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The End of the World News

James E. Krier

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My title, but nothing else, owes to Anthony Burgess.[1] I like the ambiguity of Burgess's words. They could be a play on what an anchor says when she brings the night's news of the world to a close ("and that's the end of . . ."), or they could be the name of a doomsday periodical, or a headline announcing the bankruptcy of a tabloid, or, at the extreme, a reference to the end of the world.

For my purposes, however, they signify the end of an era.

I

> *But speculation, however brilliantly it may be carried out, is at best only a poor substitute for experience.*[2]

How is environmental policy made? More to the point, what *informs* it? I claim that, by and large, the answer to that question remains today what it has been over the last twenty-five heady years, and what it was before that. It is an answer I explained at length in an earlier study,[3] and so I shall only briefly restate it here.

Policy of any kind happens, of course, for reasons (good or bad), but reasons of various sorts, and reasons with differing influence. Political expediency is a reason, and understanding of circumstances is a reason, too. By understanding of circumstances I mean a collective vision of the policy problem at hand, a shared or dominant notion of just what it is that is wrong and needs to be fixed. Expediency, in my view, dictates policy more than does understanding; but then, what is expedient is in part a matter of what is understood (and vice versa), such that the two blend together in ways that might often be indiscernible. So concentrate just on understanding and consider how it is achieved. Once again we

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1. ANTHONY BURGESS, THE END OF THE WORLD NEWS: AN ENTERTAINMENT (1983).

2. JONATHAN SCHELL, THE FATE OF THE EARTH 21 (1982).

3. *See* JAMES E. KRIER & EDMUND URSIN, POLLUTION AND POLICY: A CASE ESSAY ON CALIFORNIA AND FEDERAL EXPERIENCE WITH MOTOR VEHICLE AIR POLLUTION, 1940-1975 (1977). Chapter 14 of that work develops the larger theory. *See id.* at 251-307. For a discussion focused particularly on my chief concern here—the production of knowledge useful to the making of policy—see *id.* at 287-95.

can think in terms of two rough categories, the first being speculation and the second being experience.

In this context speculation means learning from study and theorizing, with much reliance on models, technical experts, and scenarios projecting one or another vision of some particular phenomenon. Experience, on the other hand, means learning from actual events—events that even lay people can commonly understand. Like expediency and understanding, speculation and experience also blend into each other (events are studied); I claim, however, that in the making of policy, experience is much more salient and influential than speculation. In particular, it is usually experience that *identifies* problems in the world in the first instance; beyond that, and more importantly, it is usually experience that *reveals* shortcomings and misjudgments in our responses to the problems in the world that were themselves first identified by experience. Put another way, experience is more powerful than speculation in shaping dominant notions of just what it is that is wrong and needs to fixed—what is wrong, first, with (so to speak) the state of nature, and then what is wrong, second, with our initial sense of what was wrong with the state of nature and our initial judgment regarding what to do about it. And so on, increment by increment. "Usually," says Schell, "people wait for things to occur before trying to describe them."[4] Yes, and before trying to control them as well.

Let me give a concrete example of the process I am talking about.[5]

Southern California "discovered" the air pollution problem in the early 1940s in much the same way that other areas, such as London, England, and Donora, Pennyslvania, had discovered their own air pollution problems some time before: The problem simply announced itself, by way of a severe pollution episode. Yet notwithstanding the earlier episodes elsewhere—episodes brought on in part by exactly the sort of population growth and concentration that Los Angeles itself was suddenly experiencing in consequence of World War II—the appearance of air pollution in Southern California was regarded as a mystery. The problem in London and Donora was soft (dirty) coal, and soft coal had not been used as a fuel in Los Angeles for fifty years.

But what about gasoline? Motor vehicle registrations in Southern California had increased by fifty percent from 1930 to 1940, and vehicle miles traveled annually had without question shot up much more. It did not take a rocket scientist to figure out that there was a connection be-

4. SCHELL, *supra* note 2, at 21.

5. For an expanded account, see KRIER & URSIN, *supra* note 3.

tween gasoline combustion and pollution. Besides, Southern California had rocket scientists in abundance, scientists who as early as the mid-1940s suspected that motor vehicles were an important part of the mysterious new smog problem. But any idea of pinning the problem on cars was fiercely resisted by the public in general and the auto industry in particular. It took fifteen years to get motor vehicle controls in place—fifteen years of speculation, and fifteen years of experience.

