

tional affairs at NASA, says that this program is not to be "an open license for other countries to come and fish for any technology they want."

NASA's position, as expressed by Pedersen, may put the agency on a collision course with ESA. In the second resolution adopted at Rome, which deals exclusively with the space station, ESA members said their participation in the project would be contingent on their having open access to use of the station and the technology it is built with. The Europeans are determined to avoid repeating the arrangements they agreed to for Spacelab, which required them to turn the facility over to NASA after using it just once, even though they covered all development and construction costs.

Pedersen insists that all partners will have access to all facilities, but it remains to be seen whether this claim can be squared with concerns about preventing excessive transfer of technology.

Before Phase B ends in mid-1987, negotiations will have begun for Phase C/D. At that time, the political context in which negotiations are taking place may be more or less drastically transformed. For one thing, Reagan may be starting to look like a lame duck. In West Germany, where a financial scandal has been eating away at the ruling conservative parties, the government will be facing national elections. Among the opposition Social Democrats and Greens, the space station is widely regarded as too American, too poor science and too likely to be used for military purposes.

A strong science rationale for the space station would clearly help dispel European concerns that they might end up subsidizing US military technologies without getting anything in return. The scientific objectives for the project have not been stated with precision as yet, which is what prompted the Congressional Office of Technology Assessment to recommend late last year "against committing at this time to the specific space station concept proposed by NASA, the related time-scale or the currently suggested method of funding." OTA's conclusions have been widely reported in Europe along with a negative assessment the National Research Council's Space Science Board gave the space station, though neither was unequivocal.

OTA objected to the particular space station NASA was proposing, but not in principle to the idea of a manned space station. What the Board said in two short reports to NASA was that the station was not needed for most space science missions planned during the last two decades of this century, but that if the station were built anyway it "could eventually provide significant

opportunities for a number of disciplines in space science provided there is a commensurate increase in the total level of space science activity."

Thomas M. Donahue of the University of Michigan, the chairman of the Space Science Board, says his group's main concern was to protect current space programs. Donahue says that most space scientists are quite satisfied now with the scope and character of NASA's efforts, in contrast to the situation a couple of years ago (PHYSICS TODAY, April 1984, page 73). Donahue claims planetary scientists will have little problem with the space station, provided current programs are continued on schedule.

In Europe the situation appears to be quite similar. Spacelab, despite the bad notices about costs and benefits, is almost universally considered an exciting success. While there is still great support for the skeptical views expressed by Keppler in *Physikalische Blätter*, it bears noting that the journal also ran a rejoinder.

The author of the rejoinder was Reinhard Furrer, an experimental physicist who has been selected for a space mission in 1985. In a reply notable for its sharp tone, considering the eminence of his adversary, Furrer said that the unmanned satellites favored by Keppler consume around 85% of the Federal Republic's space budget; he accused Keppler of being "confused" about key questions, and he raised the question of why Keppler considered himself qualified to make qualitative evaluations in so many diverse areas.

Furrer's list of processes that could be studied fruitfully in a low-gravity environment include fluid phases and fluid dynamics, transport processes or-

dinarily obscured by thermal convection, sedimentation, capillary action, surface-area convection, diffusion phenomena and crystallization. He pointed, for example, to the question of whether gravity-free conditions allow one to form new types of alloys and truly homogenous crystals. He also considered the study of cell division and cell differentiation most promising.

Frank McDonald, chief scientist at NASA, sees even more immediate promise for the space station in two broad areas: first, the maintenance of large space facilities such as the Hubble Space Telescope, Space Infrared Telescope Facility, the Advanced X-ray Astronomy Facility, and, possibly, new instruments such as an astrometric telescope and a space VLB interferometry antenna in low-Earth orbit; and, second, the construction of spacecraft and instruments in orbit, especially entirely new types of lightweight or containerless instruments that take advantage of the mechanical possibilities a low-gravity environment introduces. McDonald anticipates that the manned station could help bring about a mini-revolution in the design of instruments for space.

Reimar Lüst, the director general of the ESA in Paris, appears in agreement with that assessment. Speaking at a forum organized by *Die Zeit*, West Germany's leading journal of opinion and commentary, Lüst claimed that the journey to the moon liberated "unbelievable scientific and technological energies." Space also can be "a practical contribution to European integration," Lüst said, making reference to the fruitful cooperation the Europeans have achieved with the Joint European Tokamak and CERN. —ws

East German sentenced to 8 years as spy

By pleading guilty to eight counts of espionage on 21 February in US District Court in Boston, Alfred Zehe, a solid-state physicist from the University of Dresden who has been teaching since 1976 at the Autonomous University of Puebla in Mexico, made a startling decision. It even surprised his team of lawyers, headed by Harvey A. Silverglate of Boston. Silverglate denied that Zehe was cooperating with US authorities before or since confessing to spying. "There are advantages to pleading guilty," said Silverglate.

The advantages became clear on 4 April when US District Judge David S. Nelson sentenced Zehe to eight years in prison and fined him \$5000. The maximum penalty Zehe faced was four life sentences plus 40 additional years in prison and \$40 000 in fines. Judge Nelson ruled that the eight months

Zehe spent in jail after his capture and nine months Zehe has been under virtual house arrest would go toward serving the sentence. That the sentence was not as severe as the law allowed, said Nelson in court, should be attributed to the nature of Zehe's crime. No harm came to US security because the documents Zehe handled had been released by the Defense Department and FBI, said Nelson.

