AIP CORPORATE ASSOCIATES HOLD 1991 MEETING AT GRUMMAN CORPORATION

Computer simulation and data visualization were the interconnected themes at the latest meeting of AIP's Corporate Associates, which was hosted by Grumman Corporation at its Bethpage facility on Long Island, 21–22 October. In his welcoming address, Richard Anderson, vice president and chief technical officer of Grumman, said that simulation techniques are critical at Grumman, allowing aircraft designs to be extensively tested before any metal is cut.

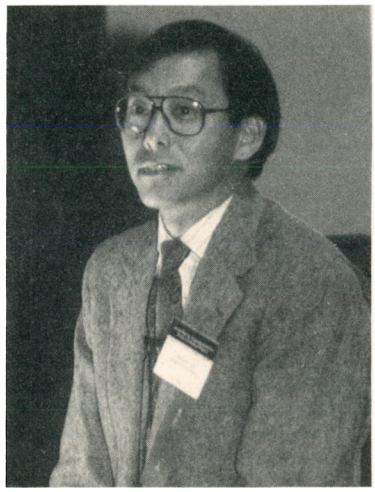
The Corporate Associates are corporations and organizations that pay dues in support of activities sponsored by the American Institute of Physics and that provide advice to AIP on the role of industry in the physics community. Each year a two-day meeting of the Corporate Associates is held, giving participants from universities, government and industry a glimpse of research and related activities in each sector. The meetings typically include talks on current policy issues, technical talks on a topic related to the host company's main research activities, more general talks addressing "frontier" topics in physics and a tour of the host's research facilities.

At a banquet marking the end of the first day of meetings, Thomas J. Kelly, president of Grumman's space-station support division, gave an after-dinner update on the controversial Space Station Freedom program. Kelly said that it would take five shuttle launches to achieve a "man-tended configuration" and eleven further launches to achieve a "permanently-manned configuration."

Commenting on the problems of maintaining public support for space programs in times of fiscal duress, Kelly said, "Support for space is a mile wide and an inch deep."

Robert Park, the American Physical Society's public affairs officer in Washington, best known perhaps for his weekly electronic bulletin, "What's New," suggested that support in the scientific community for the space station was not even as deep as Kelly had implied. Others at the dinner wanted to know which scientists, specifically, supported the space station.

"Boy, this was a tough audience!" Kelly remarked at the end.



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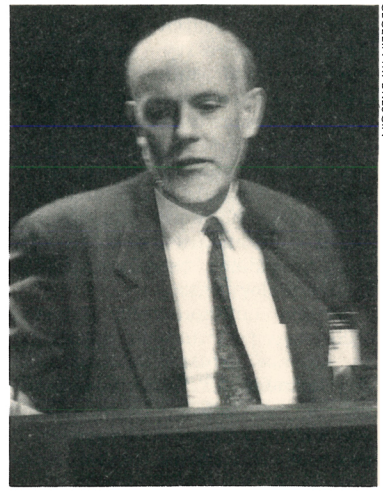

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Speakers at the Corporate Associates meeting included Stephen Chu (left) of Stanford and Richard E. Smalley (right) of Rice University. Chu described laser cooling and trapping of atoms, and Smalley spoke about the properties and potential uses of buckyballs.

Policy talks

In a session on matters of policy, J. Roger Angel of the University of Arizona spoke on lessons learned from the Hubble Space Telescope. A member of the board of inquiry established to investigate the Hubble fiasco, Angel emphasized the importance of frequently bringing together designers and builders in a project like Hubble, to raise questions at every stage of design and production.

Angel said simple "sanity checks" would have caught the error with the Hubble. He said military and corporate secrecy tended to exclude the injection of wisdom from experienced outsiders into the Hubble project.

More generally, Angel noted that projects costing much less than $1 billion, such as the Infrared Astronomical Satellite, seem to be completed rapidly and with enthusiasm, whereas larger projects in the range of $1–2 billion typically become slow and institutionalized, deadening interest in their construction. Searching for what he called a "new paradigm for space," Angel proposed substituting speed and simplicity for smallness and cheapness because, he said, space telescopes must be large and accurate to discover the "great prizes." Such instruments would complement observations from ground-based telescopes, in which adaptive optics would be used to overcome some effects of atmospheric blurring.

In another policy talk, William Harris, assistant to the director of the National Science Foundation, spoke on research, education and partnerships. Harris said industry and universities still have to find ways to work together more effectively: He noted that Japanese industry is very interested in US university research because of its high quality, and he pointed out that of the top nine patent winners in the US in 1990, five were

Japanese firms and two European.

Harris outlined various NSF programs, including a new academic research instrumentation program, through which the agency will provide up to 50% matching funds for projects in the range of $100 000 to $2 million.

Reminding his audience that education and competitiveness are currently the country's top priorities, Harris noted that the agency's education budget grew 40% last year, while its research budget increased about 10%. Still, he said, NSF provides support for nine materials research labs, 19 engineering research centers, 40 industry–university cooperative centers, eight minority research centers of excellence and 25 science and engineering technology centers.

