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ENVIRONMENTAL LESSONS

*Carol M. Rose**

Early in the modern history of environmentalism, James Krier and Edmund Ursin wrote a very useful book called *Pollution and Policy*.¹ Building on California's experience with air pollution control, the authors argued that environmental regulatory efforts involve a kind of learning process. That is, legislators operate by collective trial and error, enacting and then "exfoliating" one regulatory scheme after another, ideally using even the failures to learn more about the problems confronting them.²

In these matters as in so many others, the country as a whole has followed California's lead, learning in fits and starts about environmental problems. But *what* have we learned in all the exfoliations since the first Earth Day? Readers of this Symposium will no doubt observe that there are almost too many answers to that question; quite a number, however, fall into three major categories of problems. I call these, respectively, the Information Problem, the Budget Problem, and the Priorities Problem. Regarding the first, we have special difficulties in simply finding out about environmental problems. As for the second, even when we do have information, we have additional difficulties in adopting a systematic, cost-effective approach to budgeting on environmental issues. And as for the third, even when we can budget for individual issues, we find still other impediments to comparing and ranking environmental issues—impediments that prevent us from addressing these issues in an orderly progression.

In the environmental area, learning, budgeting, and ranking are difficult tasks technically. But what is more daunting, as this Essay argues, is that some of the most promising approaches to the *technical* problems seem *socially* unattractive. All this should direct our attention to still

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1. JAMES E. KRIER & EDMUND URSIN, *POLLUTION AND POLICY: A CASE ESSAY ON CALIFORNIA AND FEDERAL EXPERIENCE WITH MOTOR VEHICLE AIR POLLUTION 1940-1975* (1977).

2. See James E. Krier, *The End of the World News*, 27 *LOY. L.A. L. REV.* 851 (1994).

another issue: We need to think about persuasion and rhetoric in dealing with environmental matters.

I. THE INFORMATION PROBLEM: SEEING THE ISSUES

One very useful intellectual device for discussing environmental issues has developed over the last generation: Social and economic thinkers have framed these issues as instances of the more generalized problem of the "commons." According to the now-conventional wisdom, the collective course should be to conserve or invest in common resources. Unfortunately, because of shared or open access, individuals cannot reap all the benefits of their own forbearance or investment, and hence may be motivated simply to grab before others do, sometimes with disastrous results.³ This motivation may affect even public-spirited individuals who fear that their personal restraint or contribution may go for naught, or worse, may only enrich the greedy and self-serving. This now-familiar tale can be told about the pollution of the oceans or the air mantle, the overhunting of wildlife stocks and underfunding of habitat, the pumping or poisoning of underground water sources—all cases where unowned or collective resources are subject to overuse and underinvestment.

Economics, of course, has an interest in such matters, as it does in all issues of scarce resources. Generally speaking, the greatest social well being should incorporate collective as well as individually owned goods. Even if one thinks that individual ownership generally enhances care for resources, one might call for "privatizing" the good things previously used or enjoyed in common, but it will not do to pretend that they were not good things in the first place.

The commons approach to environmental problems has thus assisted us in the simple first step of recognition: We can see that environmental problems really *are* problems, in the prosaic sense that overuse of environmental commons can decrease overall social well-being. Despite the massive uncertainties about environmental questions, we have a good guess that auto exhaust fumes increase the chances of heart attacks; that acid rain kills trees and fish; that overforestry aggravates flooding; that fugitive refrigerant gases, floating high into the atmosphere, contribute to the irradiation and resulting damage to organic life in the oceans and on continents below.

3. H. Scott Gordon, *The Economic Theory of a Common-Property Resource: The Fishery*, 62 J. POL. ECON. 124, 124 (1954). This idea was popularized by Garrett Hardin, *The Tragedy of the Commons*, 162 Sci. 1243 (1968).

If one looks only to the conventional theory of the commons, one can easily grow pessimistic about solving vast and multilayered ecological problems like these. But after a generation of concern with commons issues, we have also learned that whatever the difficulties in principle, people in practice sometimes do manage to cope with collective resources, so that the "inexorable" logic of commons does not always play out so inexorably after all.⁴ Left to their own devices, people can figure out ways to preserve fishing grounds and wild animal stocks; they can organize and operate collective irrigation systems; and indeed as our own legislation suggests, they can make some inroads on the polluted commons in air and water, even if the successes have been costly and limited.

Unfortunately, however, we have also learned that despite our tentative grip on some large environmental problems, we really do not deal very well at all with vast numbers of others. The commons analysis suggests a reason why this is so, though the reason is only indirectly tied to the self-interest that supposedly induces people to trash the commons. The trouble is rather a derivative one: People have too few reasons even to *notice* commons problems.

Self-interest clearly does play a role here. For example, I easily observe how much more my new car costs because of the pollution control device that has been installed in it, but I am not likely to focus so sharply on my own and others' marginally improved chances of avoiding smog-induced respiratory ailments. Similarly, I quickly notice an increase in my electricity bill, but I have less pointed reason to contemplate how the utility's new pollution control expenditures may save trees and fish someplace far away. When we mix these weak informational motivations with the tremendous uncertainties of remote causation (Will carbon dioxide warm the oceans and threaten shorelands with inundation, or will additional clouds recool the surface?), the problem of simply *learning* about environmental problems seems overwhelming. This becomes increasingly so as we find ever remoter and ever vaster commons in the interactions of resources.⁵

4. See, e.g., ELINOR OSTROM, *GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION* (1990) (citing sources); *THE QUESTION OF THE COMMONS: THE CULTURE AND ECOLOGY OF COMMUNAL RESOURCES* (Bonnie J. McCay & James M. Acheson eds., 1987) (containing essays addressing theory of tragedy of commons); Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711 (1986).

5. See, e.g., Marlise Simons, *Winds Sweep African Soil to Feed Lands Far Away*, N.Y. TIMES, Oct. 29, 1992, at A1 (reporting that dust from Africa nourishes Atlantic biota and South American rain forest).

In a sense, what we have learned about self-interest and the commons is not that people necessarily act selfishly in using common resources. Instead we have learned, among other things, that self-interest is a *signalling* or *attention-getting* device of great power. For instance, regardless of how you eventually act, when you are trying to decide whether to reroof your own or even a friend's or relative's house, you are apt to make at least a rough calculation of the costs and benefits and possible side effects. Unfortunately, environmental problems do not come packaged with any signalling systems as powerful as self-interest; quite aside from the enormous difficulties of collecting information scientifically about, say, airborne toxics, we often lack the motivational spur even to make the effort.

