

NATIONAL SCIENCE FOUNDATION

Lane Holds to the Middle in Debate Over NSF's Future

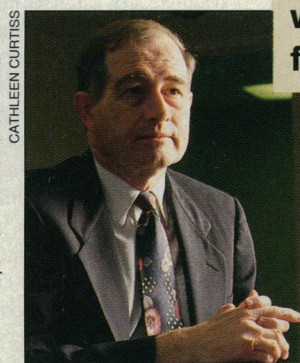
While officials in the Clinton Administration, members of Congress, and policy wonks are warning academic researchers to pay more heed to national objectives or risk losing federal support, the new director of the National Science Foundation (NSF) is saying things that will soothe scientists' frazzled nerves. "My bias from my upbringing," Clinton appointee Neal Lane told *Science* editors during a recent 90-minute lunch at the magazine's offices in Washington, D.C., "is toward individual investigators working in the laboratory with a small number of students and post-docs. I think that's the mode in which one has the most freedom to explore and the most control... over how the time is invested." Better yet, Lane argued that "many in the Congress remain very supportive of what we're doing.... I believe there is an understanding of the important role for basic study."

Unfortunately, that's only half of Lane's message. The Rice University theoretical atomic physicist and later provost also made clear to *Science* that he's well aware of the politics of his new job: "It is getting increasingly hard [for Congress] to support the types of things we do in fundamental science and engineering," he said, "because of the problems the nation faces—jobs, the economy, health care, and the overall state of the world. These things are on the minds of legislators, so they're asking tough questions." He paused, then added: "As they should be." And that's not all. "Congress," Lane noted, "is saying, 'Okay. Show us. Tell us. What have you researchers done for us?' I think that's the question being asked, and in the aggregate, it's not an unreasonable question."

Mixed message? It's a modern-day political reality that NSF (and, for that matter, the National Institutes of Health) is being whipsawed by conflicting agendas. When Lane abandoned his 25-year relationship with Rice—and accepted a 50% cut in pay—to come to Washington, he knew the challenge before him: The 50-year arrangement between the federal government and academia to fund basic research on campus would have to be modified to keep up with the times. But so far this 55-year-old, soft-

spoken guardian of what is now a \$3 billion a year agency is keeping his cards close to his vest. Should NSF change the way it supports academic research? Are more centers the answer? Does NSF need to realign its internal structure to make its mission

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clearer to the outside world? How large can it grow before it risks losing touch with working scientists? Good questions, but Lane won't say.

Once it was easier to make snap judgments about NSF's leadership. Former NSF Director Erich Bloch, who completed his 6-year term in 1990, was outspoken and blunt about his goals and strategies. He created a network of engineering research centers despite strong criticism that they would weaken support for individual investigators, and he convinced the White House to request a doubling of NSF's budget within 5 years in return for the agency's taking a central role in a half-dozen initiatives aimed at moving the nation ahead in such applied areas as advanced manufacturing and high-performance computing. Lane's agenda, *Science* learned, will be much more opaque.

"I think there's no inconsistency in saying we have a high priority in global change research [one of the cross-agency initiatives] and in saying that we want to have world leadership in fundamental science and engineering," Lane explained. "It doesn't help the astronomer much, but it would not be fair to say that it's inconsistent with supporting the best funda-

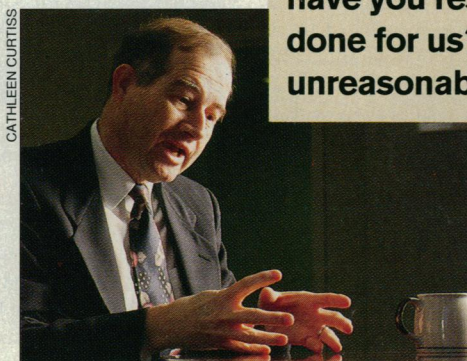
mental science. It's just the fundamental science in that particular area of national need. Is that clear? I want to be sure that I'm as clear as I can be on that."

Three months into his reign at NSF, Lane seems to be trying hard not to offend any of NSF's constituencies. Asked to explain NSF's evolution by comparing current funding practices with what was funded during his brief stint 15 years ago as director of the physics division, Lane began by talking about the similarities. "What hasn't changed in all these years," he said, "is that researchers mentioned... in a published article or a proposal or a project report, that [their work would be] good for something down the road. There wasn't any pressure on NSF to worry very much about possible applications."

But what followed may leave many scientists wondering if the rules have indeed changed. "Today, there are areas of research where [NSF is] thinking about the ultimate impact of this research. In high-performance computing, for example, we still try to support the best people who come to us for funding in an area. But now we're also being asked to pay attention to knowledge that will help us solve one or another current problems in communications, and to report it as a success of the program itself."

Lane also equivocated on two perennial issues for NSF: the proper balance between funding individual and small teams of investigators and supporting large centers with dozens of scientists, and the relative importance of science education. Asked to rank the value of both types of research, Lane patiently explained how each serves a vital func-

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tion. (For the record, NSF plans to create three to four new engineering research centers this year, bringing the total to 22, but its 1995 budget request includes

no money for either new engineering centers or the more fundamental science and technology centers, of which there are now 25.)

As for complaints that the rapid growth of the science education directorate has come at the expense of the research disciplines, Lane said he doesn't fault Congress for pouring more money into precollege

education. "It's hard to find a more serious problem," he says. "If NSF can make a significant impact, then I'd have to vote for that." At the same time, NSF's proposed 1995 budget would increase research at three times the rate of education, with Lane making a point of saying that it's time for NSF to evaluate how it's spending its \$570 million education budget.

