Counting On Science at EPA

William Reilly is trying to give science a bigger role in EPA policy and wants to focus on the worst environmental problems, not just the most visible. It may be an uphill struggle

WILLIAM REILLY, THE ADMINISTRATOR of the Environmental Protection Agency, and his top advisers are plotting a quiet revolution. They have embarked on a process that could fundamentally change the way EPA does business: an attempt to focus the agency's resources on the environmental problems that pose the biggest risks rather than those that have attracted the most political attention. "It's an effort to inject science more prominently into the policy process," says Hank Habicht, deputy administrator of the agency and Reilly's right-hand man.

That may not sound revolutionary, but Reilly is trying to reverse nearly 20 years of piecemeal environmental policy-making. Congress, reflecting public concerns, has written numerous laws instructing EPA to deal with individual environmental problems—hazardous waste one year, toxic substances or pesticides another, and medical wastes still another. The result: EPA's budget and priorities have been shaped more by "what the last phone call from Capitol Hill or the last public opinion poll had to say" than by a scientific assessment of risk, says Frederick Allen of EPA's office of policy analysis.

Now, Reilly has asked his Scientific Advisory Board to tell him which problems pose the biggest environmental or public health threats. The board's analysis, a draft of which has been obtained by *Science*, reveals that the environmental problems that dominate public concerns—and EPA's budget—are often not those that Reilly's scientific advisers deem the biggest threats (see table below). Radon and climate change, for example, are at the top of the list for EPA but near the bottom in the public's view.

But turning the agency around would be no mean feat, and even within EPA, opinion is divided on whether Reilly can pull it off. Without question, he starts with several strikes against him. For one thing, the EPA administrator has very little discretion in allocating funds: most of the agency's budget is needed just to implement the major environmental laws, like Superfund, already on the books. And for another, Reilly faces inertia from within EPA, a bureaucracy that has a vested interest in maintaining the status quo. And then there is the public, which EPA is beholden to, whether or not it agrees with the latest scientific study. Reilly's new effort is "laudable," says Richard Morgenstern, director of the office of policy analysis and an old hand at EPA. "I am bullish on it. But I wouldn't bet the store on it."

But Terry Davies, assistant administrator for policy, planning and evaluation and one of the architects of the new plan, voices no doubts. "We're already doing it," he exclaims. "We are changing the way the agency thinks." But not even the optimists expect major shifts overnight. Deputy administrator Habicht, for instance, talks about "a rapid evolutionary change, not a revolutionary one," but he is convinced that it will be a different agency—if they can pull it off.

The new effort actually had its origins before Reilly came to EPA, in a much discussed 1987 report, *Unfinished Business*. In that tome, EPA staff tried, for the first time, to take a broad look at all the environmental problems the agency deals with and figure out which pose the greatest risk to human health and the environment. Risk ranking, per se, was nothing new—people often ranked one air pollutant against another, for example. And EPA had even attempted to rank the cancer risks within small geographic areas, like Philadelphia and Silicon Valley. But this was different: it was an attempt to look at toxic air pollutants versus pesticides versus global warming.

The task proved to be a methodological nightmare, given the paltry data, uncertain techniques, and value-laden questions such as how to rank loss of wetlands against, say, visibility degradation. But Morgenstern, who directed the study, and 75 senior staff plunged in nonetheless, using whatever data they could muster and falling back on pro-

EPA's Top 11 (not in rank order)	Public Concerns (% rating "very serious")
Ecological Risks	1. Active hazardous waste sites (67%)
Global climate change	2. Abandoned hazardous waste sites (65%)
Stratospheric ozone depletion	3. Water pollution from industrial wastes (63%)
Habitat alteration	4. Occupational exposure to toxic chemicals (63%)
Species extinction and biodiversity loss	5. Oil spills (60%)
	6. Destruction of the ozone layer (60%)
Health Risks	7. Nuclear power plant accidents (60%)
Criteria air pollutants (e.g. smog)	8. Industrial accidents releasing pollutants (58%)
Toxic air pollutants (e.g. benzene)	9. Radiation from radioactive wastes (58%)
Radon	10. Air pollution from factories (56%)
Indoor air pollution	11. Leaking underground storage tanks (55%)
Drinking water contamination	12. Coastal water contamination (54%)
Occupational exposure to chemicals	13. Solid waste and litter (53%)
Application of pesticides	14. Pesticide risks to farm workers (52%)
Stratospheric ozone depletion	15. Water pollution from agricultural runoff (51%)
	16. Water pollution from sewage plants (50%)
	17. Air pollution from vehicles (50%)
	18. Pesticide residues in foods (49%)
	19. Greenhouse effect (48%)
	20. Drinking water contamination (46%)
	21. Destruction of wetlands (42%)
	22. Acid rain (40%)
	23. Water pollution from city runoff (35%)
	24. Nonhazardous waste sites (31%)
	25. Biotechnology (30%)
	26. Indoor air pollution (22%)
	27. Radiation from x-rays (21%)
	28. Radon in homes (17%)
	29. Radiation from microwave ovens (13%)