Experience was the more important part, the better teacher, the prime source of understanding, though scientific studies also contributed. At the least, it was experience that validated studies and made them credible. Speculation sometimes explained—whether before or after the fact—what was happening, but it was the happenings themselves that moved the policy process along, and in a very characteristic way. Government officials, under considerable pressure from an aroused public and with no clear idea of exactly what else to do, attacked first the most obvious (the most apparent, the most apparently obvious) and politically vulnerable pollution sources, and then, failing that, the next, and the next, each time learning by doing. Small step by small step, with each step taken down the path of least resistance, it was not so much study as action—commonly ill-informed action—that stripped away the uncertainty surrounding the mystery of smog.

Consider, for example, that the initial reaction to the pollution episodes in Los Angeles was to put the entire blame on a single synthetic rubber plant. The plant was a plausible candidate for one reason and one reason alone—its emissions were visible—and closing it down did provide a useful piece of information: The plant was not the problem after all, because the pollution continued without the plant. So enforcement efforts turned to other stationary sources, focusing first on those that produced visible smoke emissions. Smoke (particulate pollution) had been a problem on the East Coast, so perhaps it was a problem on the West Coast as well; never mind that Los Angeles did not burn the coal that everyone knew caused the smoke back East. Like a drunk searching under a street light for the car keys lost elsewhere in the dark, pollution officials looked where they could see—ironically, in this case, in the smoke. And doing so, they once again learned something useful; not what the problem was, but, as before, emphatically what it was not. "[B]lack smoke and soot never were the real problem in this area. Re-

moving them *makes it more apparent* that there is a serious air pollution menace from invisible . . . pollutants in the atmosphere."[6]

By attacking "obvious" problems, the policy process gradually stripped away some of the mystery of smog. The rubber plant was not the cause, nor were visible smoke emissions. Nor, for all of that, were sulfur oxides, the next candidate. These were *in*visible emissions, but "it was only logical" to suspect them because they too "had been a very bad actor during eastern smog."[7] So sulfur dioxide was attacked relentlessly, to the point that total emissions of the pollutant in Los Angeles were brought down to only a fraction of the amount produced in other cities that were *free* of pollution problems. But smog persisted in Los Angeles. "It would appear," officials reported at the end of the exercise, "that the only conclusion which can be drawn is that sulphur dioxide, as a pollutant in the general atmosphere, is one of the least important contaminants in the Los Angeles smog."[8]

Speculation had suggested as much long before, but speculation was not enough. The nature of the pollution problem in Southern Calfornia was revealed by experience, not study, though study came to play a considerable part. Officials, finally realizing that they had a unique problem on their hands, started a major research effort that promptly identified the photochemistry of Los Angeles air pollution; an understanding of the photochemical reaction in turn confirmed the role of hydrocarbons, something that had been speculated about as early as 1945, if not before; and the subsequent focus on hydrocarbons led, eventually, to control of motor vehicles.

Not directly, of course; that would spoil the story. The initial hydrocarbon controls were aimed at emissions from stationary rather than vehicular sources—despite the fact that the research mentioned above implied the latter as an important contributor. But scientists differed among themselves about the auto's role, some leaning one way and some the other, and the general public was not eager to have its cars controlled. Nor were the auto companies. They capitalized on the scientific disagreement and the public resistance, asserting throughout—as tobacco companies, to mention only a single instance, were later to do in a related

6. HAROLD W. KENNEDY, THE HISTORY, LEGAL AND ADMINISTRATIVE ASPECTS OF AIR POLLUTION CONTROL IN THE COUNTY OF LOS ANGELES: REPORT SUBMITTED TO THE BOARD OF SUPERVISORS OF THE COUNTY OF LOS ANGELES 22 (1954) (emphasis added).

