leader of the Israeli delegation, the Hebrew University of Jerusalem's Eliezer Rabinovici, the Palestinians got travel permits and made the journey to Dahab on the same bus as the Israelis.

For the Palestinian physicists, the Dahab meeting provided the first opportunity for them to participate in a physics event as a recognized national group. This clearly mattered a great deal to them; while most participants identified themselves in terms of their professional affiliations, the Palestinians wanted it known that they were from Palestine.

Although academic institutions are quite ancient in the Arab world—Cairo's Al-Azhar University may well be the oldest university in the world, having functioned for over a millenium—physics as an academic discipline is quite recent. Knowledge of modern research, especially in particle physics and mathematical physics remains scant. This was evident from the many questions—both formal and informal—put to the lecturers by the Arab attendees. There was also much talk of curriculum content and development; PhD physics programs in the Middle East region exist only in Egypt and Israel.

One came away from Dahab with the impression that Arabs have great enthusiasm for and interest in our subject. Given the chance, it seems that physics, especially its less-abstract branches, could flourish quite vigorously. Such development could be fueled by easy access to Israel's strong physics departments and to the Trieste-headquartered ICTP, whose mission is to foster the development of physics in countries without a previous presence in the field.

The Dahab meeting seemed to please the participants, and one felt that a useful first step had been taken. Official agreements are now being concluded to hold a second such meeting later in 1996, and individual institutions are forging arrangements to support reciprocal visits between Arab and Israeli institutions. In coming years, further opportunities will likely present themselves, especially for young Palestinians, who for a generation had little possibility of advancing in physics or any other field. (In recent years, Edward Witten has made it a practice to lecture at university physics departments on the West Bank, thereby giving young Palestinians their only exposure to modern topics.)

On reflection, it appears that, in the past, physicists' contributions to the resolution of international conflicts was confined to armament questions for one side or the other. Here, with the first Sinai Meeting on Physics, held only two weeks after the assassination of Israeli prime minister Yitzhak Rabin, we have embarked on a different path, using our discipline as a vehicle for understanding and cooperation. Someone at Dahab drew an analogy with CERN: Given that, following World War II, the European combatants worked jointly and successfully in physics, it may be that the Dahab meeting will lead to a similar evolution in the Middle East.

The setting of the Dahab meeting also enabled the attendees to obtain an understanding of the Sinai in both real and symbolic terms. They ventured out into the gulf to observe the remarkable flora and fauna of a living coral reef. They climbed Mt. Sinai (*Jabal Musa* in Arabic, meaning the "Mount of Moses") to visit Christianity's oldest monastery, St Catherine's, within whose precincts there is also a mosque, as well as a descendant of the burning bush near which Moses conversed with God. And, halfway through the meeting in Dahab, they directly experienced one form of the instability that still plagues the Middle East: an earthquake that registered 7.2 on the Richter scale.

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## Medical Physics Is a Demanding Profession

I would like to add a note of caution to G. Donald Frey's perspective on the medical physics profession (November 1995, page 11).

I get pleasure from demonstrating my medical physics specialty (radiation oncology) to basic physicists, but a frequent reaction is, "This doesn't seem that hard." They need to know that there is more to medical physics than simply applying basic physics principles to medical problems. Basic physics students should definitely be informed about medical physics, but they should also be made aware of certain other aspects of the field.

One important aspect is being able to work with the sick and dying—from the very old to the very young.

Another is knowing how medical physicists pursue solutions. In both the medical setting and the basic physics laboratory, that pursuit requires intelligence and training. If failure occurs in basic physics, the experimenter replaces the burned-out components in the circuit, introduces new discrimination in the electronics, places a new operator in the Hamiltonian or revises the model from which the prediction arose. In medical physics, however, the solution is literally pursued with a life-or-death consequence. The safety of the tried and tested is not only preferred, but required. Incorrect solutions can jeopardize the success of treatment, and errors are likely to occur if the individual's dedication to quality assurance falters. (Prior to my present employment, I caused a man to lose vision in one eye when I bypassed quality-control procedures. That error still haunts me.) Medical physicists must have malpractice insurance to protect themselves or their employers against such possibilities, but the human toll on both the patient and medical physicist is not so easily disposed of.

Yet another aspect is to understand how medical physics has changed over the past two or three decades. When I came into medical physics in 1971 from basic physics, an individual with a PhD could get up to speed with one year of on-the-job training. At that time there were no accredited medical physics training programs. Now there are seven. A quarter of a century ago, one could sufficiently master all areas of medical physics—radiation oncology, diagnostic imaging and nuclear medicine—in a year of concerted effort. Today one cannot.

Another aspect is realizing the risks involved when individuals try to practice medical physics without the benefit of training programs and apprenticeships. Incidents have occurred, such as numerous patients being overexposed to radiation—and hospitals and physicists thereby being exposed to legal action.

Finally, I urge interested physics students to contact the headquarters of the American Association of Physicists in Medicine (301-209-3350) for information about training programs in medical physics.

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## Spirited Debate on the Role of Science

In "The Role of Science in Our Society" (September 1995, page 43), Burton Richter has done a fine job of emphasizing the importance of continued funding for basic and applied science at a time of major changes in Washington, DC. I agree with him completely on such issues as the need to continue funding basic science for national security and economic reasons, and to have industry, government and universities work together.

However, there are a couple of changes in emphasis that I would make. First, funding of basic and applied science must continue both for individual investigators and for megaprojects. The megaprojects must be prioritized by the scientific community. Prioritization would be a natural role for the National Academy of Sciences, National Academy of Engineering and the National Research Council, and you can be certain that if it is not done by the scientific community, it will be done for it. The long-term payoff from these projects needs to be carefully communicated to the Administration and Congress, and also to the general public—but without overstating results and making hollow promises.

Second, the problem in the US has not been with commercializing technology. We have a very active venture capital community, and funding companies to commercialize new technologies is not a problem. Rather the problem lies in the improved design and low-cost manufacturing of technologies that meet mass-market needs. We must emphasize the importance of good design, quick introduction into manufacture, determining what customer requirements are, and closing that loop with changing designs to meet global market needs. This capability is much stronger outside the US, and seems to be at its best in the Pacific Rim countries. Most foreign competitors can introduce dozens of new products while US companies struggle to introduce a single new design.

The future leadership of the US will depend on supporting the points made in Richter's article, and the ability of the scientific community to infect our lawmakers with the excitement and promise of science and technology.

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Burton Richter argues for continued massive government funding of sci-

*continued on page 77*