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.

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

of spin-off companies, Mikulski helped funnel $54 million in earmarked funds into the project over several years, tacking the money onto the appropriations of several federal agencies. With a guarantee of federal money, the state and city kicked in an additional $89 million, and the nonprofit Columbus Center corporation established by Heuisler attracted another $17 million in private funds. "The federal government provide[d], to some extent, what I call venture capital," Mikulski says. "We got in where nobody else had the resources to do it."

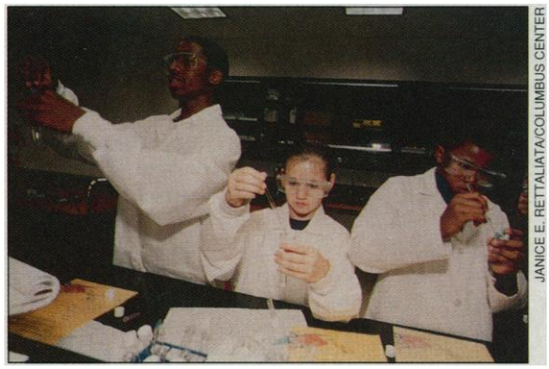
But from the very start, there were signs of tension. An initial design for the facility—by Richard Rogers, the creator of the Pompidou Center in Paris—called for passages resembling tubes for caged gerbils to thread through the labs. The idea was to give visitors a closeup view of researchers, but the intrusiveness of the plan led to its quick rejection. In the final design, only the common facilities lab, which contains showcase equipment used by all the researchers, is on the same level as the museum exhibits. To catch a glimpse of other work areas, museumgoers must crane their necks to peer through second- and third-story windows above the museum floor.

The design of the exhibits has also sparked controversy. After an extensive search, the center selected a company led by an Academy Award–winning movie and stage designer, Bran Ferren, to create the exhibits. COMB researchers have spent hundreds of hours reviewing exhibit designs and scripts and consulting with film crews making loops describing their research. But some scientists say that the designers and filmmakers have not taken their suggestions seriously. "It has been a mixed experience," says John Hind, a postdoc at the lab. Others question whether the films and the exhibits have adequately captured the research being done at the center. "A lot of microbial research is not that obvious. So, it's hard to get it both accurate and striking," says Frank Robb, the acting director of COMB. Most researchers praise the exhibits as good initial presentations but hope that some will be modified once the hall opens.

These tensions over the design of the building and exhibits reflect deeper divisions among COMB staffers. At the top level, commitment to outreach is unequivocal. "There's a quid pro quo for everything," says Heuisler. "The city, the state, and the congressional delegation have secured over $100 million to build an institution that the 49 other states would kill for. That's the quid. The quo is that there probably will be on the face of the planet few other groups of scientists who will be as visible or as accountable for establishing a dialogue with the public."

But while all the scientific staff publicly support the idea of outreach, privately some remain skeptical about the center's approach. Some of the 14 tenured, tenure-track, and research faculty at COMB say they don't know how they will find the time to participate extensively in outreach. Others are concerned that museum activities will take their students and postdocs away from research. According to one staffer, such concerns have helped open a cultural divide within COMB: "One group has wanted to make sure that good science is presented, and another has figured it [is] somebody else's problem."

Still, outreach proponents point to an activity that they say should lessen doubts about success. Since the education facilities opened 2 years ago, school and community groups have been coming to the center for field trips. Typically, the groups split their time between the center's teaching and computer labs—both of which are overseen by the center's education staff—with a half-hour interlude called "Meet the Scientist." At first, only a handful of people, mostly graduate students and postdocs, volunteered to meet with the groups—and several of them professed to be "terrified," says education director Judy Brown. So, she organized lunches with master teachers from Maryland schools to build confidence and interest, and today a core of a dozen or so researchers meet regularly with visitors. In addition, one of COMB's nontenured staff scientists, Bill Jones, is being supported by COMB to spend part of his time on outreach activities. Brown also has hired several research technicians to conduct 3-hour teaching labs with students.



JANICE E. RETTALIATA/COLUMBUS CENTER

Meet the scientist. Researchers and technicians conduct teaching labs with groups of students.

So far, none of the tenured or tenure-track faculty members has gotten directly involved with the student groups, although Brown says they contribute by working with her and by allowing their students and postdocs to volunteer. And while those engaged in the educational activities would like to see more faculty participation, they recognize that, at present, faculty members have few incentives to get involved. Says Will Straube, director of the common facilities lab, "Until the time you spend with the public goes into your promotion and tenure file ... faculty [members] aren't going to feel that they can afford to participate." Faculty members are discussing the possibility of incorporating public outreach into tenure decisions, but they feel constrained by policies governing other departments at the University of Maryland.

Many COMB researchers have worked with student groups before, but the opening of the Hall of Exploration this May represents uncharted territory. As the staff struggles to define its involvement in the hall, some are asking whether scientists are really the best people to explain science to the public. Carol Bossert, a former research geneticist who now works full-time for the Columbus Center as the director of the hall, believes they are: "It will be of greater benefit to the public if the person explaining the exhibit is a COMB scientist." She argues that all scientists should have some experience translating their work into lay terms.

Still, Bossert and others also acknowledge that there may be a role for intermediaries who understand the science but are trained in public communication as well. Colwell is working with her counterparts in other parts of the University of Maryland system to establish a graduate program in science education that would involve work at the center with schoolchildren and the public. She also is exploring whether graduate students elsewhere in the university system could serve as teaching fellows at the center, substituting work with high school students and the public for the usual experience of teaching undergraduates. "It will provide young scientists a new career track that they might not have considered but that they could enjoy very much," she says.

Even as the last few exhibits go up in the Hall of Exploration, these and other issues remain up in the air. That's not surprising, say the center's supporters, given that no one has ever tried something like this before. What is surprising, they say, is how much attention their largely untested idea is attracting. Almost every week, groups from the United States and abroad have been visiting the center to explore the possibility of setting up similar facilities. Says Heuisler: "When this is a success—well, I should say if it's a success—you're going to see a lot of these popping up."

–Steve Olson

Steve Olson is a science writer in Washington, D.C.