management cannot easily replicate the tort law's claims-processing mechanisms. For the time being, the legal situation is likely to continue with common law as an active and tangible element in most toxic exposure cases, with supplementary overlays from the public law system. Or is it vice versa?

Section 2. **RISK MANAGEMENT CONCERNS**

In an influential article, excerpts of which follow, Peter Huber (of the "junk science" debate, previously discussed in this chapter) argued that private tort law should be supplanted by a system of public law administered by expert agencies. In his view, tort claims wrongly fixate on public risks, which are only one part of society's risk "portfolio," and this fixation often backfires by increasing total risk through discouraging public risks. As you read the article, consider what Huber might have to say about the comparative advantages of public and private law in the Woburn case.

Peter Huber, Safety and the Second Best: The Hazards of Public Risk Management in the Courts

85 Columbia Law Review 277, 277–281, 301–307, 329–337 (1985)

The devastating chemical plant tragedy in Bhopal, India will do little to reassure skeptics about the advantages of technological innovation and development. Those who already view the chemical, nuclear, pharmaceutical, and other high-tech industries with profound suspicion and fear can now point to the 2200 dead of Bhopal as martyrs to unbridled technological tyranny. And Bhopal will henceforth serve as the shrine of Nemesis for those who would defend the value of high technology.

But Bhopal is only one painfully vivid example in a much larger, longstanding legal debate in this country. The debate reflects a deep division among legal commentators regarding the role of mass production and technological change in the improvement of social welfare. Long before Bhopal, the standard diagnosis in many judicial opinions and in much of our scholarly legal literature has been that our society produces too much "public" risk, through its excessive or unwise use of dangerous new technology and the tools of mass production. The standard prescription has been for lawyers to do something about it. This article argues that the diagnosis is probably wrong, and that the prescription should certainly be rejected.

The legal debate about risks is very much a debate about "public" risks. These are threats to human health or safety that are centrally or mass-produced, broadly distributed, and largely outside the individual risk bearer's direct understanding and control. Public risks usually derive from new or especially complex technology — they are the hazards of large-scale electric power plants, air transport in jumbo jets, mass-produced vaccines, chemical additives and contaminants in food, or recombinant-DNA technology. For many lawyers, "advancements" such as these arouse deep suspicion and concern. "Private risks," by contrast, are discretely produced, localized, personally controlled, or of natural origin. They are the risks of cottage industries, wood stoves, transportation by car, or exposure to natural toxins or pathogens. Typically, private risks arouse little anxiety among legal commentators.

The legal system's almost obsessive preoccupation with public risks is, in my view, entirely misguided.[43] I wish to develop this argument soberly; there can be no technological arrogance in

43. [Particularly at the outset, Huber is responding to the work of commentators who argued that public risk is being overproduced. Two articles in particular provoked Huber's attacks: Yellin, High Technology and the

the shadow of Bhopal. But the facts and the regulatory arguments seem plain nonetheless. First, public risks are progressive — they improve the overall state of our risk environment — whenever the incremental risk created is smaller than the quantum of existing privately-created risk that is displaced. The point may seem obvious, but the fact that a large number of judges and legal commentators ignore it suggests otherwise.

Second, the judicial system is, for a variety of reasons, incapable of engaging in the aggregative calculus of risk created and risk averted that progressive public-risk management requires. While it is not my goal to replace an absolutist's aversion to public risk with an absolutist's embrace of it, I will argue that the judicial role sought (and achieved) by many commentators is imprudently biased against many progressive, risk-reducing (though still risky) technologies. This bias significantly hinders our progress towards a healthier, safer environment.

My arguments grow out of a single paradox of the risk economy: greater private safety is often to be found in the greater acceptance of public risk....

The Attack on the Windmill... How much public risk is too much? And who shall decide how much is too much? Most of the legal debate revolves around these two questions. For many legal scholars and judges, the answer to the first question is almost self-evident: we currently bear more public risk than we should, because we have been too ready to accept the hazards of new or mass-production technology. Answers to the second question tend to be longer and more varied, but most have the same general thrust: lawyers and judges are well positioned to assess the problem and supply the additional deterrence that is so plainly needed. It is this pair of answers (both of which are, in my view, quite wrong) that this Part describes....

Excess Public Risk... Life is already unacceptably hazardous, and likely to grow more so as the result of excessively rapid and overwhelming technological change. This is the common starting point in much of the legal commentary. How is the point to be proved? First, by referring to the public's aversion to public risks. Second, by reciting the myriad public terrors already in our midst. Third, by developing the microeconomic and philosophical underpinnings of a case against means of production that entail public hazards.