What, then, might focus human attention on common resource problems? Well, one thing is drama. But what makes things dramatic? I will return to this subject, but preliminarily, it seems that drama appears sometimes simply by accident, when events speak to what seem to be widely shared human emotions. On this point, some psychologists have noted that people exhibit a preference for status quo outcomes and a special aversion to losses.⁶ Furthermore, some have identified a set of factors called "dread" that make a loss or change seem especially bad.⁷ Among the factors of dread are the sense of large, remote, and sometimes suddenly erupting forces that cause large-scale havoc and lingering pain to some identifiable group of innocents. The accidental chemical leak at Bhopal is a textbook example of loss aversion compounded by dread factors. It was followed, as even nonpsychologists might have predicted, with its own rush of legislative responses.⁸

When accidental events create such drama, they no doubt contribute to the herky-jerky character of our environmental legislation. But another way of creating drama is not so accidental: It is conscious *talk*. That is, speakers and actors can frame issues in ways that people will take notice; they implicitly recognize that people notice certain kinds of outcomes more readily than others.⁹ Environmentalists have certainly taken this cue, and often use disaster imagery in the furtherance of a variety of causes, just as they use appeals to so-called charismatic animals to dramatize conservation efforts. I do not believe that it is wise to

6. See Daniel Kahneman & Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk*, 47 *ECONOMETRICA* 263, 277-80 (1979).

7. See Paul Slovic, *Perception of Risk*, 236 *SCI.* 280, 280 (1987).

8. See, e.g., Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. §§ 11001-11050 (1988).

9. For the implications for politicians, see Roger G. Noll & James E. Krier, *Some Implications of Cognitive Psychology for Risk Regulation*, 19 *J. LEGAL STUD.* 747, 772-77 (1990).

be too critical of this kind of imagery. After all, it does call people's attention to important matters when ordinary self-interest might not. In any event, environmentalists are not the only ones to use talk; advertisers are in this business too, and appeal to environmental consumers with references to their own green-ness.

Aside from dramatic accidents and image making, what else catches people's attention? Psychological studies observe several revealing characteristics in the ways that people think about probabilities. Some psychologists use the terms "anchoring," "representativeness," or "availability" to describe aspects of people's tendency to guess probabilities as if the events in question were similar to other events, particularly those that are easily accessible in their own thought processes or prior experiences.¹⁰ Along these lines, some environmental talk appeals to popularly accessible thought patterns, making issues "salient"¹¹ by coupling them with already "available" ideas. The burgeoning discussion of environmental rights, such as animal rights or ecosystem rights, carries a familiar concept into unfamiliar territory, and thus lends a kind of mental mooring to the issues, especially in a culture like ours where rights talk bears considerable freight.¹²

Another referential coupling appears in the newly emerging topic of environmental racism, now discussed particularly in connection with the location of toxic or other wastes in low-income areas.¹³ Although many of the specific issues have a familiar ring, since the siting of unwanted land uses in low income areas is a pattern with a long and shameful history, the language of environmental racism may have helped to alert the residents of these areas that environmental problems are their problems too, and not just the musings of wealthy bird watchers. Moreover, this rhetorical coupling links environmental issues to our most serious historic social problems, thus highlighting for the wealthy bird watchers an underemphasized dimension of pollution.

I do not mean to suggest that these devices are complete antidotes to the Information Problem of environmental issues. Indeed, in responding

10. See Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCI. 1124, 1124 (1974). This literature is summarized in Noll & Krier, *supra* note 9, at 752-55.

11. Noll & Krier, *supra* note 9, at 767, 769.

12. See, e.g., RODERICK FRAZIER NASH, *THE RIGHTS OF NATURE: A HISTORY OF ENVIRONMENTAL ETHICS* (1989). For the import of rights rhetoric, see Carol M. Rose, *Environmental Faust Succumbs to Temptations of Economic Mephistopheles, or, Value by Any Other Name Is Preference*, 87 MICH. L. REV. 1631 (1989) (reviewing MARK SAGOFF, *THE ECONOMY OF THE EARTH* (1988)).

13. For a summary, see Robert W. Collin, *Environmental Equity: A Law and Planning Approach to Environmental Racism*, 11 VA. ENVTL. L.J. 495 (1992).

to dramatic gestures or salient linkages, we could be embarking on just another set of herky-jerky routines, overlooking nuances of comparative advantage, or disguising from ourselves some causal factors that might be revealed by more patient inquiry.¹⁴ But one positive aspect of these appeals is that they may push the research—the information-seeking effort—in directions that would have been ignored otherwise. As I argue later in this Essay, all these rhetorical devices deserve very serious consideration.

Interestingly enough, our laws reflect a growing sophistication about the problem of motivating environmental information gathering.¹⁵ Environmental impact review for major federal projects was an early move in this direction. The federal law and related state laws operate by making a simple direct command to a project-proposing agency: Collect information! This begs other critical questions: Information about what? And, under what circumstances? In practice, of course, opponents of particular projects have used these statutes on occasion simply to delay offending projects, thus making them more costly and problematic.¹⁶

In one sense, the impact-review statutes did recognize something important quite early in the modern environmental movement: They implicitly recognized that weak self-interest may result in only weak information. After all, why collect data on bird habitat when you do not have to pay for its loss? You might collect the data anyway, of course, but your shareholders or constituents generally will be just as happy if you do not, since this only adds to your costs. In short, there is no systematic motivation for you or others to collect data about inputs from or outputs to the unowned commons. The National Environmental Policy Act (NEPA) and its state clones were created in an effort, however clumsy, to counterbalance that lack of information-gathering motivation.

The command and control statutes of early environmental legislation can be seen as further steps in the legal quest to motivate information gathering. The explicit hope of technology-forcing legislation was not simply that it would reduce pollution, but also that it would induce industrialists to undertake research that would lead to more environmentally benign technology. One notable hope was that new types of automobile engines would result from legislation that punished the lack of

14. For a classic example, see KRIER & URSIN, *supra* note 1, at 52-54 (describing Los Angeles officials' targeting of one synthetic rubber plant as chief cause of 1943 smog episode).

15. Cf. James E. Krier & W. David Montgomery, *Resource Allocation, Information Cost and the Form of Government Intervention*, 13 NAT. RESOURCES J. 89, 96-97 (1973) (proposing that government intervention evolves in direction of saving information costs).

16. See, e.g., Milner S. Ball, *Good Old American Permits: Madisonian Federalism on the Territorial Sea and Continental Shelf*, 12 ENVTL. L. 623, 645 n.68 (1982).

best available technology, where the phrase included technology that *might* be ready in the middle-term future.¹⁷

Critics have long berated technology forcing for its costs, inflexibility, and general futility, and have instead proposed a turn from the stick of mandatory technology to the carrot of economic incentives.¹⁸ This has implications for information, because if environmental problems can be framed in ways that better jog self-interest, then knowledge will be jogged along with the economic incentives to improve.

The hopes for incentive approaches are particularly noticeable in two areas: "proto property" rights in pollution control and "shadow pricing" in cost-benefit analysis. A major experiment in proto property appears in the acid rain provisions of the 1990 Clean Air Act,¹⁹ which create a limited regime of tradeable emission rights. A similar approach was used even earlier in the experiments of the Environmental Protection Agency (EPA) with the bubble concept—that is, the permission of plantwide emissions offsetting to reduce total emissions at lower costs.²⁰ Such schemes should make each polluter regard its small measure of pollution as a bounded entitlement, and induce each one to figure out how to stay within the boundaries, or alternatively, bargain with others for some portion of their entitlements. As with more conventional forms of property, tradeable pollution entitlements should give entitlement holders and entitlement purchasers an interest in holding costs down. This, in turn, should provide an interest in finding cheap, effective pollution control methods that would presumably alleviate overall pollution.

