International cooperation in physics

Participants at AIP's Corporate Associates Meeting call for increased internationalism on a world-wide scale.

John T. Scott

Physics is the uniquely international science. No other science is so closely tied, in all countries, to budgetary and regulatory agencies at the government level, and so no other science is as well placed as physics to implement cooperative ventures cutting across national boundaries. And its followers communicate in an international language that transcends any trivial difficulties over mere words; physicists around the world may not always agree, but at least they know what their foreign counterparts are saying and publishing.

In this current period of overlapping and interconnected global crises—food, population, energy—what are the implications for physics? At the governmental level, international cooperative ventures are being discussed, or in some cases undertaken, that should involve physicists as major contributors. But what about industry, whose traditional habits of corporate secrecy run counter to the urgings of those who would have the industrialized nations share their technological expertise with the developing countries? Is old-fashioned chauvinistic protectionism dead? And what role should the academic community, historically one that ignores national boundaries, play in our attack on the problems facing the whole world's population today?

These questions and others like them were addressed by The American Institute of Physics Corporate Associate representatives, meeting last November at the National Academy of Sciences in Washington, D.C. Additional invitations were extended to chairmen of physics departments, government officials and scientific-affairs personnel attached to Embassies in Washington, in order to ensure broad discussion of the stated topic of the meeting, "International Science and Technology."

This year's meeting, which was chaired jointly by H. Richard Crane (Chairman of AIP's Governing Board and professor at the University of Michigan) and Herbert I. Fusfeld (Kennecott Copper), was the second at which university-based physicists were invited to join the industrial physicists representing the Corporate Associates. The general opinion of participants was that this successful conference demonstrated the need for an annual meeting of US physics research and education directors, to exchange views and to plan for the future. (A complete listing of the Corporate Associates appears on page 72.)

The US view

Until recently it was habitual for American physicists to assume that, because the US held such a leading position in world physics, they could dominate any international cooperative ventures, and any transfer of scientific information across national boundaries would be largely one-way as far as the US was concerned. This is no longer true. As Allan Bromley (Yale) told the meeting, the US still has the strongest basic physics program in terms of overall balance, but other nations now lead in certain subfields. As examples he quoted the Intersecting Storage Rings at CERN (Geneva, Switzerland) in elementary-particle physics, the Darmstadt Heavy Ion Linac (West Germany) and the Daresbury (UK) 30-MV Tandem Van de Graaff in nuclear physics, the Laue–Langevin reactor at Grenoble (France) for condensed-matter physics, and the Kurchatov and Lebedev institutes (USSR) for plasma and laser physics respectively. While discussing the reasons for American domination in the past, Bromley said that basic US physics had been fortunate in its diversity of support mechanisms. Any move toward a single support agency would in his view be a mistake.

In today's conditions, cooperation with physicists of other nations must continue, must be allowed to grow freely, and must be a cooperation among equals. These points were made repeatedly by all speakers at the meeting, from backgrounds in the universities, the national laboratories and private industry.

The view from the universities

Two characteristically American attitudes, as stated by Charles P. Slichter (University of Illinois), are a belief in the importance of social mobility—the ability of individuals to cross class-dividing lines—and the belief that the key to social mobility is education. A result is that college education, to advanced-degree level where possible, is in great demand, and the US system of equal opportunity offers the chance of such an education to a large segment of the population. In some countries, the future college population is selected from among high-school students at a comparatively early age, and those who are picked switch to accelerated academic courses; in the US there is no such selection, with the result, Slichter said, that the level of attainment is held back in US high schools—particularly in science and mathematics, writing and literature. It is in graduate school that the US student catches up with his counterparts in other countries, emerging in every way their equal.

But differences are to be seen in American physics PhD's, Slichter maintains, in comparison with those of other countries. He sees a stronger back-

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Heads of graduate physics departments were invited to attend the 1974 meeting of AIP's Corporate Associates, as they had been for the first time at the 1973 meeting. Here are Oswald F. Schuette (left) of the University of South Carolina and George B. Beard of Wayne State University. In all, seventy academic physicists were present at the November 1974 meeting.

ground in theory for the US physicist, because at least during the first year of graduate school, experimenters and theorists stay together, taking the same courses. Only later do the experimentalists emerge as a separate group.

The staffing of US physics departments also differs from the practice abroad. In America, Slichter said, one finds many professors of roughly equal rank doing their own research work fairly independently. Abroad, there is more likely to be one or two senior professors, with a staff of junior colleagues working on projects defined by their seniors.

What role should the universities play in international ventures, for example in attempts to resolve the current worldwide energy crisis? David White (MIT) sees the universities' job as "education in the broad sense." We must be able to recognize how energy problems fit into a modern industrialized society, bringing in expertise from a variety of disciplines, including economics and politics as well as science and technology. And the approach must involve international exchanges, not just the local university community.

The Energy Lab at MIT, which White directs, adopts a broad approach to energy as an "all-pervading factor in world economy," coupling the skills of economists, managers and technologists. The university role, according to White, is to "add a voice to the perspectives of what can be done by the government and industrial communities," taking a long-term view and avoiding too much reliance on "quick fixes." He suggested further that the main progress should be in the social sciences, on such topics as the management of resources and the structure of industry. Universities have the broad viewpoint from which these perspectives can best be obtained.

Academic physics research has a good record of cooperative teamwork among universities from different countries—notably at CERN, but elsewhere also.

Representatives of three of AIP's Corporate Associates, industrial organizations with a stake in developments arising from basic physics research: Frank E. Jamerson of General Motors (left), Victor E. Ragosine of the Ampex Corporation (center) and Robert Adler of Zenith Radio (right).