Lawyers opposed to public risks are in good company. The public consensus, if there is one, seems to be that risk-taking, like abortion, religion, travel, or marriage, should be a private affair. Indeed, consumer hostility to public risk is matched only by consumer affection for private risk. Illustrations of this division of preferences abound. The aerial spraying of malathion in a California program to combat the Mediterranean fruit fly provokes passionate opposition, but consumers eagerly spray tens of thousands of gallons of the same pesticide in their own, private gardens. A proposal to vent small amounts of radioactive gas and water from the damaged nuclear reactor at Three Mile Island in the course of cleaning up that facility — a comparatively minuscule investment in public risk with clear risk-reducing benefits — causes panic. But a proposal to ban saccharin — a proposal to curtail, as these things go, a fairly substantial investment in comparatively "private" patterns of risk taking — precipitates what was described in the New York Times as panic buying of the sweetener. Mass aircraft accidents arouse great concern, and the mandatory use of seat belts in planes is accepted without a murmur. But in the much more hazardous private-risk environment of automobile travel, seat belt interlock systems or mandatory seat belt laws encounter vociferous consumer opposition. Mandatory vaccination programs are vigorously attacked in the courts, but individuals also come to court to insist on

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Courts: Nuclear Power and the Need for Institutional Reform, 94 Harv. L. Rev. 489 (1981), and Rosenberg, The Causal Connection in Mass Exposure Cases: A Public Law Vision of the Tort System, 97 Harv. L. Rev. 851 (1984).] [Eds.]

their right to be treated with medical quackery of every description, apricot pits providing a recent and much-publicized example.

Panic, protest, and organized resistance thus greet almost every venture that entails new public risk. Meanwhile, efforts to restrain private risk-taking are denounced as grave attacks on personal freedom. Some litigants have seriously maintained — and some courts have agreed — that the Constitution itself enshrines both the right to bear a private risk and the right not to be exposed to a public one. In short, shared risks, like shared goods, are thought to be almost un-American — a collectivist affront to individual autonomy and self-reliance.

The layperson's aversion to public risks is shared by much of the legal community. Lawyers, for the most part, are convinced that there is too much public risk out there, and they generally begin their indictment of public risks by citing some that they especially dislike. Professor Yellin, for example, uses as his paradigm case the hazards of generating nuclear power, but he also points to chemical pesticides, air and water pollution, occupational hazards, and "complex environmental decisions" of every description — the "ominous, not yet fully understood risks to public health [that] involve decisions that may seriously alter our physical environment." Professor Rosenberg's concern centers on similar targets: the risks accompanying "the production, distribution, marketing, consumption, and disposal of toxic agents." He lists as examples "asbestos, Agent Orange and Agent White, Three-Mile Island, dioxin, and a string of acronyms — DES, PCB, PBB and IUD," drugs, and aircraft disasters. Numerous other commentators have similar lists of concerns, and all supply citations to cases in which judges and juries have echoed these fears.

It is easy enough to clothe a visceral aversion to public risk in the robes of market efficiency or social justice. So easy, in fact, that the exercise has become quite reflexive and mechanical in much of the legal literature.

To the lawyer qua economist, risk is a cost — the cost of confining, disposing of, or simply coexisting with hazardous matter or energy. The cost can, of course, vary enormously, depending on how wisely a particular hazard is managed. It is nevertheless ascertainable. As with all other costs, the lawyer-economist will contend, the creator of a risk must shoulder it if markets are to operate "efficiently." A producer of risk who is not held strictly accountable for the unconsented-to consequences of that risk will generate risk in socially undesirable amounts. The result will be a market failure. Or so the story goes.

The lawyer qua philosopher may reach similar conclusions about public risks on somewhat different grounds. Our libertarian, individualistic, political ideal forbids one person from imposing unconsented-to burdens on another. Burdens that take the form of external threats to health or safety are especially objectionable intrusions on the risk bearer's private space and personal autonomy. Like the lawyer-economist, the lawyer-philosopher is therefore opposed to external risk. The mass producer of a dangerous good, or the operator of a hazardous power plant, acts antisocially. Her conduct is worse than economically inefficient — it is morally wrong. Or so the story goes.

Arguments along these lines are wheeled out, with pedestrian regularity, by those opposed to everything from nuclear power to synthetic sweeteners. Absent the risk bearer's individual, fully informed, and entirely free consent, any activity that creates public risk is, pro tanto, both a threat to market efficiency and an infringement on the just entitlements of the risk bearer. Public risks are an absolute bad. We want as few of them as possible.

