

Colwell Reflects on Six Years at NSF Helm

Colwell is proud of her accomplishments and passionate about her science, and she has a friendly relationship with both Republicans and Democrats.

Step into microbiologist Rita Colwell's new office at Canon US Life Sciences Inc in Arlington, Virginia, and you can trace the last six years of her career simply by studying the walls. Just inside the door is a signed photo from Al Gore, who was vice president when Colwell was appointed head of NSF six years ago. Hanging next to Gore's picture is one of former President Clinton with Colwell at an event. Across the room hangs the photo of Representative Sherwood Boehlert (R-NY), chairman of the House Committee on Science, and behind her desk is a picture of Colwell with President George W. Bush and his wife, Laura. Next to that is Paul Sarbanes, the senior Democratic senator from Maryland and a friend of Colwell's.

The photos reflect not only the Washington world of power but Colwell's ability to work both sides of the street as the staunchly bipartisan director of NSF. Colwell left her job on 21 February, a few months short of a full six-year term, to lead Canon's new effort to develop and market medical instruments in the US. She took the job, she says, because she is intrigued by the prospect of creating portable devices that will allow the genomic sequencing and identification of microorganisms "almost instantly."

The new effort ties neatly into her long history of research into cholera and allows more time to conduct and direct research through her faculty positions at the University of Maryland and at Johns Hopkins University. "What I'm doing is establishing from my many connections around the world . . . an international network monitoring global infectious diseases. I'm focusing on what I know very well, which are water-borne diseases, and that's a pretty big slice."

For the past six years, Colwell, in her role as a bureaucrat, has been a regular visitor to Capitol Hill, proposing NSF budgets that were better than most other federal science budgets but far short of what she and most of the rest of the scientific community believed was needed. A year ago, the president signed legislation calling for

the doubling of the NSF budget by fiscal year 2007. Despite the promises, the money hasn't come.

But in a 29 April interview with *PHYSICS TODAY*, Colwell was critical of almost no one in the federal government. Even when asked about the recent Union of Concerned Scientists report accusing the Bush administration of manipulating science to fit policy (see *PHYSICS TODAY*, April 2004, page 30), Colwell said simply, "I don't want to go there."

She did note that neither Bush nor Clinton ever asked her to tilt science to fit policy goals. "In my six years at NSF . . . no program was ever forced on us, nor was any program eliminated," she said. "I worked very closely with the OMB [Office of Management and Budget] and the White House and there were never surprises. There was no difference [between Clinton's treatment and Bush's] for me as director."

Colwell clearly enjoys both science and public policy, and she spoke of zooplankton in the Bay of Bengal, physics funding, postdoc stipends, copepods, and her relationships with Republicans and Democrats, all with equal enthusiasm.

PT: You speak of doing science, especially your research on cholera, with great passion. Is there a sense of relief in leaving the government to return to science?

COLWELL: I've had an extraordinary time in Washington. I don't feel exhilaration at being out, nor do I feel regret or nostalgia about being out.

I was passionate about the National Science Foundation. It is the very best agency in the entire federal government. I believe fervently, passionately, in the value of fundamental research in physics, chemistry, mathematics, in biocomplexity . . . and in the social behavioral sciences. And I'm proud of providing initiatives that brought more than a billion dollars into computational sciences and engineering.

In physics, I wish I could have done more. I'm excited about what is happening in physics, and cosmology, and astronomy. But it always [involved]

balancing the budget, and it was so painful. The budget [currently about \$5.6 billion] really should be the \$19 billion that we helped the [National Science Board] work out.

PT: You have recently been on the hill defending a budget proposal that was well below the amount needed to reach the five-year budget-doubling goal Congress and the president approved for NSF a year ago. How does that process work?

COLWELL: I don't want to be Pollyanna and I don't want to be a carper. My relationship with the OMB was extraordinarily good. [Former OMB Director] Mitch Daniels was someone in particular with whom I got along extremely well. We understood each other. He was very, very supportive. So the White House and the budget office were terrific. The hill was great, too. Sherry [Boehlert] is someone who really, really understands science and engineering and the need for the country. . . . And he carries the message very well.

