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COVER Mature sporangium of *Rhinosporidium seeberi* discharging endospores through a single pore. The organisms were present in a large polyp located in the external nares of a dog. Mature sporangia are approximately 100 to 400 micrometers in diameter and have relatively thin walls. They contain endospores that may be in various stages of maturation. This section is 1 micrometer in thickness and stained with toluidine blue. See page 474. [Donald J. Meuten, School of Veterinary Science, North Carolina State University, Raleigh, NC 27606]

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Spanking, Reason, and the Environment

An exceedingly logical friend of mine told me that when he was 10 years old and playing peacefully with his siblings, his father suddenly picked him up and spanked him. He turned in bewilderment to ask, "What did I do to deserve that?" "Nothing," his father replied. "Then why was I spanked?" "To teach you that this is not a rational world," was the answer. Even scientists without perceptive and theatrical fathers eventually learn that this is not a rational world. It should be part of our responsibility, however, to make it more so.

A sizable expansion of research by the Environmental Protection Agency (EPA) should be encouraged in the years ahead. Emotion runs high on environmental issues and the EPA has been marred by political factionalism. Yet it deals with our most precious and increasingly threatened resources: the air we breathe, the water we drink, and the soil that nourishes our food sources. Environmentalists argue that we are doing too little to protect our resources; industry argues that excessive regulation stifles progress. The reality is that we live in a world that becomes more densely populated each year and that population depends on chemicals for its food and its standard of living. So the problems will only become more serious, and they cannot be solved by headlines, law cases, or political posturing.

In the past when faced with problems in health, fuel resources, defense, and food supplies, we responded with programs of basic research that paved the way for vast improvements. The environmental problems may be even more difficult. First, their solutions are bound to be costly and therefore opposed by both special interests and taxpayers. Second, the research is complex, requiring risk assessment analyses that strain current theories and are not easy to explain to lay audiences. Third, many of the solutions require international as well as national cooperation. Acquisition of convincing data is even more important when nonprofessionals must be persuaded of a course of action involving complex science. Time is of the essence. Governments delay action, claiming "lack of facts," as the clock ticks against a background of a deteriorating environment.

The current EPA research budget is approximately \$300 million, but it is almost all devoted to specific problems: a selenium contamination of water in California, an acid rain problem in the Great Lakes, a toxic waste dump in New York. The specific problems must be pursued, but basic knowledge is needed to develop broad strategies as well as innovative solutions. The Superfund costs are in the billions; asbestos cleanup costs are staggering; the science of risk assessment itself is in a primitive state; the EPA is entering the recombinant DNA field, when most of the expertise is found in the National Institutes of Health. All of these areas are candidates for a basic research approach.

Furthermore, the type of research and its spatial requirements are unconventional. One model may be found in the recent opening by the Department of Energy of the gaseous fuels test site in Mercury, Nevada. Far away from any populated area, the facility is constructed to test the spread of toxic gases such as the methyl isocyanate released at Bhopal or hydrofluoric acid, a corrosive but widely used chemical. Tests are planned on protective measures such as vapor fences and detoxication techniques. A rational policy for toxic waste disposal requires facts, and this experimental approach is laudable.

A tripling of the EPA research budget is not unreasonable in view of the need. This could be achieved over the next couple of years mainly through a greatly expanded extramural program. EPA would be well advised to model its research program on the successful NIH example, with most of its research in a peer-reviewed extramural program but with a sizable intramural program as well. Because most of its research is inevitably controversial, it will gain by the outside component, both in terms of expertise and credibility.

There will be those who believe that these issues have become so politicized that they can only be solved by the media and publicity, others who say that they require lawyers and litigation, and still others who say that they devolve on politics and money. I would like to believe reason and data can be used to make decisions, but then I was never spanked at an appropriately impressionable age.—DANIEL E. KOSHLAND, JR.