The Judicial Role... Though there is somewhat less unanimity about precisely why it is that a nation with a large and powerful government, fifty autonomous state governments, and 650,000 lawyers, has apparently allowed public-risk technology to run so wild, the consensus is that the

existing, agency-centered system of risk regulation inadequately deters the production of public risk. Help from the legal community is therefore in order. It may come before the accident, or after it, but in either event its thrust should be to discourage new dangerous technologies and the instrumentalities of mass-produced risks. Professor Yellin's and Professor Rosenberg's proposals typify the two larger schools of thought.

Professor Yellin urges the courts to improve pre-accident decision-making. He advocates closer judicial scrutiny of "broad new regulatory departures." When an agency approves a novel technological venture that entails new public risk, the courts, suitably advised by "a committee of scientists, engineers, and lawyers to act as standing masters," should supply a "second" (read "final") opinion.

Professor Rosenberg, for his part, suggests a greater degree of judicial intervention after the public risk has been approved and is in place. The courts, again advised by "court-appointed experts, special masters, and blue-ribbon juries," should impose tort liability on public risk creators sooner, more often, and in larger amount. To this end, the cost of risk itself, rather than consummated injury, is to be made compensable — when, and only when, it is a "public" or "mass exposure" risk. Questions of legal causation are to be resolved under a relaxed "proportionality" rule, that will hold risk creators liable for the proportion of total injuries attributable to their activities, even when no single plaintiff can accurately claim that her injury was, more likely than not, caused by the defendant's conduct.

The Yellin and Rosenberg prescriptions are complementary in their intended effect on activities that create public risks. More before-the-accident review and stricter after-the-accident liability are mutually reinforcing responses to the same perceived problem — the excess creation of public risks. At first blush, it is hard to think of any reason not to applaud. Indeed, many do, by citation to or by development of Yellin's and Rosenberg's proposals….

[Eds.—Major portions of the article are omitted here, including a segment in which Huber presents a case study of how vaccine development and use has been greatly overdeterred by the cost of paying damage awards to injured victims of the vaccine. Also omitted is a segment that argues against treating damage awards against public risk producers as desirable cost internalization. To internalize those costs, Huber argues, in the absence of imposing corresponding costs against natural risk producers, such as disease, leads to a distortion of risk consumption. He invokes the theory of second best in favor of noninternalization of public risks stating, "patchy, erratic risk internalization may impose greater costs on the safer substitutes within particular markets, and so may encourage a shift in consumption to the more hazardous." Huber claims that the morality of public risks also must be judged with reference to the private risks they retire, not merely on the basis of harms they may inflict. To prove that changes in lifestyle associated with public risk-creating behaviors have made life safer in the aggregate, Huber invokes evidence of decreasing mortality and increases in life expectancy in the last several centuries. He then argues more narrowly that the degree of capitalization and expertise surrounding most public risk ventures are likely to make them more safe than the private risk counterparts that they displace.]

On close, objective examination one almost invariably discovers that public risk alternatives provide goods and services with less risk (per unit of good) than the private-supply substitutes. The reasons are not difficult to discover. Large, centralized, capital-intensive production facilities are easier to operate safely than their small, distributed, labor-intensive alternatives. The very characteristics of mass production and distribution that make public risks possible in the first place also make mass production inherently safer than the private-production alternative. The central- or mass-producers can and do deliver goods and services with much less attendant risk than distributed- or discrete-producers (including Nature) possibly could....

The Judicial Role in Managing Public Risks... The second large question in the public risk debate follows naturally from the first; who should decide how much public risk is enough? Since some measure of public risk is not only inevitable but desirable, some institution must be directed to define the measure and specify its ingredients....

Public control of public risks is therefore necessary, both to prevent the excess generation of public risk and to make possible the acceptance of as much public risk as is socially desirable. The government regulator, a single, central decision-maker, acts as the consumers' collective "broker" in a particular risk market. The regulator — whoever it may be — must perform at least two tasks. One, of course, is to reject unfavorable investments in public risk. The regulator has the resources to proceed against creators of unacceptable public risks. Here we have the more familiar regulator, government, saying "no," placing limits on the risks individuals may create.

But the regulator's second function is to acquiesce in risk creation. To represent his principal effectively, a broker in a risk market, like a broker in any other setting, must be able to buy as well as to sell. A centralized risk-regulatory system must not only reject bad public risk choices but also supply the public's consent to good ones. This is most clearly illustrated in comprehensively regulated industries such as those producing electric power, drugs, pesticides, and many other products of modern technology. In these areas, risk creators start with no freedom to do anything at all until they receive express regulatory permission. The nay-saying regulatory role then effectively disappears; the regulator's task is to serve as a retail deregulator, giving case-by-case consent to new ventures that entail public risks.