This is not to imply that property approaches fully satisfy our pollution control needs; they too have garnered some hefty criticism.²¹ Proponents of entitlement schemes are often optimistic about administrative savings. But in fact, property regimes may be expensive, particularly where the entitlements are difficult to monitor and police, such as those involving air emissions.²² It is no accident that most of the entitlement

17. See *International Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 626, 634-35 (D.C. Cir. 1973); see also *Edison Elec. Inst. v. EPA*, 996 F.2d 326, 336 (D.C. Cir. 1993) (finding that Congress hoped to force innovation by standards set higher than existing technology).

18. See, e.g., Richard B. Stewart, *Controlling Environmental Risks through Economic Incentives*, 13 COLUM. J. ENVTL. L. 153 (1988).

19. 42 U.S.C. §§ 7651-7651o (Supp. III 1991).

20. See *Chevron U.S.A. v. National Resources Defense Council*, 467 U.S. 837, 837 (1984).

21. See, e.g., Howard Latin, *Ideal Versus Real Regulatory Efficiency: Implementation of Uniform Standards and "Fine-Tuning" Regulatory Reforms*, 37 STAN. L. REV. 1267 (1985).

22. See Carol M. Rose, *Rethinking Environmental Controls: Management Strategies for Common Resources*, 1991 DUKE L.J. 1, 12-24. Even proponents recognize monitoring costs. See Robert W. Hahn & Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 ECOLOGY L.Q. 361, 377-78 (1989).

approaches to date have been applied to pollution from large, fixed, industrial sources. No one is seriously suggesting, for example, that automobile drivers receive individualized tradeable pollution entitlements, even though some crude surrogates have indeed been discussed, such as taxing gasoline or purchasing and destroying old, heavily polluting cars.²³

Quite aside from the administrative objections to entitlements regimes, however, some people sense that these stratagems carry a *moral* cost of very substantial dimensions. Property rights proponents sometimes seem to assume that only the *total* pollution matters, and are less attentive to local concentrations, even though ordinary people may be very sensitive to the equity of such "hotspots."²⁴ More subtly, the older command and control approach required each polluter to do its very best to contain pollution—indeed, better than its best, insofar as best available pollution control technology included as-yet uninvented devices. The property rights approaches, on the other hand, seem subject to the complaint that polluters need not do their best at all—they can perpetrate a wrong if they simply purchase the right to do so. The moral message strikes some as repugnant and counterproductive,²⁵ a point to which this Essay will return shortly.

In a different effort to enlist the self-interest of polluters, some economists have devised ways to derive shadow prices or "contingent values" to assess the nonmarket values of environmental resources—the value of their availability for future use, or for the pleasure that they convey by simply being there, for example.²⁶ Shadow pricing appears in cost-benefit calculations at the regulatory stage, as well as in the *ex post* assessments of damage to natural resources in oil spills and other instances of unplanned pollution releases.

One of the attractions of shadow pricing is its hard quality, which makes environmental issues seem really to count for something—in a

23. For such a surrogate, see *Chicago's "Cash for Clunkers" Program Boost for Air Quality, Governor Claims*, 24 *Env't Rep. (BNA)* 643, 643 (Aug. 13, 1993). Gas tax schemes are, of course, related to consumption of gasoline, but not directly to emission of pollutants.

24. See Donald T. Hornstein, *Reclaiming Environmental Law: A Normative Critique of Comparative Risk Analysis*, 92 *COLUM. L. REV.* 562, 592-97 (1992). Complaints about locational effects have already surfaced with respect to acid rain entitlement trades. See E. Margaret Kriz, *Emission Control*, 1993 *NAT'L J.*, at 1696, 1700.

25. See, e.g., Melissa Healy, *Clinton Hopes to Clean Up by Buying, Selling Right to Pollute*, *L.A. TIMES*, Sept. 9, 1993, at A5; Dan Tracy, *OUC [Orlando Utility Commission] Sees Pollution Rights as Gold Mine*, *ORLANDO SENTINEL TRIB.*, Apr. 7, 1993, at A1 (noting critics' description of emission rights trades as immoral and perverse).

26. On "contingent valuation" for "option" and "existence" values, see *Ohio v. United States Dep't of Interior*, 880 F.2d 432, 475-78 (D.C. Cir. 1989).

way, linking environmentalism to the market-oriented thought patterns so familiar in a larger commercial culture. Moreover, shadow pricing has the general advantage of quantification, insofar as shadow prices let people compare some environmental values to others, or compare environmental goods to more individualized ones. Perhaps most important, these assessments may jog the imagination, and may encourage people to pay attention to the otherwise ignored losses that they suffer from damage to common resources.

Unfortunately, shadow prices have some disadvantages too. One is precisely their seemingly hard numerical quality, which may mask their widely varying presuppositions.²⁷ Moreover, these metaphoric “prices” sometimes seem rather bizarre to interview subjects, who may be either puzzled when asked how much they would pay to preserve a place they will never see, or aggravated at the implication that a price can be put on something too precious to be sold at all. Indeed, shadow prices have aroused furious denunciations even from very sophisticated commentators, notably Mark Sagoff, who has reacted with rage to what seem to be the commodifying premises of these studies, without perhaps noticing their attention-catching metaphoric usefulness.²⁸

Thus our environmental legislation has clearly exfoliated a whole series of information-eliciting approaches to the general problem of learning about the environment. But upon reflection, it is quite daunting to realize that the very approaches that might be among the most promising—that is, those that enlist self-interest to motivate environmental information gathering and problem solving—seem to run into serious moral criticism precisely because they *do* enlist self-interest. Unfortunately, this serious rhetorical problem mirrors an equally serious rhetorical problem in the area of environmental budgeting.

II. THE BUDGET PROBLEM: MANAGING RISKS

If we think about environmental problems as variants on commons problems, it is pretty clear that not all commons problems are the same. Thomas Schelling pointed out several years ago that in some—but not all—of these problems, the slightest damage ruins the whole. In his example, the cutesy roadside sign “every litter bit hurts” is misleading. In-

27. For this critique in the general context of cost-benefit analysis, see Daniel A. Farber, *Revitalizing Regulation*, 91 MICH. L. REV. 1278, 1282-85 (1993) (reviewing SUSAN ROSE-ACKERMAN, *RETHINKING THE PROGRESSIVE AGENDA: THE REFORM OF THE AMERICAN REGULATORY STATE* (1992)).

28. MARK SAGOFF, *THE ECONOMY OF THE EARTH* 83-92 (1988). *But see* Rose, *supra* note 12, at 1645-46.

stead, the *first* scrap offends the most in a pristine area, just as the first lawn mower disrupts a quiet Sunday morning, no matter how many others follow.²⁹ In such cases, there is an argument for all-or-nothing solutions: no snowmobiles in the park, no powerboats in the Boundary Waters Canoe Area, no trash fires in the backyard.

But pollution problems often have a different pattern, where many "litter bits" can occur before it matters. Just as your body readily manages small amounts of the same iodine that would poison you in larger volumes, so can many water bodies absorb a modicum of certain pollutants without any noticeable damage. Similarly, some wild animal stocks thrive even though, or perhaps because, they are subject to some predation. All-or-nothing approaches are unwarranted here; unrestrained exploitation would certainly decimate the common resource, but a total ban would neglect the regenerative qualities of the stock, or the absorptive and self-cleansing capacities of the medium.