Scientists and the public draw different conclusions about the seriousness of various environmental problems. Above: the worst environmental problems, as identified by EPA's Scientific Advisory Board. Right: the public's top concerns, as reflected in a March 1990 Roper Poll. (Figures in parentheses are the percentages that rated each problem "very serious;" highlighted items also appear on EPA's list.)

fessional judgment when they couldn't. They ended up with a list of 31 problems, essentially in rank order. To their credit, they never pretended scientific rigor; they never claimed, for instance, that problem number 2 was definitely worse than problem 3, but said that it was certainly worse than 13, and 13 in turn was worse than 26.

Their list showed that the old assumptions were wrong. Many of the things that the public was most concerned about—and that EPA was devoting vast resources to—like hazardous waste and underground storage tanks, posed relatively small risks, while the biggest problems, like radon and climate change, were being virtually ignored. In 1987 the agency was spending several billion dollars for waste cleanup, for example, as opposed to several million for indoor air pollution and climate change.

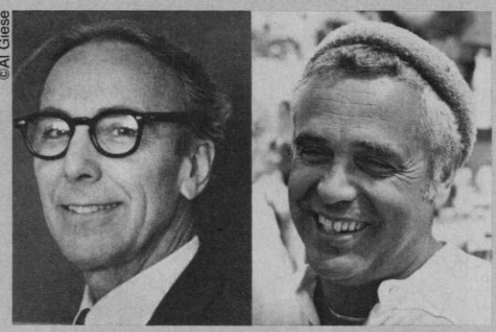
"*Unfinished Business* revolutionized how people thought," says Jonathan Lash, a former environmental activist with the Natural Resources Defense Council who is now the secretary of natural resources in Vermont.

But while *Unfinished Business* may have changed thinking, it didn't change practice much at EPA, mostly because "you don't turn a tanker on a dime," says Morgenstern. Its impact was also limited by the fact that many in the agency saw the study as an "unscientific" first cut—not the kind of hard analysis on which to force a change in environmental policy.

But the study did influence Reilly. Soon after he was appointed but before he was confirmed as EPA administrator, Reilly was sitting around the World Wildlife Fund/Conservation Foundation headquarters with his colleagues, including Terry Davies and Dan Beardsley, a deputy assistant administrator for policy at EPA who was then on loan to the conservation group, talking about what he should do at EPA, and how. All were frustrated with the "chemical of the

Ranking the Risks Proves Contentious

If the deliberations of EPA's Scientific Advisory Board committee are any indication, then ranking environmental risks, as William Reilly is proposing to do, will not be easy. Indeed, the committee members almost came to academic blows over just how far they were willing to go on admittedly squishy data. The scientists fell out basically along subcommittee lines, with the ecological group taking a bolder or more foolhardy stance, depending on your perspective. But this says as much, if not more, about the personalities of the two subcommittee chairmen as it does about the nature of the problems they were wrestling with.



Bold and cautious. *William Cooper (right) was willing to rank problems, but Arthur Upton wasn't.*

William Cooper, an ecologist at Michigan State who headed the subcommittee looking into ecological effects, dove right in. His group discarded the methodology of the earlier report, *Unfinished Business*, as unscientific and divided up the universe in a new way, and then promptly ranked the problems. His group came up with a complex set of matrices for evaluating risk, but the bottom line, says Cooper, is that problems are worse if they affect a broad area and have a long "time horizon"—in Cooper's words, a measure of how long it takes, once you shut off the stress, for the ecosystem to recover. According to their new scheme, global climate change and stratospheric ozone depletion came out way on top, as they did in *Unfinished Business*, and so did two other problems the earlier committee did not even consider: habitat alteration and destruction, such as deforestation, and species extinction and loss of biodiversity. Second rank, or relatively high ecological risks, were airborne toxics, toxics in surface water, and pesticides and herbicides.