After Zehe's arrest in November 1983 at the Boston conference of the American Vacuum Society, he insisted he was innocent of all charges that he paid \$15 800 to a civilian electrical engineer with the US Navy for classified documents—specifically, details for an antisubmarine concept known as TASS (for Towed-Array Sonar System) and a naval communications master plan (PHYSICS TODAY, September, page

59). Since last June, when the court ordered Zehe freed on \$500 000 bail posted by the East German embassy in Washington, DC, he has pursued his scientific interests at universities in the Boston-Cambridge area.

His guilty plea came just one week before his trial was to begin. On motions to dismiss the case, Zehe's lawyers argued that US courts lacked jurisdiction because Zehe had been simply a scientific adviser to his government and the Navy documents had been transmitted in Mexico and East Germany, not on US territory. US District Judge David S. Nelson rejected both claims. Instead, in an unprecedented decision, according to Silverglate, Judge Nelson ruled Congress had intended that the espionage law of 1917 and its subsequent amendments reach beyond US territorial limits.

In sentencing Zehe, observed Nelson, he recognized that the physicist was acting in a scientific capacity, evaluating technical documents for his country. The message to East Germany and other nations in his sentence, said Nelson, is that scientists and academics should not be transmuted into spies under the pretense of doing their patriotic duty. —IG

Education

Triangle Coalition forms with wide society support

At a "round table" held at the National Press Club in Washington on 4 April, it was announced that the Triangle Coalition for Science and Technology Education now exists as a formal organization with a steering committee, more than 20 member associations or corporations, and three chairs. The chairs, representing the three major components of the Triangle Coalition, are Glenn Seaborg, university professor of chemistry at the University of California, Berkeley (science); Alice Moses, president of the National Science Teachers Association and elementary-school teacher at the University of Chicago Laboratory School (education); and Robert Forney, executive vice-president of E. I. DuPont de Nemours & Co (industry).

The member organizations in the Triangle Coalition are, at this writing: American Association for the Advancement of Science, American Association of Physics Teachers, American Geological Institute, American Institute of Biological Sciences, Apple Computers Inc, Association for the Education of Teachers in Science, American Institute of Physics, Chemical Manufacturers Association, Chevron USA Inc, Council of Chief State School Officers, Council of State Science Supervisors,

Edison Electric Institute, DuPont, Exxon Research and Engineering Company, Federation of American Societies for Experimental Biology, General Electric Co, Institute of Electrical and Electronics Engineers Inc, Junior Engineering Technical Society Inc, National Association for Research in Science Teaching, National Association of Biology Teachers, National Council of Teachers of Mathematics, National Institute for Work and Learning, National Science Teachers Association, and Standard Oil Company-Indiana (Amoco).

John Fowler, the NSTA staff member who is serving as acting director of the Triangle Coalition, is pleased by the decision of IEEE to join. For a time, it appeared that the IEEE Pyramid effort and the Triangle Coalition were addressing the same issues. Now that IEEE has joined Triangle, there may be increased cooperation (see PHYSICS TODAY, March, page 111).

It is Fowler's hope that member organizations will agree to pay some kind of dues to support Triangle activities. Fowler credits Jack Wilson, executive officer of the American Association of Physics Teachers, with having played an instrumental role in getting the Triangle off the ground. "Jack was one of the earliest supporters and AAPT was one of the first organizations to join," Fowler says. Wilson was chairman of the Triangle committee on secondary education, which was largely responsible last summer for writing the Coalition's basic agenda (see PHYSICS TODAY, November 1984, page 103), and AAPT has provided several thousand dollars to help fund Fowler's staff work. Wilson has served on the Coalition's steering committee since it was established.

The other members of the steering committee are: Joseph Blanding, United Auto Workers; Barbara E.

FOWLER



Bontemps, Chevron USA Inc; Joanne Capper, Council of Chief State School Officers; Audrey B. Champagne, AAAS; Kenneth Chapman, ACS; Joe Crosswhite, National Council of Teachers of Mathematics; Kenneth D. Fisher, FASEB; Marjorie King, National Association of Biology Teachers; Alan McClelland, E. I. DuPont de Nemours; Phyllis McGrath, General Electric; E. Joe Piel, State University of New York, Stony Brook; Walter Purdy, Edison Electric Institute; and Jack Wilson, AAPT. —ws

Education

AIP to send two observers to world Physics Olympiad

The AIP Governing Board, meeting at the AIP Woodbury facility in mid-March, decided to put up \$10 000 to send two observers to this year's International Physics Olympiad, which will take place in Yugoslavia in July. The idea for US participation originated in the APS Education Committee. Jack Wilson, AAPT executive officer, found that the American Chemical Society had decided to participate in the Olympiad after sending observers for two years. ACS spent \$40 000 to select and train a team last year and is seeking \$120 000 for this year's team.

The International Science and Mathematics Olympiads originated in the 1950s as Eastern European events. Gradually, teams from Western European countries started to take part, and, more recently, teams from the United States. An *ad hoc* group in the United States has sent a team to the Mathematics Olympiad for many years, Wilson says.

The observers for this year's Physics Olympiad are to be selected by a committee that includes Governing Board members Anthony P. French (MIT) and W. W. Havens Jr (Columbia), and AIP director H. William Koch. It is Wilson's hope that AIP eventually will support full participation by a US team in the Physics Olympiad. While US physics students are not doing well on average by international standards, Wilson points out that the US has some excellent programs and a lot of very talented budding physicists. Wilson strongly believes that participation in the Physics Olympiad would bring physics more recognition as a field, attract better students and inspire them to work harder. He concedes that many of the questions currently asked in the Physics Olympiad may reflect an antiquated approach to science instruction, but he argues that the US would be able to exert some influence on the design of the test once it becomes a full participant. —ws □