There are many examples of resource stocks in which a few "litter bits" have no noticeably damaging effects. In a more complex variant, there are many other resource stocks where some activities *do* cause damage—but the damage costs are dwarfed by the costs of stopping. At least as of now, for example, most automobiles add to air pollution, and as a result of our long love affair with the car, we suffer noticeable health and aesthetic damage. On the other hand, forcing all cars to a screeching halt would be incredibly costly, both to the individuals who depend on them or just enjoy them, and to the larger industries that depend on their production and use. Pollution costs may be real, but control or forbearance costs are real too, and in vast numbers of environmental areas, a dominating task has been to weigh the one against the other. That is the first part of the budgeting problem: locating and providing for what has been called optimal pollution.³⁰

Unfortunately, part-way solutions run counter to much of our legal tradition. All-or-nothing solutions pervade our tort law, or at least they did prior to modern ideas of comparative fault. Winner-take-all is the preference in American electoral law too. And all-or-nothing solutions, or slight variations on them, have dominated much of our environmental law as well, particularly in the early stages.

Indeed, it has taken some time to learn that all-or-nothing approaches can be quite awkward and costly. The first version of the En-

29. THOMAS C. SCHELLING, MICROMOTIVES AND MACROBEHAVIOR 131 (1978).

30. See William J. Baumol & Wallace E. Oates, *The Use of Standards and Prices for Protection of the Environment*, in THE ECONOMICS OF ENVIRONMENT 53, 58 (Peter Bohm & Allen V. Kneese eds., 1971).

dangered Species Act³¹ permitted no disruption of species designated "endangered,"³² and only after the Tellico Dam imbroglio was the Act modified to permit some post hoc reconsideration.³³ Similarly, the Federal Water Pollution Control Act Amendments of 1972,³⁴ having now evolved into the modern Clean Water Act (CWA),³⁵ called for an end to the discharge of pollutants into the nation's waters by 1985,³⁶ but this too has run into hitches. One example is the CWA's regulation of ocean disposal of various organic wastes.³⁷ In some places, notably Hawaii, the surrounding waters are deep and vast; ocean disposal has genuine costs, but they are relatively minute in comparison to the cost of fully treating the sewage before discharge. Hawaiian officials have asked for and received many exemptions, but only after some considerable struggles—not only with the federal government, but also with the state's own irate citizens.³⁸

On the whole, the courts are not particularly friendly to these partial solutions. They have been hard on sewage spills in Hawaii, even when it has appeared that expensive treatment options might yield comparatively low returns.³⁹ They have been equally unsympathetic to the EPA's own efforts to avoid what seem to be particularly high regulatory costs. For example, in *National Resources Defense Council v. Costle*,⁴⁰ the court torpedoed the EPA's effort to exempt a variety of small feedlots from water pollution controls, giving short shrift to the argument that the small operations presented relatively high enforcement expenses. Similarly, in *Sierra Club v. Ruckelshaus*,⁴¹ the court required the EPA to issue regulations on radionuclide emissions. The court held that once the emissions were listed among toxic air pollutants, the EPA had an affirmative duty to regulate,⁴² and brushed aside the EPA's plea that it was

31. Pub. L. No. 93-205, 87 Stat. 884 (1973) (codified as amended at 16 U.S.C. §§ 1531-1544 (1988 & Supp. IV 1992)).

32. § 9, 87 Stat. at 893-95.

33. Refer to current law at 16 U.S.C. § 1539(g) (1988).

34. Pub. L. No. 92-500, 86 Stat. 816 (codified as amended in scattered sections of 33 U.S.C.).

35. 33 U.S.C.A. §§ 1251-1387 (West 1986 & Supp. 1993).

36. § 101(a)(1), 86 Stat. at 816.

37. 33 U.S.C.A. § 1343.

38. *Hawaii's Thousand Friends v. Honolulu*, 821 F. Supp. 1368 (D. Haw. 1993).

39. *See id.* at 1395-96 (disparaging city's dilution strategy, yet mitigating civil penalties since no measurable harm shown).

40. 568 F.2d 1369 (D.C. Cir. 1977).

41. 602 F. Supp. 892 (N.D. Cal. 1984). For more recent developments, see *Natural Resources Defense Council v. Reilly*, 976 F.2d 36 (9th Cir. 1992).

42. *Sierra Club*, 602 F. Supp. at 894-95.

impossible to regulate these intractable materials.⁴³ In *Chemical Manufacturers Ass'n v. EPA*,⁴⁴ a private party attempted to avoid regulation by presenting an explicit cost-calculation theory: Regulatory expenditures should only extend to the "knee-of-the-curve," the point at which additional and more thoroughgoing controls face steeply rising marginal costs.⁴⁵ The argument fell on deaf ears.

In these and other judicial opinions, the courts often claim to be following the logic of Congress's legislation, and to a considerable degree they are. But some environmental laws suggest that regulators should not pursue pollutants on an all-out basis, but only somewhat beyond a margin where it seems to be worth the effort; much legislation requires not outright bans on dangerous substances, but only controls that assure "an adequate margin of safety." This language recognizes *some* limit on the effort to eradicate harmful materials, and hence embraces some partial solutions. To be sure, of course, this language cannot be read as a full commitment to optimizing, which would justify an earlier spending cutoff at that knee-of-the-curve where additional control expenditures rise rapidly without proportional benefits.

Critics like Barry Commoner argue that even the "margin of safety" route is misguided, and that we are wasting our time and resources when we adopt partial solutions. Better to abandon these unsuccessful halfway accommodations to problems, he argues, and to turn toward eliminating pollutants at the source.⁴⁶ On his prescription, we should reduce pollution not to some more or less acceptable level, but to zero.⁴⁷

Why have all-or-nothing solutions seemed so attractive, and half-a-loaf solutions so difficult to devise and defend? For one thing, people may have only a dim intuitive grasp of the benefits from partial measures.⁴⁸ For another, these measures are likely to be organizationally and politically complex. Optimal pollution requires us to select allowable levels of pollution and determine the triggers for regulatory activity, all of which invite fervid lobbying—and even more so when the choices shift with experience and technological change. Thus, for example, it might make sense to permit more contact even with something as toxic as di-

43. *Id.* at 899.

44. 870 F.2d 177 (5th Cir. 1989), *cert. denied*, 495 U.S. 910 (1990).

45. *Id.* at 205.

46. Barry Commoner, *Failure of the Environmental Effort*, 18 *Env'tl. L. Rep.* (Env'tl. L. Inst.) 10,195 (June 1988).

47. *Id.* at 10,196-98; see Charles Alpert, *A Fresh Start for Environmental Regulation*, 24 *Env't Rep.* (BNA) 923, 923 (Oct. 24, 1993).

48. Similar is the tendency to underspend on probabilistic insurance, which reduces without eliminating the possibility of loss. See Noll & Krier, *supra* note 9, at 758-59.

oxin if we learn that this substance is not so dangerous as we once thought; or conversely, it may make sense to ratchet down the allowable amounts if new control technologies make restraint cheaper. Either way, we can predict that changes in permissible levels will generate innumerable headaches and resistance as well as figures and counterfigures from conflicting interests.⁴⁹ By comparison, all-or-nothing approaches—let it go or ban it entirely—look attractively simple when intermediate choices face wrangles, as they always do on environmental questions, given the fuzziness of our information about them.