I think what breaks down is working with [congressional] staffers who don't really understand the complexity. They think they do, but they don't. Some of the hill staffers, they have an arrogance that they are somehow the senators or representatives, and not their staff. And they don't understand how hard NSF staff works and that what we present in our budgets has been vetted over and over again internally, and by OMB, and by the [science] board. They have an—and I have to use the word arrogance—in thinking that they know more than everyone else.

PT: You occasionally got grief on Capitol Hill because you were reluctant to provide a ranked list of scientific priorities for lawmakers. Why were you reluctant?

COLWELL: They [Senate and House staff members] don't understand how science works. You have to balance some enormous priorities. How do you balance ALMA [Atacama Large Millimeter Array] against EarthScope, against a neutrino capturing system? They're all important. You can't say one should have priority over another.

You've got to have a bouquet of the science and engineering that the country needs, and I can't say one is more important than the other be-

cause they are integrated. What physicists do is important for biologists. The discoveries of biology are important for physics. How do you pull that apart? You don't. What you need to do is glue it together and that is why I liked so much the initiatives that brought the computer scientists and physicists, the mathematicians, the biologists, the engineers, and the social scientists together.

PT: When you wanted to promote your programs and budget within the government, how did you go about it? Especially given the highly partisan nature of the current government?

COLWELL: I've enjoyed and maintained good relationships with both sides of the aisle. I found wonderful supporters of science in Kit Bond [Sen. Christopher Bond (R-MO)] and even Trent Lott [Republican senator from Mississippi]. Dennis Hastert [Illinois Republican speaker of the House] has been terrific to work with. Ted Kennedy [Democratic senator from Massachusetts] is good to work with, as is Barbara Mikulski [Democratic senator from Maryland].

I hope it doesn't surprise everybody, but Newt Gingrich [a former speaker of the House] is a wonderful supporter of science and engineering. I admire what he does for science and engineering. He gets it in a big way.

I have found that party makes no difference. It is the understanding of the power of science and engineering that cuts across party lines, that suffuses through the White House and the OMB.

PT: There is tension between the administration and many in the science community. What should the science community do to better understand how the federal government works?

COLWELL: The science community has emerged from its cocoon in the past six years. My message to scientists [in convening the Coalition for National Science Funding] was to speak for the NSF in a very loud, clear voice. Don't go up to the hill and speak like a gaggle of ducks pecking away for your piece of corn, because you'll be thrown just that piece of corn.

PT: What was the impact on NSF of the September 11th terrorist attacks?

COLWELL: I was very proud of the fact that within hours, days, it was the National Science Foundation that sent scientists and engineers to ground zero. The engineers who studied the rubble, who studied the

twisted steel, who produced the computer analyses, they were NSF-funded engineers. The robots that went in because the pole-attached cameras couldn't do the job, those were DARPA- [Defense Advanced Research Projects Agency] and NSF-funded robots. The social and behavioral scientists who went in to ground zero to determine, within weeks after the attack, the economic effects and the social devastation, they were NSF funded through small grants for exploratory research.

The sequencing of anthrax [following the fall 2001 anthrax attacks in Washington, DC, and Florida] happened because NSF could move quickly. Within days we were able to



Rita Colwell at the South Pole with Congressman Nick Smith (R-MI), a member of the House Science Committee.

respond to a proposal to sequence the anthrax, and that is a string we continue to fund with other agencies. And it is fundamental research that made it possible to succeed so well in Iraq, in the first days of the war. It was NSF and DARPA funding the basic, fundamental research that allowed precision direction of our weaponry.

PT: The scientific community regularly does reports on what science projects need support, then sends scientists to Washington to lobby for that support. The results are mixed. Is there a disconnect between the science community and how politics works in Washington?