7. KRIER & URSIN, *supra* note 3, at 291 (quoting L. DuBridge, *Summation of Conference*, *in* PROCEEDINGS OF SOUTHERN CALIFORNIA CONFERENCE ON ELIMINATION OF AIR POLLUTION 132 (1955)).

8. *Id.* (quoting CALIFORNIA ASSEMBLY COMM. ON AIR AND WATER POLLUTION, FINAL SUMMARY REPORT 25 (1952)).

connection—that there was insufficient evidence to pin the blame on cars.

> Yet the passivity of the policy that resulted eventually provided the best proof of all, proof that simply would not yield to scientific attack or industry doubt-mongering. Smog conditions persisted—indeed, they grew worse—yet every conceivable source other than the automobile had been brought under control. . . . The conclusion was so obvious that even the industry relented. . . . The auto companies caved in (though not without qualification) by 1960. It had taken fifteen years of exfoliation to demonstrate what science had suspected in 1943-47, confirmed in 1950, and considered conclusive in 1957.[9]

Notice the word "exfoliation," chosen to describe a way of producing information not by the systematic process of study but by the *un*systematic "process of gradually exposing, layer by layer, inappropriate or insufficient responses to the pollution problem, at each stage arriving at a better understanding of what to do next."[10] By taking least steps down the path of least resistance, officials "muddled through"[11] and "learned by doing"—usually by doing the wrong thing. Had the process been more self-conscious, we could call it trial and error.

II

Plus ça change, plus c'est le même chose.[12]

Is the process I have just described a ubiquitous way of resolving uncertainty in the policy process—*any* policy process? I happen to think so, and others seem to agree, at least as to environmental policy,[13] but I wouldn't like to have to prove the thesis. Some years ago, in late 1977, I presented my work on Los Angeles air pollution to a legal theory workshop at Yale Law School. The audience did not doubt that I had accurately captured and convincingly (even conclusively) documented the

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9. *Id.* at 293.

10. *Id.* at 289.

11. *See* Charles E. Lindblom, *The Science of "Muddling Through"*, 19 PUB. ADMIN. REV. 79, 81 (1959) ("A succession of comparisons greatly reduces or eliminates reliance on theory."); Charles E. Lindblom, *Still Muddling, Not Yet Through*, 39 PUB. ADMIN. REV. 517 (1979).

12. ALPHONSE KARR, LES GUÊPES (1849), *quoted in* JOHN BARTLETT, FAMILIAR QUOTATIONS 443 (Justin Kaplan ed., 16th ed. 1992) (translation: The more things change, the more things stay the same.).

13. *See, e.g.*, WILLIAM OPHULS & A. STEPHEN BOYAN, JR., ECOLOGY AND THE POLITICS OF SCARCITY REVISITED 244-46 (1992).

Los Angeles story, nor did it question my suggestion that much the same could be said of a number of other cases of environmental policy making, whether in the United States or abroad, that had by then been reported. I was challenged by one participant, however, to "generalize" the idea of exfoliation, to marshal the evidence for a global account, with global meaning not only other countries but other problem contexts as well. Having spent some half-dozen years on the Los Angeles epic alone, I had no desire to devote the rest of my life to a massively larger project. But my intuition was and still is that exfoliation, or muddling through, or learning by doing, or trial and error, is pretty much the name of the policy game, and necessarily so, thanks to stark limitations in human cognitive capacities coupled with a scarcity of time, energy, and other resources. Taken together, these drive us to proceed as we do, relying on salient happenings to set priorities among the countless list of entries on the agenda of social problems, working piecemeal and clumsily, traveling the easy path, learning from mistakes that themselves make for more salience, starting over, but not quite, because now we know a little bit that we didn't know before.[14]

I believe that any reader who plants such a thought in his or her mind as a working hypothesis will find it confirmed with frightening, though actually unsurprising, regularity. I wish I had been gathering cases in point all these years, rather than simply noting them and letting them go. Unhappily, I have started doing so only lately, for purposes of this Essay. I share a few instances now, just by way of little accounts from the newspapers, because the events in question are well known.