And of course, monitoring is apt to be easier with all-or-nothing approaches than with partial ones. Alcohol regulators reduce their policing costs by barring liquor sales to those under eighteen, even though many young people would doubtless drink prudently. A ban on a given pesticide may mean boarding up the manufacturing plant; but a rationed solution, or the requirement of particular application technologies, requires the monitoring of many more persons, locations, and activities. Small wonder, then, that commentators like Commoner despair of partial solutions and opt for banning instead of rationing.

But quite aside from these conventional problems of administrative feasibility, experience suggests that partial solutions raise substantial moral issues. At the most primitive level, the very materials of environmental degradation often strike us as repellent, revolting, and frightening. Oil slicks and sewage sludge seem loathsome in themselves. The common disgust at these contaminants impedes our coolly weighing the possibility of, say, simply closing the beaches a few times a year, rather than requiring better-built ships or demanding the installation of leak-proof sewage treatment equipment, which would obviate these unpleasant events altogether. Is it cheaper to close the beaches occasionally? Arguably, yes; but this solution may be viscerally unacceptable.

At a considerably more sophisticated level is the ethical approach linked to a Kantian categorical imperative, according to which one should be able to universalize the moral principles upon which one acts. This certainly is not a prescription for partial solutions, whereby a little bit of a bad is accepted. Insofar as a Kantian ethic captures moral intuitions, it suggests that partial solutions may run into moral quagmires. As Commoner puts it, partial solutions allow the pollution perpetrators

49. For impediments to changing resource management regimes, see GARY D. LIBECAP, *CONTRACTING FOR PROPERTY RIGHTS* 19-28 (James Alt & Douglas North eds., 1989). Dioxin is an example; for pros and cons on its dangerousness, see Jeff Bailey, *How Two Industries Created a Fresh Spin on the Dioxin Debate*, WALL ST. J., Feb. 20, 1992, at A1.

to set the baseline, and encourage meekness about a situation whose ill effects he says are likely to be felt most by the poor.⁵⁰

Indeed, distributional issues may especially compound Kantian qualms when partial solutions take the form of tradeable, property-like entitlements. Not only are emission or effluent entitlements part-way approaches—since they contemplate some modicum of continuing pollution—but the entitlements themselves are unevenly distributed. Tradeable emission or effluent rights, however dear to the economic approach towards environmental budgeting, look rather like a dispensation from good behavior *sometimes*, enjoyed only by *some people*, namely those who pay for the privilege. Needless to say, Kantian or crypto-Kantian intuitions may find such solutions offensive.⁵¹

Summing up the Budget Problem, then, when we compare the gains from environmental protections to their costs, it seems clear that we sometimes need some level of optimal pollution or optimal resource use. This is because at some marginal point, an extra measure of control will bring only diminishing returns in protection. Beyond this point, we waste resources by devoting more to pollution control.

But optimal pollution may be politically and administratively costly—a concern even for cost-benefit calculators. Perhaps more important, optimal pollution also may seem *morally* costly. Indeed, the very concept runs the risk of undermining the civility and mutual forbearance that quietly underlie so much of our practical environmental conservation.⁵² It is hard to see a little bit of pollution as the right thing to do. It is even harder to see it as the right thing for *some* people to do, simply because they can afford it. Moreover, regimes permitting such pollution-for-pay pose the threat of making citizens callous about polluting in general. Thus in the Budget Problem as in the Information Problem, moral objections seem strongest against just those approaches—the partial solutions and property-rights methods—that would otherwise appear to be particularly promising in environmental management. Unfortunately, the same depressing scenario appears when we try to prioritize risks.

50. Commoner, *supra* note 46, at 10,198; BARRY COMMONER, MAKING PEACE WITH THE PLANET 42-43, 59-60 (1990).

51. For moralism of "everyday Kantianism," see JON ELSTER, THE CEMENT OF SOCIETY 192-95 (1989).

52. See Thomas C. Schelling, *Prices as Regulatory Instruments*, in INCENTIVES FOR ENVIRONMENTAL PROTECTION 1, 4-5 (Thomas C. Schelling ed., 1983).

III. THE PRIORITIES PROBLEM: RANKING THE ISSUES

I have used the Budget Problem as the label for a difficult, but relatively narrow, set of issues—that is, weighing the net benefits of some particular extractive or polluting activity, and balancing those against the benefits that we would enjoy if we alleviated the degradation of the same environmental resource. The Budget Problem, so defined, is about comparing particular resource risks to particular control costs.

An extended version of the Budget Problem is what I am calling the Priorities Problem, which raises budgetary concerns in a more global context. The Priorities Problem revolves about comparative risks: Should we turn first to Environmental Danger Number 1 (ED-1) or to Environmental Danger Number 2 (ED-2)? To answer that, we need to weigh the costs and benefits of controlling ED-1, at any given level, against the costs and benefits of controlling ED-2.

Looked at in this broader context, the Priorities Problem presumes that not all resources are equally valuable, not all risks are equally risky, and not all costs are equally costly. Moreover, even if ED-1 is our most serious risk at the outset, at some level of expenditure we would do better to shift our layouts to control ED-2; and similarly, later on, to ED-3 and so on. This, in very simplified form, is the idea that Richard Stewart has outlined as a “risk portfolio approach,” where the goal is to achieve what military planners used to call “the Biggest Bang for the Buck”—the greatest level of risk protection, given the budget available for the whole array of environmental risks that confront us.⁵³

In view of the need to use our resources in the most prudent way, risk portfolio approaches seem to make obvious sense. This is something else we have learned over a generation of environmental law, and the lesson is reflected in the comparative risk approaches that now influence so much of the EPA’s thinking.⁵⁴ Indeed, a quite remarkable set of *New York Times* articles in the Spring of 1993 suggested that comparative risk approaches have seeped into the popular consciousness as well. Even Jane and John Doe now are starting to believe that we should concentrate on the big environmental issues first; if necessary even letting the little things ride for a while.⁵⁵

53. Richard B. Stewart, *The Role of the Courts in Risk Management*, 16 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,208 (Aug. 1986).

54. For an interesting analysis, see Hornstein, *supra* note 24.

55. Keith Schneider, *New View Calls Environmental Policy Misguided*, N.Y. TIMES, Mar. 21, 1993, at A1; Michael Spector, *Sea-Dumping Ban: Good Politics, but Not Necessarily Good Policy*, N.Y. TIMES, Mar. 22, 1993, at A1; Joel Brinkley, *Many Say Lab-Animal Tests Fail to Measure Human Risk*, N.Y. TIMES, Mar. 23, 1993, at A1; Keith Schneider, *How Rebellion*

But a risk portfolio approach only magnifies the obstacles encountered in the Budget Problem, and adds a few besides. Most important is the question of assessing comparative costs and benefits. If these are difficult to calculate in the context of one single pollutant, they are exponentially more difficult where the control of each pollutant has to be weighed against the control of the other pollutants in the entire portfolio full of risks.