With Lane so hard to pin down, *Science* decided to ask him how he would like to be evaluated after spending a few years as director. But his answer provides few concrete criteria for either critics or supporters to use: "I think the question that I would ask is

whether NSF continues to support the best ideas and the best people adequately, so that research discoveries continue to get made," he said. "I would ask if the NSF still provides the facilities or access to facilities someplace else in the world. I would want to know if the NSF is still carrying out its mission of supporting the creation of fundamental knowledge and supporting the Administration's priorities, and not lowering its standards in making decisions on how to invest these funds." He stopped, then added, "How do you measure all that? I don't know."

Considering the political land mines that former NIH Director Bernadine Healy

touched off with blunt language about her thoughts and goals, perhaps Lane's determination to avoid being pinned down will better serve NSF in the long run. And considering the Clinton team's emphasis on harnessing science to solve national problems, Lane can hardly ignore the subject. Next month he will begin his first round of appearances before the congressional panels that set his budget. Those presentations may offer scientists the first chance to judge for themselves whether Lane's tendency to walk softly and look in all directions before proceeding is indeed the best strategy for NSF.

—Jeffrey Mervis

ECOLOGY

Phosphorus Fingered as Coral Killer

Ever since Charles Darwin looked over the side of the *HMS Beagle* and noticed the apparent paradox of a thriving coral reef only meters away from clear, lifeless water, scientists have been fascinated by the way reefs flourish in waters virtually free of nutrients—lush oases in blue deserts. But this anomaly also makes reefs vulnerable: Supply more nutrients and the delicate balance of the reef's multitude of constituent organisms can be disrupted. Excess nutrients can create an algal "jungle," blocking sunlight from the coral and depriving it of oxygen, a process known as eutrophication. The reefs are left brittle and stunted.

Reef researchers across the globe are concerned that this may already be happening on a large scale. Sewage from cities and run-off from agricultural land carrying fertilizers can dump large amounts of nitrates and phosphates into coastal seas, threatening nearby reefs. Now, in a unique experiment on the world's largest reef system, Australia's Great Barrier Reef (GBR), a team of Australian researchers is trying to quantify the effect by carefully exposing isolated areas of reef to high concentrations of nutrients. The experiment has been running for only 5 months, but preliminary results suggest that excess phosphorus may be the biggest threat—a finding that, if confirmed, would have widespread implications for sewage treatment and agricultural practices.

The GBR is particularly threatened by the rapid population growth on the nearby coast of Queensland. A recent study calculated that 15 million tonnes of sediment, 77,000 tonnes of nitrogen, and 11,000 tonnes of phosphorus are discharged along the Queensland coast every year. Before Europeans settled the area, the amounts are thought to have been one-quarter of this.

Studies in the 1970s that exposed reefs to excess nitrogen and phosphorus for 8 months showed that both enhanced growth of a reef community by 25% but inhibited

calcification of the reef by more than 50%. Last September, the Great Barrier Reef Marine Park Authority initiated the new \$600,000 study, called ENCORE (Effect of Nutrient Enrichment on Coral Reefs) to extend those old findings. According to Sydney University biologist Tony Larkum, who heads the research team: "Apart from anecdotal evidence that 'reefs ain't what they used to be,' there is scant scientific evidence of coral reef degradation on the GBR

The project is based at One Tree Island, 70 kilometers offshore on the southern Great Barrier Reef. The team chose the site because its high-rimmed lagoon contains many micro-atolls, small circular patches of reef like swimming pools about 220 meters across. At low tide, these pools are isolated from the main lagoon for about 5 hours and so become perfect test sites.

The team sited nine floating robots in the water alongside 12 micro-atolls. Shortly before each low tide, a base station on the island sends a radio signal to each robot. An onboard computer then triggers the discharge of a measured quantity of solution—nitrogen (in the form of ammonium chloride), phosphorus (potassium dihydrogen phosphate), a mixture of the two, or a control—into the micro-atolls. Nutrient concentrations are raised to 10 times those currently found on the GBR.

Although the experiment has barely begun, some changes to the coral are already becoming apparent. The team has found that both nitrogen and phosphorus stimulate algal growth but, importantly, phosphorus treatment alone inhibits calcification. Reef expert Amatzia Genin of the Hebrew University at Eilat in Israel says he believes that this differentiation between the nutrients has not been observed before. If these early results hold up, phosphate-rich fertilizers and sewage will be unambiguously exposed as a major threat to the world's coral reefs. Says reef scientist Zvy Dubinsky of Bar Ilan University in Israel: "Unless something is done to prevent runoffs, coral reefs will disappear, or will only survive well away from humans."

—Maria Burke

Maria Burke is a science journalist based in London.



Too much of a good thing. ENCORE's robot dispenses excess nutrient to the Great Barrier Reef.

that can be unambiguously attributed to eutrophication. That's what makes ENCORE unique—it's being undertaken before the effects of eutrophication have been clearly demonstrated on the GBR."

Other countries, most notably the United States, are also studying reefs but on the whole, according to marine scientist Marlin Atkinson of the University of Hawaii, U.S. researchers are focusing on how reef organisms take up nutrients, rather than on the effects of excess nutrients as ENCORE is doing. Atkinson says the size, scope, and unique reef environment of ENCORE set it apart.