(1) Brush fires are as familiar to Los Angeles as air pollution, and seemingly as difficult to control. One would think that by now officials would have the matter in hand, would have planned for the worst, would have anticipated every path to disaster, and would have taken all feasible steps, but it seems they have not. So the *Ann Arbor News* of November 3, 1993, reported this:

> Interviewed this morning on ABC television, Interior Secretary Bruce Babbitt said officials will need to examine laws on building in canyons, perhaps requiring better brush clearance and different zoning. "It's a tough problem and we obviously

14. On salience and related phenomena in the context being addressed, see Roger G. Noll & James E. Krier, *Some Implications of Cognitive Psychology for Risk Regulation*, 19 J. LEGAL STUD. 747 (1990).

have to figure out how to better manage it," he said in Washington.[15]

(2) Everybody knows about Florida's problems with foreign tourists—actually, foreign tourists' problems with Florida—and officials have taken every precaution they could think of. Unfortunately, they could not think of them all, and a Mr. Colley was murdered at a highway rest area:

> Mr. Colley's death . . . was the second of a foreign tourist in Florida in less than a week and the ninth since last October. James T. Moore, director of the Florida Department of Law Enforcement, . . . defended the security measures in place on Florida highways before Mr. Colley was shot. "How many places can we guard?" he asked. "We had no reason to think we should deploy scarce resources at rest areas, because there was not a problem there. Now there is a problem."[16]

Readers might think that these examples are unfairly critical. How could officials be expected to anticipate with much precision the behavior of the next breakout of fires, the next move of arsonists in Southern California or the next attack of muggers in Florida? But that's just my point: They couldn't, any more than could the officials trying to cope with the onset of air pollution in Los Angeles. The officials probably did the best they could given what they knew and what they did not and what time and resources they had available to devote to one of a host of pressing tasks. And, doing the best they probably could, at least they learned from experience (call it failure); they learned "there is a problem." People died, to be sure, but that's not the end of the world!

(3) Here is a final example, from the *New York Times*:

> Global warming is not a cut and dried issue, and scientific experts are still debating most of its aspects. . . . A substantial number of highly regarded climate researchers have long believed that global warming set off by industrial and automotive emissions is a real possibility that could have serious consequences sooner or later. But they cannot say exactly how severe the effects of the warming will be or when it will come.

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15. Michael White, *Fire Winds Bring Hell to Malibu*, ANN ARBOR NEWS, Nov. 3, 1993, at A1.

16. Larry Rohter, *Florida, Fearing for Tourism, Offers Assurances on Safety*, N.Y. TIMES, Sept. 16, 1993, at A1.

> And very few climatologists are ready to declare that global warming has begun.[17]

III

A perfect illustration of the potential dangers of muddling through is our approach to global warming.[18]

Whether it was speculation or experience that led to the first concerns about global warming I am not sure. In any event, a far more interesting question is whether speculation or experience will be the prime mover behind global-warming policy from here on out (if there is an out). And in this connection it appears that we are doing business pretty much as usual, or so I gather from the account in the *New York Times* about the global-warming debate.[19] On one side of the debate are some environmentalists and politicians who warn "of climatic apocalypse"; on the other side are those who argue that the likelihood of harm from warming in the foreseeable future is " 'ludicrously small,' " to use the words of a 1993 book published by the Cato Institute.[20] "In the midst of this," asks the article in the *New York Times*, "whom is the public to believe? . . . Are the chances of harm 'ludicrously small' or all too great?"[21]

Those are interesting questions, and one has to wonder how they will be answered. Notice I focus on the "how" of the matter, not the "what." Whatever the truth regarding global warming, a pressing concern has to be whether it will be revealed chiefly by speculation, or rather, and more characteristically, by experience. Here it is worthwhile to quote from the *New York Times* at length:

> There are two undisputed facts about global warming: first, carbon dioxide, the waste gas produced by burning coal, oil and wood, has been accumulating in the earth's atmosphere over the last century; and second, the gas traps heat that is produced when the sun's energy is absorbed by the earth and then re-radiated.

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17. William K. Stevens, *Scientists Confront Renewed Backlash on Global Warming*, N.Y. TIMES, Sept. 14, 1993, at C1.