Then too, there are all the issues plaguing partial solutions. Comparative risk assessment drags in a whole portfolio full of these part-way solutions, and administrative and political obstacles are bound to multiply in this broad arena. Moreover, because comparative approaches pick and choose across a whole spectrum of risks, they may cluster the distribution of environmental burdens, and in so doing may raise particularly difficult equitable questions. That is, with a comparative risk approach, the issue is not simply that some air pollution controls may be halted before easing the discomfort of the most sensitive asthmatics. Rather, *all* the asthmatics' breathing problems might be disregarded, at least temporarily, while resources are concentrated instead on some other risk altogether, such as a waterborn pollutant linked to birth defects. The logic of comparative risk speaks clearly for dealing first with the most serious, most widespread, and most easily controlled harms; however, that logic creates "hotspots"—or rather, cold comfort for the asthmatics.

Once again, tradeable pollution entitlements seem especially vulnerable to such distributional complaints. For example, it has been suggested that toxins be ranked, and that control over more serious toxic materials might be exchanged for continued production of less toxic ones.⁵⁶ That is, producers of ED-17 may continue to produce, if they clean up some portion of ED-3, on the theory that the expenditure on ED-3 will prevent more overall harm. But the nagging distributional question of these trades is obvious: What then happens to those populations particularly affected by the generally *less* damaging Environmental Danger Number 17?

Indeed, in principle, a risk portfolio approach should weigh the relative costs and benefits of *all* regulatory efforts; thus, in effect, we should be talking about an "Unhappiness Portfolio." In that sense, an *environmental* risk portfolio is itself a part-way approach writ large, since so-called environmental risks only constitute one slice of the array of risks

over Environmental Rules Grew from a Patch of Weeds, N.Y. TIMES, Mar. 24, 1993, at A16; Keith Schneider, *Second Chance on Environment*, N.Y. TIMES, Mar. 26, 1993, at A17.

56. See Catherine Cooney, *State Air Regulators Question Legality of EPA Toxics Plan*, ENV'T WK., Nov. 5, 1992, at 3.

existing in the world. Small wonder, then, that all the problems of part-way solutions rise exponentially when risks are compared.

Perhaps it is not surprising, then, that comparative risk approaches have had faint resonance in the courts, where equitable considerations are never far in the background. I have already mentioned some instances in which the courts have disrupted partial solutions.⁵⁷ Now, consider this hostility in the arena of comparative risks. If, with respect to a single risk, an agency is forbidden from taking into account the marginally increasing costs of pursuing diminishing dangers, then by extension and *a fortiori*, it would seem that the same agency would be required to ignore the point that on average we would be better off if, after the control costs of ED-1 (say, smog precursors) started to rise very rapidly, the agency turned its attention instead to ED-2 (say, construction runoff), not to speak of ED-3 or ED-100.

Courts have a particular problem with such global approaches: As an institutional matter, they see problems one at a time. When judges say that the EPA has to go the regulatory whole hog once it has declared radionuclides a danger, they have no information about other potentially regulatable risks that are claimants on the regulatory budget. Furthermore, even if they did have such information, they might not be able to predict whether the EPA would expend its budgetary savings on the next risk in line.

But of course it is hard for *anyone* to see risks in a global context. That too is one of the reasons for our herky-jerky legislation—our Love Canal legislation (CERCLA),⁵⁸ our Bhopal legislation (EPCTRA),⁵⁹ our Exxon Valdez legislation (Oil Pollution Act)⁶⁰ and so on. The courts are not the only ones to see things one at a time. Indeed, the judicial decisions on environmental regulation only highlight a more widespread point about global approaches to risks: Once an evil is known, it becomes salient, and it crowds out other possibilities in the risk portfolio. Courts have their own rules for salience, but for the rest of us, the simple identification of a problem makes it more salient than other matters that remain undisclosed. It seems more important to follow through on controlling the known risk than the unknown, at least in part because we are often not comparing the known risk to anything else at all.

Hence the Priorities Problem—which is in a way only a globalized version of the Budget Problem—circles back around to the Information

57. See *supra* notes 38-45 and accompanying text.

58. 42 U.S.C. §§ 9601-9675 (1988 & Supp. III 1991).

59. 42 U.S.C. §§ 11001-11050 (1988 & Supp. III 1991).

60. 33 U.S.C. §§ 2701-2761 (Supp. IV 1992).

Problem, and to the difficulty of simply *noticing* environmental issues. Indeed, in a sense, the very notion of prioritizing risks suggests that we have already solved the Information Problem—that we already know the range of risks “out there,” and which risks are more dangerous than others. Distressingly often, however, we do not have a firm grasp on that information at all, and even when we do in principle, the dramatic and already known things get noticed, the not-known and not-present risks remain beneath the surface, precluding any genuine comparison. The result, as the “loss aversion” psychologists point out, is that we may hate risks that threaten the things we now have, but are comparatively complacent about risks that threaten things we can only contemplate. Moreover, even when we are aware of comparative risks, the comparisons themselves do not carry much intuitive meaning, particularly in the context of very large or very small numbers. Who really grasps the difference between one-in-a-billion and one-in-a-trillion risk? What is a trillion, anyway? The psychologists suggest that while human beings can talk the talk, the numbers do not mean much.⁶¹

Thus it may well be that a risk portfolio strategy is a useful approach to environmental regulation, but legal institutions do not easily take a synoptic and comparative view. Instead, particular and individual questions crowd out the big picture—and the most salient and dramatic questions have the biggest elbows.

And so, once again, one of our most promising approaches, a risk portfolio strategy, seems to face the greatest obstacles from the very intuitions we rely on to tell us what is important, appropriate, and normatively acceptable. Moreover, we have only a dim and quavering picture of what a risk portfolio would look like—but what we see looks administratively difficult and morally hard-hearted.

IV. ENVIRONMENT AND RHETORIC

Are there ways out of these related dilemmas—that is, that the most promising efforts to learn about, and act upon, environmental risks seem to elicit only threadbare comprehension and stubborn normative resistance?

One response is to look to institutions. Bruce Ackerman and William Hassler have suggested that such problems are precisely why we need a kind of New Deal agency to manage environmental questions—an agency with wide latitude and with only light policing by Congress and

61. Chauncey Starr & Chris Whipple, *Risks of Risk Decisions*, in *RISK IN THE TECHNOLOGICAL SOCIETY* 217, 227-29 (Christoph Hohenemser & Jeanne X. Kasperson eds., 1982).

the courts.⁶² Such a superagency, the argument goes, is the only institutional chance we have to deal comprehensively with specific environmental questions on some basis other than sheer accident or theatricality.⁶³

Something akin to the superagency idea has been around for some time. William Ophuls, extrapolating from Garrett Hardin's work, gave an early and pessimistic assessment of such an agency by calling it a Hobbesian solution—a Leviathan in the form of an expert elite, necessitated by the general intractability of environmental issues to popular democratic choice.⁶⁴ Even with a Leviathan, of course, one might question how well agency experts manage environmental problems. For one thing, they too seem prone to the errors of statistical judgment that plague the rest of us.⁶⁵ For another, there is the question of accountability. Too much accountability makes the administrators simply second guess the elected branches, whatever the effects on the environment;⁶⁶ too little accountability, if the dismal environmental example of the former Soviet bloc is any guide, makes them careless to the point of recklessness.

