FUNDING

Plasma Physics Gets a Home

Plasma scientists have rushed to take advantage of a new $13 million federal program aimed at generating more basic knowledge about these ionized gases. They hope that the program, jointly sponsored by the U.S. Department of Energy (DOE) and the National Science Foundation (NSF), will reverse a decades-long pattern of viewing plasma science as "a large collection of applications" strewn across fields from fusion energy to plasma processing of semiconductors. That trend jeopardized both the basic research and its applications, according to a National Research Council (NRC) panel on opportunities in plasma science and technology, which called for "the revitalization of basic plasma science" (*Science*, 14 July 1995, p. 153).

Now, the two agencies have taken action, setting up a 3-year program called Partnership in Basic Plasma Science and Engineering that excludes proposals for fusion studies. The community's response was "overwhelming," says Barry Schneider of NSF's Division of Physics: Some 300 proposal abstracts, for 25 to 30 funding slots, were received by the 28 February deadline. "It's a little startling to us," he says.

University researchers aren't surprised. Basic plasma science has been "just bits and scraps of other programs" scattered among at least a half-dozen agencies, says John Goree of the University of Iowa. "People doing basic plasma research have had to be the tail of the application dog," adds Goree, who sent in a proposal to study the crystalline patterns spontaneously formed by dust particles as they hover in a plasma. Although the dispersion of plasma funding among agencies and the fuzzy boundary between basic and applied research make it hard to gauge existing funding, the new program should boost it by 10% to 50%.

NSF had realized that new tools for creating and probing plasmas in the laboratory, such as cheap, high-powered lasers, were opening new opportunities for understanding basic plasma physics, says C. Denise Caldwell of NSF's Division of Physics. Unifying plasma funding at the agency, she and other managers realized, could benefit everything from studies of the plasma storms called "space weather" to the superhot plasma furnaces used for incinerating toxic waste.

At the same time, DOE was also recognizing the need for a plasma science program separate from applications. The awakening came a year ago when a fusion energy advisory panel called for a restructuring of the agency's energy-research program (*Science*, 2 February 1996, p. 592). The committee recommended that DOE "redirect the program away from the expensive development path to a fusion power plant" and toward increasing "the knowledge base needed for an economically and environmentally attractive fusion-energy source."

The emphasis of the new program, say officials from both agencies, will be on university-scale research efforts by small groups and collaborations. "I think it's a very positive and focused response that addresses in many ways what [the NRC report] had recommended," says Clifford Surko, a plasma physicist at the University of California, San Diego, who co-chaired the NRC panel. Although the new program falls far short of the panel's recommendation for $15 million a year for university-scale plasma research, "this is just an excellent start," says Surko. "The key will be continuation."

But first NSF must deal with the enthusiastic response the program has generated. As Ronald McKnight of DOE's Office of Fusion Energy Sciences notes, "This large a response probably indicates some pent-up pressure."

–James Glanz

J. GOREE AND J. PIEPER/U. OF IOWA

Dusty crystal. Micrometer-diameter spheres in a plasma pick up charge, repel each other, and form an orderly array.

SPACE STATION

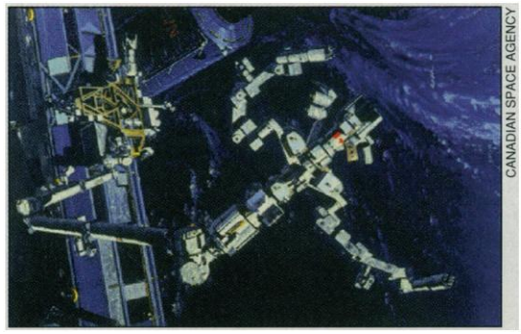
Canada Reaches Out to NASA

OTTAWA—Three years after Canada decided it could not afford to do science on the international space station, Canadian officials are hoping to broker a deal with NASA that would reopen the facility's labs to the nation's research community in exchange for making an essential piece of hardware. But some Canadian space scientists are wary of any deal. Although they would like to work in space, they fear that the Canadian government won't pay for what they want to do even if NASA lets them aboard.

Under the deal, discussed here last week during a meeting of top scientific leaders from both countries, Canada would spend a projected $150 million to manufacture the robotic hand, the Special Purpose Dexterous Manipulator (SPDM), which Canadian engineers have already designed for the station. The project, which industry strongly supports, complements the $865 million Canada is spending to build the station's main robotic arm, known as the Space Station Remote Manipulator System. Together, the two pieces will help astronauts assemble the station and carry out needed repairs and maintenance. In return, Canada wants a break on contributions to common system operating costs, which are required of all nations doing science on the station. Canadian officials estimate that a 2.7% stake in the station's research capacity is worth roughly $22 million a year.

From NASA's perspective, Canada's offer to build the robotic hand would help hold down construction costs, an important consideration for a project facing overruns (*Science*, 14 March, p. 1558). And agency officials see a way around a standing policy that capital expenditures should not be included as in-kind contributions to offset operating costs. The robotic hand is a unique apparatus, says one NASA official, adding that Canada also is willing to accept a lower stake in research capacity, 2.3%, in exchange for access.