18. OPHULS & BOYAN, *supra* note 13, at 245.

19. *See* Stevens, *supra* note 17.

20. *Id.* at C1 (quoting BEN W. BOLCH & ROBERT D. MCCALLUM, APOCALYPSE NOT: SCIENCE, ECONOMICS AND ENVIRONMENTALISM (1993)).

21. *Id.* (quoting BEN W. BOLCH & ROBERT D. MCCALLUM, APOCALYPSE NOT: SCIENCE, ECONOMICS AND ENVIRONMENTALISM (1993)).

> Given those physical facts, the practical question of interest is how much the earth's climate will heat up after injection of a given amount of carbon dioxide. Since no experiment can answer that question, other than the global one now in progress, scientists have turned to their next best method, which is to simulate the earth's climate system in a series of equations that are run on a supercomputer. This exercise, known as computer modeling, is somewhat contentious because the models are far from perfect and represent a simpler, stripped-down version of the earth's real climate.[22]

The article goes on to say that the best computer models predict a doubling of atmospheric carbon dioxide by the year 2100, absent remedial action; this in turn would raise average global temperature by about the same amount again as the earth has warmed since the last Ice Age. A United Nations panel and several committees of the National Academy of Sciences have consistenly found merit in the global-warming theory, which has also enjoyed some recent empirical support: Geological evidence of carbon dioxide levels in two ancient climates, one known to be much warmer than today's and the other much colder, suggests a relationship betweeen warming and carbon dioxide levels that "agrees well with the best estimate from the computer models."[23]

Critics nevertheless attack the theory and the predictions on a variety of grounds, such as poor measurements, counter-evidence, and the possibility that the climate may behave differently now than it did in the remote past. The critics also enter a plea in the alternative, much as did the auto companies in the Los Angeles air pollution story. The auto companies claimed, in essence, that motor vehicles weren't a problem, and that if they were they weren't a big problem, and that if they were the companies could not yet do anything about it.[24] So, on the question of global warming, "[s]ome critics contend that even if the atmosphere does heat up, the warming will be benign, . . . a boon, not a catastrophe."[25]

"Where," asks the *New York Times*, "does all this leave the debate?"[26] I worry that it leaves it up in the air (no pun), where it will remain until some climactic event brings the problem to earth. As with Southern California's air pollution problem some fifty years earlier, it

22. *Id.*
23. *Id.* at C6.
24. *See* KRIER & URSIN, *supra* note 3, at 86-89, 259-60.
25. Stevens, *supra* note 17, at C6.
26. *Id.*

appears now, in the case of global warming, that speculation is not providing sufficient salience to move policy along. This in turn implies that global-warming policy might instead have to develop through a process of exfoliation.

The trouble is that that process does not seem to fit this problem. It did fit the other problems I have discussed—pollution and fires in Southern California, tourist muggings in Florida—primarily because those were *local* problems. Localization helped to contain error costs; mistakes exacted a painful but tolerable price in exchange for what was learned. But will this be true as well of *global* warming and ozone depletion and toxic chemicals and the destruction of ocean fisheries and tropical rain forests? I am not saying that in instances like these, mistakes will mean the end of the world. They might, however, mark the end of an era, the end of a long, long period during which we could afford to rely on experience to guide us through uncertainty.

In the past the world reported back, and so it will in the future, but at what price? And will the feedback we get from the world be timely and useful, or too much and too late? The end of the world is not the point. The end of the world news is.

IV

> *The human species is, in a word, an environmental abnormality. It is possible that intelligence in the wrong kind of species was foreordained to be a fatal combination for the biosphere. Perhaps a law of evolution is that intelligence usually extinguishes itself.*[27]

In his famous article on social cost, Ronald Coase referred to air pollution as "the smoke nuisance."[28] This was only thirty-some years ago, and yet in that space of a single generation our sense of environmental problems has changed dramatically, as the term "global" itself suggests. Lynn White, Jr., a medieval historian, puts the matter this way:

> [T]he impact of our race upon the environment has so increased in force that it has changed in essence. When the first cannons were fired, in the early 14th century, they affected ecology by sending workers scrambling to the forests and mountains for more potash, sulfur, iron ore, and charcoal, with

27. Edward O. Wilson, *Is Humanity Suicidal?*, N.Y. TIMES MAGAZINE, May 30, 1993, at 24, 26.

28. Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 18 (1960).