Indeed, a second response to this set of environmental dilemmas is simply pessimism. James Krier, for example, who among environmental scholars has taken an early and penetrating interest in the cognitive blocks to environmental understanding,⁶⁷ often writes in a deep vein of melancholy.⁶⁸

Nevertheless, our stock of intellectual traditions may have some supplies that we might well peruse more carefully. How does one engage the attention of persons who are otherwise uninterested? How does one change people's minds about the ways they should behave, individually or as members of larger communities? Accidental events can do these things, of course; but these matters are not always left to chance. Whole fields of study like theater, literature, art, and rhetoric, are devoted to such questions, even if these studies tend to be overlooked in much environmental scholarship.

62. Bruce A. Ackerman & William T. Hassler, *Beyond the New Deal: Coal and the Clean Air Act*, 89 YALE L.J. 1466 (1980).

63. *Id.* at 1471-74.

64. WILLIAM OPHULS, *ECOLOGY AND THE POLITICS OF SCARCITY* 147-63 (1977).

65. See Tversky & Kahneman, *supra* note 10, at 1125-26 (noting that "experienced research psychologists" made common statistical errors).

66. See *Delaney v. EPA*, 898 F.2d 687, 690 (9th Cir.) (discussing EPA's argument that history of extensions showed that Congress did not actually intend clean air deadlines in statute to be draconian), *cert. denied*, 498 U.S. 998 (1990).

67. See Noll & Krier, *supra* note 9.

68. See, e.g., Krier, *supra* note 2; James E. Krier & Clayton P. Gillette, *The Un-Easy Case for Technological Optimism*, 84 MICH. L. REV. 405 (1985).

It is quite astonishing to see how strongly environmentalism has been influenced by aesthetic presentations—even though the literature of environmental policy pays relatively little attention. Ansel Adams took photos; Aldo Leopold, Edward Abbey, and John Muir told stories and wrote essays. All these people have played a considerable hand in convincing others of the value and wonder of the unowned commons of our environment. In Germany, the novels of Karl May, a writer almost unknown in the United States, have had an immense effect in shaping that country's popular understandings of the American West. By the same token, there is a good reason why photography looms so large in the environmental journals, like *Sierra* or the *Audobon Magazine*. Sometimes, following in the tradition of Ansel Adams, they use photographs of breathtaking beauty; sometimes they use pictures of heartbreaking despoliation. As was mentioned earlier, advertisers too are aware that aesthetic sensibilities have persuasive power; hence the vivid photography of "green advertising." Public broadcasting plays its part as well, with its extensive television narrations about animals and wild places.

With aesthetics and rhetoric in mind, we might reconsider the Information, Budget, and Priorities Problems, and think afresh whether a moral cloud need necessarily shadow some of the approaches that otherwise seem so promising. I argued earlier that property-rights approaches might be among the most promising with respect to the Information Problem, because property rights so often induce people to collect and weigh information carefully. Unfortunately, property has a long-standing image problem, suffering from a sometimes extraordinarily vivid association with the vices of greed and avarice.⁶⁹ Yet property also resonates to a much more positive rhetoric—that of thrift, care, and attention to the needs of potential trading partners in what Enlightenment thinkers called gentle commerce.⁷⁰ Indeed the rhetoric of stewardship and trusteeship, so commonly used in environmental discussions, are derived from property arrangements.⁷¹ The stratagems of tradeable emission or effluent rights might well be more appealing if they were to draw on these latter traditions, and if they noted the association of property with the careful husbanding of resources, as well as responsibility to others. Some people worry that property-like devices permit the rich to

69. Medieval artists, for example, sometimes depicted avarice as an ape defecating money. See Lester K. Little, *Pride Goes before Avarice: Social Change and the Vices in Latin Christendom*, 76 AM. HIST. REV. 16, 37-38, 44 (1971).

70. See ALBERT O. HIRSCHMAN, *THE PASSIONS AND THE INTERESTS: POLITICAL ARGUMENTS FOR CAPITALISM BEFORE ITS TRIUMPH* 59-63 (1977).

71. See Carol M. Rose, *Given-ness and Gift: Property and the Quest for Environmental Ethics*, 24 ENVTL. L. 1, 25-27 (1994).

perpetrate evils. But another way to think about this, as some economists already stress, is that those who use environmental resources must pay the costs, just as they must pay for privately held goods. After all, as environmentalists sometimes observe, the air and waters are property too—they belong to all of us—and property rhetoric can clarify that point.⁷²

With respect to the Budget Problem, I argued that partial or moderating approaches are especially important, not only because it is wasteful to control environmental harms beyond the threshold at which they really *are* harms, but also because controls themselves tend to increase in expense as they move from alpha to omega. The commonly used phrase “optimal pollution” encapsulates a shorthand version of these ideas. But this phrase itself is a bit of a shocker, perhaps by design, given its mix of pollution with a word suggesting good.⁷³ There are other possible phrases, however, that can imaginatively open up the important and essentially conservationist idea behind partial solutions. “Sustainable development,” for example, implies not a hands-off approach but rather a moderate use of environmental resources that is compatible with their regeneration. Agriculture is a fountain of gentle language on the subject; “husbandry” and “shepherding” convey how resources may be used for a very long time, so long as they are used with attentiveness and care. Additionally, visual imagery sometimes flags these moderating aspects of part-way controls. Partial controls over resources often involve quotas, permitting the use of environmental resources up to some threshold. Several types of physical objects—a bridge, a beach, or a road—can metaphorically convey the idea that *some* use can be appropriate, so long as the use is kept within bounds.

As to the Priorities Problem, I argued that this set of issues loops back to the Information Problem. To compare risks in a risk portfolio, people need an intellectual grip on what can be compared. Just as important, people need a sense of what the comparisons actually mean when, for example, one-in-a-million and one-in-a-trillion risks do not seem that different—both just seem really, really *little*.

Here again is where rhetoric and aesthetics may help to expand our thinking. Consider “little.” This is a word about physical size, and when

72. Older legal discussions were quite forthright about this, and talked of vindicating “public rights” in prohibiting private appropriations of such environmental resources as waterways. See, e.g., Harry N. Scheiber, *Public Rights and the Rule of Law in American Legal History*, 72 CAL. L. REV. 217, 222-24 (1984).

73. For an example of a somewhat pugnacious use of the phrase, see WILLIAM F. BAXTER, *PEOPLE OR PENGUINS: THE CASE FOR OPTIMAL POLLUTION* 5-9 (1974).

we think of a little thing, our visual imagination is likely to be engaged. One way to get through the common intuitive gap about statistics is to use pictures creatively. Edward Tufte's book, *The Visual Display of Quantitative Information*, makes this point very forcefully, and does so with wonderful illustrations.⁷⁴ Furthermore, the visual imagination can draw comparisons even without actual pictures. Most of us have encountered visual rhetorical devices many times. Take, for a recent example, the explanations telling us that if all the Defense Department's waste bullets and bombs were put in disposal trucks, the line would stretch from New York to St. Louis.⁷⁵ Former Congressman Mike McCormack, who attempted to convey the relative sizes of large numbers (millions, billions, trillions), asked his audience to imagine beads covering spaces of varying dimensions, ranging from a jar to a committee room to the State of Ohio.⁷⁶

Tufte's books on graphics take seriously the visual rhetoric behind statistical information. So should those of us who think that environmental matters are important. Many of the crucial comparisons are essentially statistical risk comparisons, and if we ordinary citizens and our legislators are to grasp their meaning and make sensible decisions about comparative costs and benefits, we must see these statistics in aesthetically comprehensible translations.