COLWELL: Yes. I don't think it is understood how complex it is to get a science budget out and funded. I think my 10 years working very closely with the state legislature in Annapolis [while president of the University of Maryland Biotechnology Institute]

helped me. I learned that people who are politicians are really good people, fundamentally. They want to do the right thing for the country. But you have to spend time with them explaining what science and engineering is all about, and what it does for the community.

We need to spend more time making sure that our congresspeople locally go to the science facilities in their districts. Politics are local. I think that going to the hill [to seek support] is the last stage.

It is all of this early-stage work that we don't do very effectively as scientists. The federal government representatives . . . should be as familiar with what's going on in their state in science and engineering as they are with the other kinds of activities for which they are heavily lobbied.

PT: Do you think politicians, with some notable exceptions, share the fear of science that is common in our society?

COLWELL: Yes, but you can overcome that very quickly. One of my very good friends is Governor [William Donald] Schaefer [a Democrat and former governor (1987–95), and now comptroller, of Maryland]. When I was working with him to get funded some facilities for biotechnology research in Maryland, I took the time to show him how DNA was made. I didn't run him through a three-day session, but he actually saw DNA. We lysed some cells and we spooled it and you could see DNA.

That didn't turn him into a biotechnologist or a molecular biologist, but you could then explain to him usefully the connection between this stuff on a glass rod and how you could decode it and do various things to improve health.

When I was president of the biotech institute, I had four centers, and one of the center directors said to me, when I asked him to come to Annapolis and explain what he was doing to the legislature, "Well, they have to give us the money. We're doing very good science." I said, "That's true, but you've got to put it in terms that they understand, in terms of economic value and potential jobs down the road."

PT: One of the more successful NSF programs has been the Math and Science Partnership. The administration proposed in this year's budget moving the program out of NSF and into the Department of Education. Congress has made clear that isn't going to

happen, but where does an idea like that come from?

COLWELL: I think it comes from the philosophy that states can do [the program] in block grants. We at NSF know that our approach works very effectively and that it's critical for scientists and engineers who are practicing science and engineering to be the role models in the classrooms.

PT: That seems obvious. So where did the idea to shift the science program to the Department of Education originate?

COLWELL: It's because we have allowed a chasm to develop in transferring what we have learned in the cognitive sciences into the classroom. When you look at transportation in 1900, it was the horse and buggy. In

2004, it's the space shuttle. You look at medicine. If you had diabetes in 1900 you just got treated palliatively and you died early. Now you're talking about almost being close to . . . correcting the insulin-errant metabolism. You look at the classroom in 1900, 1950, and 2004, and it has not changed at the elementary or high-school level. We need to bring the science of learning and understanding into the classroom—along with other obvious things, like having science teachers who majored in science.

PT: You left NSF early, a little short of the full six-year term. Was that because of the opportunity at Canon?

COLWELL: It wasn't early—well, only a few months. I had shepherded the '04 budget through OMB, Congress,

and it had been signed by the president. I had negotiated the '05 budget and received White House approval for it. From what I had learned from Congress, we were going to do as well as we could, so it was a good time to leave, on a very good high. And I had accomplished my management objectives. NSF is, as Mitch Daniels said, and I agree with him, the best-managed agency in Washington.

PT: Would you ever return to a government post—say, as director of the Office of Science and Technology Policy?

COLWELL: I will always salute and serve my country. But right now I'm having the time of my life. I hope the community has been happy with my term.

Jim Dawson

Scholars Probe Nanotechnology's Promise and Its Potential Problems

With a revolution in everything from toys to tumors on the horizon, scientists in the nanotechnology arena are working to gain the public's trust.

Hoping to both anticipate pitfalls and head off a publicity fiasco, policymakers and scientists are promoting research and public discussion on

environmental, ethical, economic, and other societal implications of the burgeoning field of nanotechnology.

Loosely defined as the purposeful

creation of structures 100 nanometers in size or smaller, nanotechnology "is a real revolution because it is changing in a fundamental way how we build things," says Mihail Roco, who chairs the White House subcommittee that coordinates the multiagency National Nanotechnology Initiative (NNI).