> some resulting erosion and deforestation. Hydrogen bombs are of a different order: A war fought with them might alter the genetics of all life on this planet. By 1285 London had a smog problem arising from the burning of soft coal, but our present combustion of fossil fuels threatens to change the chemistry of the globe's atmosphere as a whole, with consequences that we are only beginning to guess.[29]

The sociobiologist Edward O. Wilson sees the same transformation. He speaks of a "long stretch of evolutionary time, during which [little attention had to be paid to] . . . [d]isasters of a magnitude that occur only once every few centuries"; these could be, and were, "forgotten or transmuted into myth."[30] But, says Wilson, the "rules have recently changed," such that "[g]lobal crises are rising within the life span of the generation now coming of age . . . ."[31]

Wilson has in mind a familiar list of problems (interestingly, it is a much longer list than that of White, who wrote a quarter century earlier): population growth and accompanying resource scarcity, ozone depletion, global warming, and, most generally but also most particularly, massive extinction of habitats and species. "The ongoing loss" of biosphere, he reports, "will not be replaced by evolution in any period of time that has meaning for humanity."[32] Evolution, in fact, has been a kind of enemy; it may be "that people are programmed by their genetic heritage to be so selfish that a sense of global responsibility will come too late."[33] As Wilson explains this view,

> The brain evolved into its present form during [a] long stretch of evolutionary time, during which people existed in small, preliterate hunter-gatherer bands. Life was precarious and short. A premium was placed on close attention to the near future and early reproduction, and little else. . . . So today the mind still works comfortably backward and forward only for a few years, spanning a period not exceeding one or two generations. Those in past ages whose genes inclined them to short-term thinking lived longer and had more children than those who did not. Prophets never enjoyed a Darwinian edge.[34]

For all of this, Wilson sees "reasons for optimism":

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29. Lynn White, Jr., *The Historical Roots of Our Ecological Crisis*, 155 SCI. 1203, 1203-04 (1967).

30. Wilson, *supra* note 27, at 26.

31. *Id.*

32. *Id.* at 29.

33. *Id.* at 26.

34. *Id.*

> We are smart enough and have time enough to avoid an environmental catastrophe of civilization-threatening dimensions. But the technical problems are sufficiently formidable to require a redirection of much of science and technology, and the ethical issues are so basic as to force a reconsideration of our self-image as a species.[35]

Not easy matters, those, and notice in any event that Wilson's optimism—based largely, though not entirely, on his view that we are entering the "Century of the Environment," marked already by a Rio Conference, a "Warning to Humanity" issued by an international group of scientists, and a "greening of religion"—entails not a happy future but rather just a future. The end of the world is not necessarily at hand, and mankind is not "suicidal." "Yet the awful truth remains that a large part of humanity will suffer no matter what is done."[36]

What exactly are the central characteristics of the new environmental problems, problems that have moved an intelligent man to connect unavoidable calamity with a word, "optimism," that we usually regard as upbeat?

All of them can be aptly expressed in terms of *scale*—spatial, temporal, and consequential. Regarding the first dimension, modern environmental problems are commonly global, not local or even national as before; they are large-scale problems. As to the second dimension, time, modern problems are marked by both contraction and expansion—contraction because ongoing exponential growth in both a huge population and a huge technological base increases the rate at which problems develop,[37] and expansion because of long latency periods in some instances and long recovery periods in others. Long latency time is typical of many cancers; thirty years might stand between a toxic chemical dose and a malignant tumor response. As to long recovery time, a good example is global warming: "[W]hatever climatic effect it has will not be reversed in several human lifetimes."[38] The third dimension has to do with worst cases, which could be, as Wilson has indicated, catastrophic, essentially irreversible, and—to get back to where we began—worldwide in their impact.