Canadian officials say that the arrangement is necessary for the country to even think about participating in the station's scientific phase. And NASA's help may not be enough. The manufacturing cost of the hand alone "would entirely eat up" what has been budgeted for new initiatives under the Canadian Space Agency's 10-year plan, says CSA President Mac Evans. Additional government funding is needed,



CANADIAN SPACE AGENCY

Handsome deal. Canada wants its robotic hand to count toward doing science on the station.

he adds, to protect existing projects and to explore new opportunities. However, government officials say that talk of new money is unrealistic, and Industry Minister John Manley says that money to build the hand will have to come from the reserve fund for new initiatives, as well as what remains of a contingency fund for potential cost overruns in developing the robotic arm.

Speaking at a background press briefing after a meeting with U.S. presidential science advisor John Gibbons, Manley appeared optimistic that the two countries can reach an agreement on Canada's building the robotic hand. "Designing the SPDM without manufacturing it would be an unfortunate thing for a country to do," he says. "Certainly, my intention would be—if I can put the pieces of our financial puzzle together in such a way that my [Cabinet] colleagues will accept it—to proceed with manufacture of the SPDM as well."

Gibbons was equally encouraging. "We're delighted that Canada has been a steady, faithful, and extremely capable partner in the international venture," he said. "I think [an agreement] is pretty well close to being finalized."

Ironically, the possibility of scientific participation in the station has generated lukewarm interest within Canada's space science community, which was told in 1994 that science was off the table. York University physicist Ralph Nicholls, former chair of the CSA's advisory board on scientific utilization of the space station, believes the projected scientific agenda is not compelling to space and solar astronomers. The research "has been severely contracted because of budget needs in NASA, limiting the science you can do to that in a microgravity environment," he says. George Sofko, project leader at the University of Saskatchewan's Institute of Space & Atmospheric Studies, says the promise of doing science on the station will be an empty one without additional research funding. If SPDM "involves a massive drain of funds away from the scientific program, then it's counterproductive," he says.

But physical biochemist Don Brooks of the University of British Columbia, current chair of the CSA's scientific utilization committee, says life sciences and microgravity researchers would be "delighted" by a deal, if it is backed up with sufficient money to support station projects. "We need to get new people involved and fresh ideas proposed," he says. And he predicts that the response to a call for proposals—assuming the government finds a way to support science on the station—will be overwhelming. "It's funny how, when you wave a bag of money, people will come."

–Wayne Kondro

Wayne Kondro is a free-lance writer in Ottawa.

PUBLIC OUTREACH

Baltimore's Newest Tourist Attraction—Scientists

BALTIMORE—Tourists visiting this city's revamped Inner Harbor will soon have a new attraction to check out: working scientists. As they stroll through the Hall of Exploration at the recently constructed Columbus Center—surrounded by such exhibits as a 14-meter rockfish and a walk-through cell—they will be able to gaze through thick glass windows at scientists doing research in the laboratories of the University of Maryland's Center of Marine Biotechnology (COMB). Throughout the day, researchers will emerge from this living "exhibit" to give demonstrations on the museum floor. "It's not an ivory tower anymore," says the center's director, Stanley Heuisler. It is "research as theater."

With scientists under increasing pressure to interact more directly with the public, the Columbus Center is taking outreach to a new level. The $160 million facility, which opens on 3 May on a pier next to Baltimore's popular aquarium, will combine a sophisticated research facility with a science museum worthy of Disney's Magic Kingdom. In what its occupants call "the tower," about 150 COMB researchers, students, and support staff already are studying fish endocrinology, the genetics of archaeal organisms, bioremediation, and other aspects of marine science. Under the adjoining "tent"—the soaring fiberglass roof meant to evoke sails—visitors will stroll through exhibits designed in part to explain the science taking place on the other side of the windows.

COLUMBUS CENTER

Exhibit/exhibitor. Marine scientists at the Columbus Center will step out of their labs to give demonstrations to museum visitors.

Reactions to the idea have been mostly positive. "It's wonderful—and it's funny," says Marcel LaFollette, a professor of international science and technology policy at George Washington University in Washington, D.C., and the author of *Making Science Our Own: The Image of Science and Scientists in American Popular Magazines, 1910–1955*. "It's the scientists behind glass, not just their results." Still, many observers wonder how happy this marriage of museum and lab will be. COMB researchers already have become embroiled in disputes over the design of the building and its exhibits. And many are struggling to work out how to play a dual role as researcher and interpreter of science to the public. "We're not talking about going out and talking to Rotary Clubs. This is interaction on an intense basis," says COMB associate professor Allen Place.

The center concept traces its origins to a 1988 breakfast meeting in a Holiday Inn just outside Washington, D.C. Heuisler, a former editor of *Baltimore Magazine* with a long-standing interest in science education, met with two people who share many of his enthusiasms: COMB founding director Rita Colwell (a recent president of the American Association for the Advancement of Science, which publishes *Science*), and Robert Embry, the president of a foundation responsible for much of the development around Baltimore's Inner Harbor. For years, Baltimore had been wondering what to do with two parcels of property on piers 5 and 6, and, over eggs and coffee, the three came up with a plan. If the city would donate the property to a nonprofit development corporation headed by Heuisler, Colwell would work with the University of Maryland to create what she calls a "science city"—combining COMB's research facilities with teaching laboratories and exhibits.

With a small seed grant from Embry, Heuisler set about the monumental task of raising money for the building. He figured that no federal or state agency would finance such a venture and that a scientific review panel would probably scoff at such an unusual proposal. So, he went where the money was: Maryland Senator Barbara Mikulski (D), who, at the time, was chair of the Senate Appropriations Subcommittee on Veterans Affairs, Housing and Urban Development, and Independent Agencies. Attracted by the philosophy of the project and the possibility