While Cooper's group bulldozed through the uncertainties, a subcommittee on health effects, headed by Arthur Upton of the Institute for Environmental Medicine at New York University Medical Center, got bogged down early on in the problems of missing data and inconsistent assumptions. The upshot was they declined to rank anything. "It was not scientifically feasible. It was more than a committee of scientists could do on a part-time basis over a few months," says Upton, especially since they were given the unenviable task of somehow combining cancer and noncancer risks. Instead, they laid out in great detail how one would go about ranking risks in a scientifically defensible way, if one had the time and money to do so. And central to that, they say, is separating out individual agents, like lead, instead of lumping it in with other "criteria air pollutants."

Their cautious stance was immensely frustrating to some committee members, like Jonathan Lash, secretary of natural resources in Vermont, and Fred Hansen of Oregon's Department of Environmental Quality, who pointed out that EPA and state agencies do not have the luxury of waiting for the definitive study but have to make decisions now. But Upton sticks to his guns. "In many cases, we simply don't have the data, either on human exposure to various agents or their toxicity." Upton recently chaired the National Academy of Sciences report, known as BIER V, which wrestled over the effects of ionizing radiation. "When you turn to chemicals, the information is even more incomplete," says Upton. "Unless one gets more data, these assessments will remain highly uncertain. Sure, one can rank risks, but the confidence one has in the rankings will not be great." And though Upton thinks comparative risk assessment is a good tool for setting priorities, he cautions that "you can carry it to absurd extremes."

The committee reached a compromise of sorts, with Upton's group identifying seven problems that would rank high by almost any reckoning: criteria air pollutants (for example, smog), toxic air pollutants (for example, benzene), radon, other indoor air pollutants, drinking water, worker exposure to chemicals, and worker application of pesticides. And though the data were "less robust," they threw in stratospheric ozone depletion as well, because it looms so large compared with other problems. For all of these high-risk problems, the common denominator was direct exposure, says Upton, not something passed up through the food chain.

Upton cautions that this is not the final word; other problems—such as pesticide residues in food or exposure to consumer products, which were described as high risk in the earlier report—might also rank high if more data were available. But until they are, Upton's committee has "no problem" with Reilly giving extra attention to the seven they have identified. ■ L.R.

month" phenomenon and the sense that EPA was not spending its money as wisely as it could, recalls Davies. They wanted to find a way to focus the agency's resources where they would get the biggest payoff—which means, as Davies says, factoring in not only how risky a problem is but how feasible and costly the various "fixes" are.

They decided upon a two-part strategy: take another look at *Unfinished Business* and the whole issue of comparative risk; and at the same time, get the senior managers at EPA to start thinking about what actions would have the biggest payoff in terms of reducing the most significant problems.

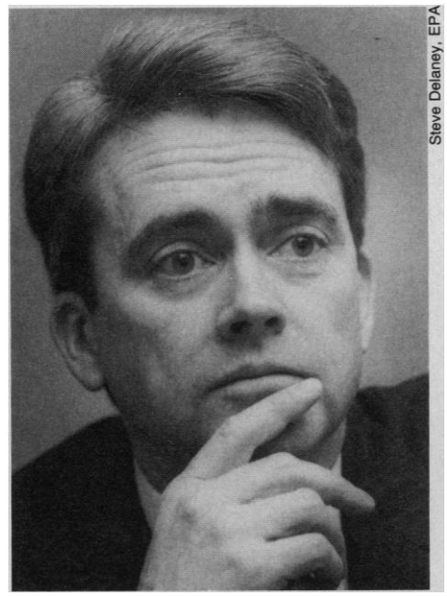
Reilly wasted little time. Soon after he arrived at EPA he asked the agency's Scientific Advisory Board (SAB) to essentially peer review *Unfinished Business*—to go over the data again, see whether they agreed with the methodology and rankings, and, if not, to come up with their own. The board set up a committee of 45 experts, mainly scientists but a few people from state government as well, like Vermont's Jonathan Lash and Fred Hansen, director of Oregon's Department of Environmental Quality, to keep the effort focused on political reality. Lash and Raymond Loehr, an environmental engineer at the University of Texas, Austin, cochair the committee.