These characteristics are interesting for any number of reasons, the most important, for present purposes, having to do with the exfoliation

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35. *Id.* at 27.

36. *Id.*

37. *Id.* at 26-27.

38. Stevens, *supra* note 17, at C6; *see also supra* text accompanying note 32 (discussing lengthy replacement time for loss of biosphere).

process, or trial-and-error decision making. "The reactive technique of trial-and-error is useful only to the extent that information generated by one (successful or unsuccessful) experiment can be considered and exploited in a subsequent one."[39] The trouble is that with many present-day environmental problems,

> the potential to learn from error is simultaneously the potential to bring about catastrophic consequences. Errors might in any event be of little educational value, thanks to latency. Latency means that what we learn, we learn late. This promotes irreversibility and limits opportunities to correct mistakes through a relatively quick series of many trials.[40]

How are we to proceed in dealing with very risky, very uncertain situations, situations that defy the convention of muddling through? The standard advice is "prudence." In a case like global warming, for example, "lack of certainty should not stand in the way of prudent steps to control greenhouse gas emissions."[41] But "prudence"—or, to use another watchword of the day, "precaution"—is not so easy to identify and achieve, given the very high stakes of modern environmental ills. Take again the case of global warming. The National Resource Council says that "despite the great uncertainties, greenhouse warming is a potential threat sufficient to justify action now."[42] True, but as the account in the *New York Times* observes, "How much action, what kind and how soon is an economic and political issue of great consequence in a world that runs on the burning of fossil fuels."[43] In other words, given the consequences of *any* decision regarding global warming, what really is the prudent course?

In an article written some years ago, Jon Elster addressed this question in a context almost identical to ours, his purpose being "to illuminate the structure of the choice between alternative modes of energy production that most Western societies face at the present time."[44] Ob-

39. Clayton P. Gillette & James E. Krier, *Risk, Courts, and Agencies*, 138 U. PA. L. REV. 1027, 1107 (1990).

40. *Id.* Notice in addition that latency frustrates the chances of natural selection to identify reliable prophets; by the time we learn some forecaster was wrong, the forecaster is long gone. *Id.* at 1108. For additional discussion of the general points made in the text, see James E. Krier & Clayton P. Gillette, *The Un-Easy Case for Technological Optimism*, 84 MICH. L. REV. 405, 427-28 (1985).

41. Stevens, *supra* note 17, at C6.

42. *Id.*

43. *Id.* On the same page, Stevens concludes his story: "Proponents of the greenhouse theory therefore need not be surprised at the intense fire now being rained down on their ideas." *Id.*

44. Jon Elster, *Risk, Uncertainty and Nuclear Power*, 18 SOC. SCI. INFO. 371, 371 (1979).

serving that it is impossible to know what will actually happen in the world if we choose nuclear over conventional fossil fuel, he argues that our objective—given the gross uncertainty—should not be to maximize expected utility but rather to maximize minimal utility, which is to say minimize regret by avoiding the worst worst case. Thus analyzing the matter, he concludes that "nuclear power has the worst worst-consequence"[45] (global nuclear war), "that fossil power has a somewhat better worst-consequence"[46] (reversible or at least arrestable heating of the atmosphere), and that the "best worst-consequence belongs to an option that at present looks politically impossible, the no-growth economy."[47]

Elster was writing in 1979, when things looked rather different than they do today. A no-growth economy is no more likely now than it was then (probably it is less so), but the threat of nuclear war is arguably less, and, most to the point, the assumption of reversible global heating now appears to have been too easily made. In essence, then, Elster managed to beg our question away. The worst-case alternatives he saw as asymmetrical fifteen years ago look symmetrical today.[48] So how do we pick the prudent path, other than by trial and error?

V

If this be error, and upon me proved, I never writ . . . .[49]

As much as any analyst hopes to be right, I hope to be wrong, and well I could be in various respects: Perhaps the costs of global errors will not be so high as I and others (like White and Wilson) worry they might be; or not so symmetrical in the context of opposing worst-case consequences, such that prudent courses of action can in fact be identified; or maybe exfoliation is not as ubiquitous as it seems to me it is; or even if it is, presumably this could change; or something else. It might be, for example, that I have committed an error of my own, a category mistake. Perhaps *plus ça change* is more apt than I have supposed, and today's ills

45. *Id.* at 389.