Stories give another kind of handle on the Priorities Problem. Scarcity underlies any ranking decision. We cannot have everything, and that is why we need priorities. One decision-making technique for ranking, in scenarios everywhere from grocery shopping to international strategy, is to take a kind of mental test, engaging in what are sometimes called thought experiments. That is, one spins out alternative scenarios to try out consequences and reactions of different rankings. People engage in these mental exercises almost without thinking about them. For example, consider last minute Christmas shopping. A person might imagine making several different sequences of trips to get the gifts most needed, reconsidering along the way which gifts are really most important and capable of being purchased within the short time available. Larger decisions, such as job moves, also involve such thought experiments. A person actually goes through a move in one's mind to see how

74. EDWARD TUFTE, *THE VISUAL DISPLAY OF QUANTITATIVE INFORMATION* (1983).

75. Barry Meier, *Breaking Down an Arms Buildup*, N.Y. TIMES, Oct. 15, 1993, at D1. For the importance of comparative imagery in a related context, see Peter H. Schuck, *What Do Patients Want to Know?: Rethinking Informed Consent*, 103 YALE L.J. 899 (1994).

76. See *Former Congressman's Advice to Lawmakers: Before Writing Laws, Get Your Numbers Straight*, 19 ENV'T REP. (BNA) 101 (May 27, 1988).

it "feels," and uses the results to decide whether the aspects one thinks important really are so important after all, and how they stack up against other aspects of working and living arrangements.

Use of art, stories, and drama raise an obvious objection: the threat of manipulation. Pictures and stories do carry messages, sometimes in forms that are not easily noticeable and hence, not easily rebuttable. It has been observed lately, for example, that those glorious Ansel Adams photographs are empty of people, as if the indigenous peoples who once frequented Yosemite had simply melted into thin air, leaving behind an equally thin understanding of the human relationship to what we fondly call "natural" areas.⁷⁷

But the problem of manipulation, in a way, points even more toward learning about these forms of persuasion. If it is true that narrative, art, and drama can manipulate human beings, then we especially need to take these matters seriously. Otherwise, we could be pulled this way or that quite inadvertently, particularly given the difficulty that we have in wrapping our rational thinking around subjects as abstract and distant as environmental issues. Indeed, inattention to aesthetics and rhetoric then becomes an especially serious mistake. If we fail to pay attention, we may find our aesthetic responses to environmental events exploited by advertising ploys and political hucksterism, or buffeted by accidents and the accompanying journalistic attention—the new Bhopals or the next pair of stranded whales. Then too, we may find that hard-nosed rationalists ridicule ordinary responses, pointing out the hard costs and benefits of reacting to such events while neglecting to note that at least some of these responses might reflect rational patterns of value.⁷⁸

Thus, simply as citizens, we owe it to ourselves to try to understand, sort out, and educate such responses in a conscious and reflective fashion. This, of course, was precisely the effort of the old study of rhetoric, which goes back to Aristotle and beyond, and which has been described recently as the way in which discourse may render situations determinate for purposes of action.⁷⁹ Narrative, a subject of some modern interest, is a close relative to rhetoric. This is not surprising since narrative theory

77. See Rebecca Solnit, *Up the River of Mercy*, SIERRA, Nov.-Dec. 1992, at 50, 53, 56.

78. See Hornstein, *supra* note 24, at 614-15. For the rhetoric of economics generally, see DONALD N. MCCLOSKEY, *THE RHETORIC OF ECONOMICS* (1985). For the use of scientific trappings, see *id.* at 96.

79. Amy H. Kastely, *Unification and Community: A Rhetorical Analysis of the United Nations Sales Convention*, 8 NW. J. INT'L L. & BUS. 574, 578 (1988).

can be related to the theory of action, and especially to the actions of social communities.⁸⁰

This is, of course, why it is important to study narrative, rhetoric, and, also, aesthetics. Aristotle distinguished the persuasive art of rhetoric from the scientific or logical study of dialectic.⁸¹ The distinction relates to action: People have to deliberate and act in the world on matters that may not admit of complete intellectual demonstration.⁸² Even scientists cannot demonstrate everything; they rely to a great extent on the work of others, resting on the reputation of other scientists. But reputation itself is an important element of rhetoric; as Aristotle discussed at length, listeners are more inclined to believe a matter when stated by a person of seeming probity and intelligence.⁸³

Parenthetically, this may be an appropriate point to put in a word for science education as well. Some environmental literature shows a tendency to array humanistic concerns for justice, empathy, beauty, and holism on the one side and squinty-eyed, mechanistic, domineering modern science on the other.⁸⁴ But whatever one's view of modern scientific method may be, it is important to bear in mind that knowledge of natural things often enhances one's passionate engagement in them. Otherwise, it would be difficult to understand such a pivotal environmental figure as Aldo Leopold, who was *both* a naturalist *and* a storyteller. Environmental issues call for considerable learning about the natural world, but learning also clearly has an aesthetic component: Knowing about things, on the whole, makes those things even more interesting, so that learning about the natural world can defy the usual declining demand curve and become a powerful spur to even further inquiry.

Science is important because the most important defense of rhetoric is that, in Aristotelian terms, rhetoric can most easily impart *true* opinion on the perhaps optimistic Aristotelian view that human beings incline to the truth anyway.⁸⁵ Modern cognitive psychologists dent this optimism, arguing that opinion-making heuristics lead to systematic error.⁸⁶ Even that point, however, is not so clear. The widespread preference for voluntary risks over involuntary ones, or for equal burden sharing even

80. *Id.*; see DAVID CARR, *TIME, NARRATIVE AND HISTORY* 24, 45-46, 57-65, 149-50 (1986) (relating narrative to theory of action and community).

81. *THE RHETORIC OF ARISTOTLE* 1 (Lane Cooper trans., 1932) [hereinafter *ARISTOTLE*].

82. *Id.* at 9-11.

83. *Id.* at 8, 91-92.

84. For a balanced discussion, see JOSEPH R. DESJARDINS, *ENVIRONMENTAL ETHICS* 5-12 (1993).

85. *ARISTOTLE*, *supra* note 81, at 5.

86. See Tversky & Kahneman, *supra* note 10.

at some social cost, may not be so much errors as reflections of “hard-wired” human desires. Preferences of this sort may even have some adaptive functions: the taste for equality, for example, may act as a rough form of insurance. Even the mental flattening of very large or very small numbers may be a useful form of rational ignorance in many instances where it is enough to know that something is “very large” or “very tiny.” Insofar as these flattenings are remediable by rhetorical or visual representation, we may not be dealing with systematic cognitive error at all, but rather with error in the choice of communicative media.

Environmental issues present special difficulties of cognition and attention because of their remoteness, abstractness, and distance from the ordinary attention-getting features of self-interest. Those are not necessarily reasons for despair. Rather, they are reasons to think about thinking, and about communication, about moral and aesthetic responses, and about the relations of those responses to the cooperative actions that we need to deal with common resources. Those are the matters that, among others, make environmentalism an inquiry not only of great economic importance, but also of special intellectual excitement.