That committee, in turn, divided itself into three subcommittees: one headed by William Cooper, an ecologist at Michigan State University, to look at ecological, economic, and aesthetic effects; another, headed by Arthur Upton, director of the Institute for Environmental Medicine at New York University Medical Center, to look at health risks; and a third, chaired by Alvin Alm, director and senior vice president of Science Applications International and a former deputy administrator of EPA under William Ruckelshaus, to look at strategies for reducing the major risks.

The SAB committee spent more than a year sifting through studies, all the while bemoaning the scanty data and uncertain analytical techniques, which make accurately characterizing a risk, much less ranking it against another, a tenuous business at best. Though they applauded *Unfinished Business* for its pioneering work, the committee had lots of problems with it, from the fact that the EPA staff had divided up the universe into problem areas that essentially reflect the agency's existing programs—which "makes no damn scientific sense," says Cooper—to some of its conclusions, which they call "provisional."

But for all their complaints, the SAB committee concluded that *Unfinished Business* was not that far off in its conclusions. Most of the "baddies" identified in the report—like climate change, stratospheric ozone depletion, air pollution, and radon—still looked bad. The earlier group had, however, overlooked a couple of big ones, habitat destruction and species extinction, which the SAB committee added. And once again, the things the public cares the most about, like hazardous waste, ended up in the middle or at the bottom of the heap.

Not everyone in the group, however, was willing to follow their predecessors out onto a scientific limb and actually rank the problems. Cooper's ecological effects group was perfectly willing to rank them, but Upton's health effects group wasn't, which led to some tussles on the committee (box, p. 617). In the end, they agreed to simply list the 11 problems that everyone agreed were high risk—with the caveat that this is not an inclusive list.



Steve Delaney, EPA

Focusing on risk. *If William Reilly has his way, EPA will spend its money differently.*

Some of these problems, like the loss of biodiversity, do not fit handily into EPA's statutory mandate, but the committee urged EPA to exert leadership anyway. The committee also urged EPA to give greater weight to ecological risks, which they say have been given short shrift while EPA has concentrated on combating pollutants that pose a threat to public health. And perhaps most important, in terms of the agency's overall direction, the SAB committee gave its scientific seal of approval to comparative risk assessment, flawed as it is, as the best way to set priorities. They recommended that EPA set up a permanent process for comparing risks and then make its policy and budgetary decisions, as much as possible, on the basis of those risks. And, they said, EPA should move beyond the conventional "end-of-the-pipe" approaches and use alternatives, such as pollution prevention and market incentives.

The committee's final report will go to Reilly in late September. At this stage, it is not at all clear how the public and the environmental community will receive it because in the Reagan era, at least, "setting priorities was a euphemism for cutting," says Jonathan Lash. "I don't see that happening here," he adds.

But Reilly and his aides have already embraced the report; in fact, they are using it in shaping the agency's 1992 budget. Their problem, of course, is that 80% of the budget is essentially cast in stone, estimates Dan Beardsley of the policy office. EPA must spend these dollars implementing the laws, paying salaries and rent, and so on. The administrator technically has discretion over perhaps 15% of the budget, but in reality, that too is sacrosanct. "You would be out of your political mind to exercise it," says Beardsley, since Congress has clearly indicated, if not insisted on, how that money ought to be spent.

That leaves only 5% of the budget that is truly flexible. While working to wrest more discretion and more flexibility from Congress, Reilly's aides are concentrating on that 5%. Last November, Reilly and Habicht asked the heads of the various programs to submit 4-year plans, describing where they want to go and how they are going to get there. The guiding principle, they were told, should be risk reduction—and not, say, how to meet the latest court-ordered deadline. In identifying the big risks, the program heads were to take direction first from *Unfinished Business*, and then, when it became available, the SAB report.

By all accounts, the first round "engendered grave suspicions," as Don Barnes, director of the SAB, puts it. "Any time a program is challenged, people wonder if the real goal is to take money away," he says. The plan did cause some resentment, concedes Habicht. But after some initial grumbling most, if not all, have come around.

But if this new thinking is really going to make a difference—if Reilly is really to get the greater flexibility and discretion he wants—then he and his aides will have to change the culture not only at EPA but in Congress and the Office of Management and Budget. Proponents of the effort point to some encouraging signs from Congress, such as rising budgets for global climate change and radon, while funding for hazardous waste has remained relatively steady.

"It is a big agenda, but you have to start somewhere," says Habicht. "We are planting seeds, most of which won't bear fruit until after we have left." ■ LESLIE ROBERTS