46. *Id.*

47. *Id.* at 390.

48. *See* MARY DOUGLAS & AARON WILDAVSKY, RISK AND CULTURE: AN ESSAY ON THE SELECTION OF TECHNICAL AND ENVIRONMENTAL DANGERS 21-23 (1983) (commenting on Elster's analysis); James E. Krier, *Risk and Design*, 19 J. LEGAL STUD. 781, 786-89 (1990) (discussing symmetry problem). In this same connection, it is interesting to compare Jonathan Schell's description of a postnuclear-war world, SCHELL, *supra* note 2, with E.O. Wilson's description of a postenvironmental-catastrophe world, Wilson, *supra* note 27. They sound the same. In any event, Elster thinks that "politicians may not be much swayed by considerations" of the sort he discusses. Elster, *supra* note 44, at 393.

49. WILLIAM SHAKESPEARE, SONNET 116.

are really no worse, after all, than what yesteryear's were incorrectly thought to be. A case in point is the crossbow, a weapon whose power was so frightening that it was banned by the Roman Catholic Church in 1139, except for use against infidels.[50] Now the Catholic Bishops ban the bomb, at least for use against cities.[51] Nuclear weapons today, crossbows long ago, it's all the same. *Plus ça change*, and so on.

I hope so, because otherwise I see neither solace nor substitute for the end of the world news. We could proceed to make policy by the equivalent of a coin flip, on the principle of insufficient reason, but it seems bizarre to let random luck decide our destiny (which of itself provides a *sufficient* reason to do otherwise). We could turn to mystery and ritual, as did our distant ancestors—could if we had not already. The primitives had shamans, which we call risk assessors; they had totems, and we have science, progress, and technological wonders; they had taboos, but so do we;[52] and despite all of these we still have our modern predicament.

Or might we instead hope for healthy norms to develop, norms by which all would behave more kindly toward each other and the globe? On one account such norms are provoked by salience,[53] and on another account they depend on small, tightly knit groups.[54] But salience is what we want norms to avoid, and small groups imply local action, which in turn implies massive externalization, only assuring that problems will be made global rather than contained. Think global/act local is a nice sentiment, but not a nice solution. Think local/act local is the more likely outcome.

So I hope I am wrong, but if I am not, I hardly expect anyone to notice. My self-indulgent footnotes are meant to indicate that I have said before virtually all that I've said here. Yet I know from casual polling that readers of my work, even students of it, have simply not *seen* the argument. It is one thing to disagree, another not to see. Have I been obscure? I think not. I think the problem is that I have no solution

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50. *See* BARBARA W. TUCHMAN, A DISTANT MIRROR: THE CALAMITOUS 14TH CENTURY 86 (1978); Lynn White, Jr., *Technology Assessment from the Stance of a Medieval Historian*, 79 AM. HIST. REV. 1, 5 (1974). For an argument that the ban on crossbows was motivated by other than moral concerns, see JAMES TURNER JOHNSON, JUST WAR TRADITION AND THE RESTRAINT OF WAR 124-31 (1981).

51. *See* JONATHAN SCHELL, THE ABOLITION 80 (1986).

52. *See, e.g.*, DOUGLAS & WILDAVSKY, *supra* note 48, *passim*.

53. KRIER & URSIN, *supra* note 3, at 269-72.

54. ROBERT C. ELLICKSON, ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES *passim* (1991).

ready at hand, so cognitive dissonance sets in. (This Essay should be the acid test of *that* proposition!)

In any event, the paradox of my position is apparent, for what I do is speculate and theorize about the limits of theory and speculation. By my own account, only experience will drive the point home, whatever the point happens to be. "Experience gives us facts," writes Jonathan Schell, "whereas in pure speculation we are thrown back on theory, which has never been a very reliable guide to future events."[55] According to this I am probably right, and therefore most likely wrong.

55. SCHELL, *supra* note 2, at 21.