George Uriano, director of the advanced technology program at the National Institute for Science and Technology (formerly the National Bureau of Standards), spoke on NIST initiatives aimed at strengthening the US technology base.

Uriano envisions the advanced technology program as a mechanism to enhance industry-led technology development. ATP is intended to help fill the gap between basic research and specific product development, an area where technical uncertainties discourage commercialization.

Uriano said ATP will fund up to 50% of joint ventures between a company and a university or between a company and a government agency, for periods up to five years. ATP also will provide direct support of up to $2 million for up to three years to companies, providing they agree to pay indirect costs of a project. Government agencies or universities may be subcontractors or joint-venture members.

In considering proposals, Uriano said about equal weight would be given to scientific and technical merit, expected commercial benefits, potential for technology transfer, experience and qualifications of the applicant, and the level of commitment and the structure of the applicant's organization.

Uriano said that 11 grants totaling $9.1 million were made in 1991, in response to 249 applications from companies and joint university–company groups. He said that in the next competition at least $24 million will be available. Commercial applications would be expected one to three years after a project's completion.

Simulation and visualization

In the research-oriented talks that opened the meeting, Terry Cole of the Jet Propulsion Lab discussed space-data visualization, and William Goddard of Caltech lectured on atomic-level simulation and visualization in the materials and chemical sciences. Cole showed a simulated flight over the landscape of Venus based on data from the Magellan probe. He said that 1989 was a turning point in planetary exploration, the change being from brief encounters with planets, as occurred in the Voyager mission, to extended observations by orbiting satellites such as Magellan and Galileo.

Goddard discussed applications of simulation and visualization techniques ranging from polymers and compounds, through superconductors and biotechnology, down to nanotechnology. He pointed out that the ability to analyze and conceptualize is more important than mere predictions.

The other two talks the first morning were by Grumman researchers: Alan Todd described computer simulations of resistive magnetohydrodynamics related to the Tokamak Fusion Test Reactor at Princeton University and of the beam dynamics of a photocathode gun used at Brookhaven National Lab; and Robert Melnik spoke on the promise and the reality of computational design and analysis, focusing on the problem of computing air flows around aircraft.

Laboratory tours provided opportunities to learn more about simulation and visualization at Grumman. A highlight was Grumman's flight-simulation system, which simulates all aspects of a military air mission. In the simulator itself, visitors got a virtual taste of low-level combat flying. The entire system has a modular organization, so that it can be reconfigured rapidly for a new project without incurring major startup costs.

The Grumman tour also included visits with the accelerator technology group, which works with neutral and negative ion beams; the plume phenomenology group, which does experiments on the fluid dynamics of plumes, especially those from multiple rocket nozzles; the low-speed fluid facility, which studies the flow around models; the ir detector materials lab, which makes use of a Grumman-developed 24-zone furnace (a design related to a type of furnace used on the space shuttle) to grow large semiconductor crystals; and the robotic vision laboratory, where visitors saw a system of holographic lenses and filters that can spot an object in a scene, even if the object is in contact with or partially obscured by other objects.

An alternate tour took participants to Grumman's final aircraft assembly line at Calverton and to Brookhaven National Laboratory, where visitors toured the National Synchrotron Light Source.

Physics frontiers

The final talks explored some of the frontiers of physics. Stephen Chu of Stanford University led off with a discussion of laser cooling and trapping of atoms. Such methods have cooled atoms to the microkelvin range in three dimensions and to picokelvins in one dimension. Applications include improving atomic clock precision by a factor of a thousand.

Anthony Tyson of AT&T Bell Laboratories spoke on the detection of dark matter by imaging distant faint galaxies that cover the sky. Some of these images are distorted by the gravitational lens effect, revealing the presence of clumps of intervening invisible matter.

Gordon Kino of Stanford talked on scanning optical microscopy and its application to imaging semiconductors and biological samples.

Richard E. Smalley of Rice University concluded with a talk on buckyballs, which he called "spherical benzene." He mentioned future possibilities such as what he said would be "the most perfect carbon fibers possible," buckytubes—nanometer-diameter tubes that could be made by rolling up graphite and capping each end of the resulting cylinder with half of a buckyball. He speculated that such tubes might be used like rods in a connector set to build complex nanoscale structures.

—Graham P. Collins

LEWIS, D'HEURLE RECEIVE AWARDS AT CORPORATE ASSOCIATES MEETING

Two researchers received awards at the AIP Corporate Associates Meeting banquet, which was held on 21 October at Grumman Corporation. The 1991 AIP Science Writing Award to a Scientist was presented to Harold W. Lewis of the University of California, Santa Barbara, and the Prize for Industrial Applications of Physics was given to François M. d'Heurle of IBM.

Lewis, a professor emeritus of physics at Santa Barbara, was chosen for his book *Technological Risk* (W. W. Norton, New York, 1990)—see the review, PHYSICS TODAY, September,