Disturbing signs of a new nationalism were pointed out by Bromley, who told the meeting of a significant undercurrent among the German scientific community to exclude non-German researchers from the facilities at Darmstadt.

The view from industry

Industrialists might be expected to resist suggestions that the US should share its advanced technology with other countries, particularly the developing nations who need it most. Such activity runs counter to entrenched habits of corporate secrecy and adherence to the profit motive. So it was something of a surprise that several speakers at the meeting argued in favor of increased international cooperation by industry.

C. Lester Hogan (Fairchild Camera and Instrument Corp) led the way by saying that "all technologies are perishable." US industry cannot be protected for any sustained period by isolationist moves; other developed nations could soon surpass the US. He expressed concern at "the almost paranoic sense of fear that they will surpass us if we do not build a wall around ourselves." After saying that "we should leave protectionist philosophies behind us," he quoted recent statements by Secretary of State Henry Kissinger supporting the same view: "We cannot continue to run the world as we did in the 1950's and 60's; what the world wants is our technology . . . our political imagination must catch up with our scientific vision."

Bruce H. Billings (Aerospace Corp), who has been a US Commissioner for a group recommending technology transfer on Taiwan, said that he had split the problem into sections: What technology to transfer? How to transfer it? Why transfer it? Who will be at the receiving end? More important than money is the correct match of technologies to the receiving country. He gave examples from his Taiwan experiences, including the introduction of aerial photography, mushroom farming and artificial insemination in duck breeding.

Roland W. Schmitt (GE) also urged technical people in industry to favor international cooperation. The past routine, he said, has been for technologists to partake in the international exchange of basic knowledge, but at the same time to promote the interests of their own employer above that of the nation or the world. "Science tourism" as Schmitt called attendence at international conferences, short-term flying visits to laboratories in other countries and so on, suffers from the lack of any back-up mechanism to cement relationships and formalise agreements.

Schmitt continued by recommending increased internationalism during the

energy crisis. "The crisis is worldwide," he said, "and the objectives are similar everywhere. The R&D personnel with the skills to tackle the problem are spread around, throughout the world, and the US does not have a leading position." The unique strength of the US, Schmitt believes, is its overall R&D competence in industry. In other countries energy research is often found under more formal government control than is the case in the US. But Schmitt does not feel that a government-to-government dialogue between countries is an adequate way to set up working relationships, and he also told the meeting that he finds the lack of US government–industry contact a "serious flaw" in the energy field.

Onstage at the National Academy of Sciences auditorium are (left to right) Bruce H. Billings of the Aerospace Corporation, C. Lester Hogan of Fairchild Camera, Herbert I. Fusfeld of Kennecott Copper, one of the two chairmen of the meeting, and Samuel H. Goudsmit of the APS, who received the Karl Taylor Compton Award for Distinguished Statesmanship in Science.

A view from the Government

Speaking particularly on the need for international cooperation on the energy problem, Nelson Sievering (US Department of State) expressed his doubts about "Project Independence"—the plan to make the US independent of the rest of the world for its energy needs. Calling it "a parochial approach," he said "Project Interdependence" would be a better goal. The President's 1973 Energy Message called on the US to move rapidly to develop an international program— mostly with sophisticated nations—and Sievering said that the habit of useful relationships in this field would itself be a worthwhile achievement.

Existing and planned agreements were listed by Sievering. Binational agreements on specific topics exist between the US and New Zealand, Iceland, the USSR, the UK, Poland and Japan. Multinational efforts, largely spurred by the oil-supply embargo early in 1974, have been initiated with programs strongly committed to long-term cooperation. The International Energy Agency is a group of 16 countries pledged to cooperate in ten program areas including nuclear power and radioactive waste disposal. The role of this new agency, according to Sievering, is "to act as a catalyst rather than an implementer" for international research.

The US National Laboratories

Schmitt mentioned in his talk on international programs in energy that US industry must become more involved in R&D done by the National Laboratories. This point was taken up again in some detail by David J. Rose (MIT), who claims that "the role of the National Laboratories is often misunderstood." He sees the National Laboratories as the level at which overall policy on energy and environment problems should be examined, leaving specific items to be developed by private companies or consortia. The Laboratories can handle the problems on a larger scale than can a private concern, and the public is their patron. Their goals have longer time horizons than those of the private sector—but they face special difficulties. The National Laboratories have tended to isolate themselves from industry—for example the AEC, which after its strong early role in nuclear power generation left the development of operating power plants to Westinghouse, GE and GA. Another problem is that, having been set up for special purposes, a National Laboratory may find it difficult to convert when its prime role is over. John Gaunt (British Embassy) described a solution to this problem devised for the UK Atomic Energy Research Establishment at Harwell. When Harwell's original role in atomic-energy development was largely completed, the laboratory successfully switched to R&D work contracted by private industry and utilizing the special skills of the AERE laboratory.

The National Aeronautics and Space Administration is an example of a US National Laboratory that does cooperate in all the ways recommended by previous speakers, according to John E. Naugle (NASA). NASA experiments are usually designed in universities and built by industrial contractors; results are global in scope. The spacecraft are regarded as international facilities, and as programs become more elaborate, complex and costly, international cooperation is more and more desirable. So far, twenty foreign-built satellites have been launched by NASA, and six more are to follow; fifty foreign experiments have been mounted in NASA's own satellites.

Naugle summed up the political benefits of NASA's international programs in a way that serves well to summarize the overall message of this AIP Corporate Associates meeting: "With increased peaceful cooperation among nations, Mankind is getting smarter and everyone is getting to know one another better." □

Representatives of foreign governments included Francois Davoine, scientific attaché at the Embassy of the French Republic (left) and John Gaunt, Atomic Energy Attaché at the British Embassy. They were two of the eleven foreign science representatives attending this meeting.