The administrative agencies are, of course, the more familiar regulators, wielding authority over public risks of every variety. But the courts are also vigorous regulators, and it is their role that most concerns me here. The courts are pivotal actors in the prospective approval of new technological ventures. They possess considerable authority to review agency approvals of new sources of risk, whether the risk involves a new vaccine, power plant, pesticide, or food additive. And in areas not subject to comprehensive administrative regulation the courts can use injunctions to act as first-tier gatekeepers of the risk environment. The courts are also heavily engaged in the retrospective regulation of public risks. Damage actions sounding in nuisance, negligence, strict liability, and absolute liability are powerful instruments of regulation. Indeed, the legal community invented the "emission fee" for dealing with hazards such as pollution long before the economists had much to say about it. Every risk creator and every risk bearer knows that the damage action, and most particularly an action seeking punitive damages, is potent medicine for regulating public risks.... [Huber's specific attacks on the judicial system as regulator are omitted.]

Private Injury and Public Safety: The Courts and the Agencies... My discussion in the previous Part brings me to two conclusions. First, governmental control of public risks is both necessary and useful. Many public risks should be excluded if they are not yet a part of our environment, or controlled if they already are. Government regulation, moreover, is also needed to fulfill the second half of the regulatory function — to supply our collective consent to public risks that are judged to be good risk investments. Second, the courts are institutionally predisposed to favor regressive public risk choices. The courts systematically prefer old risks to new ones and discretely produced or natural hazards to mass-produced substitutes, and have neither the inclination nor the expertise to distinguish sources of truly "excess" risk from their risky yet risk-reducing counterparts.

Who then should decide how much public risk we will accept and in what areas? The answer is painfully obvious to almost everyone outside the legal community: expert

administrative agencies, not lawyers. To make life safer, faster, we need not more scientists in the legal process, but fewer lawyers in the scientific one. The legal system has no special competence to assess and compare public risks, and the legal process is not designed or equipped to conduct the broad-ranging, aggregative inquiries on which sensible public-risk choices are built. Expert administrative agencies, troubled and erratic though they may be, remain best able to regulate public risks in a manner calculated to advance the public health and welfare....

COMMENTARY & QUESTIONS

1. **The benefits of public risk.** Huber is surely correct that credit should be given in the evaluation of public risks for the risks, private or public, that they displace. This is simply good accounting, just like the good accounting that the environmental perspective demands when ecosystem benefits are advanced in support of some regulatory activity, such as wetlands preservation.

Does this mean that Talbot Page, whose views were encountered in Chapter 1, is wrong when he argues that environmental risk situations display the potential for catastrophic costs weighed against relatively modest benefits? Page uses nuclear power generation as a prototypical example of an environmental risk, with regard to which we should minimize false negatives. How might Huber champion nuclear power in preference to fossil fuel generation of electricity? Nuclear power reduces the risk of ecosystem harms due to the emission of sulfur oxides from coal-fired power plants, a major cause of acid precipitation. Likewise, nuclear energy reduces the risk of massive ecological harms that would accompany the global warming threatened by the production of greenhouse gases. Are courts in a position to measure the trade-offs? Huber, in his mocking comparison of wood stoves to nuclear power plants, conveniently omits elaborate discussion about the back end of the nuclear fuel cycle — the extreme difficulties of nuclear waste disposal (including the risk of terrorist diversion of that material) — but even putting all the factors on the table, is it certain that nuclear power generation is a bad choice? Is one subject that Huber should address (but doesn't) the problems of risk assessment in high-uncertainty (sometimes zero-infinity) situations? How do you suppose that Huber would analyze a technology that provided many calculable benefits but also posed a slight chance of destroying a significant part of the world? Should Huber also take public outrage seriously? At present, the American public appears to be unalterably opposed to expanding reliance upon nuclear power, regardless of rational cost-benefit accounting. Would Huber agree with the decision in *Wilsonville*, discussed in Chapter 3?

2. **The opportunity costs of proactive regulation.** A point that Huber did not make, but well could have, is that risk management, by minimizing false negatives, may also adversely affect public health:

> Current risk assessment practice is also one-sided in failing to consider the potential negative health effects that may follow from regulatory costs themselves. Economic studies suggest that regulatory costs may impair public health, a point that has been picked up by some judges. Under this view, every dollar that goes to regulatory costs is unavailable for things that tend to promote health, such as extra medical exams, better neighborhoods, safer cars, shorter work hours, or basic

> nutrition. Moreover, investigators report that mortality data show a correlation between health and wealth. They suggest from this data that each $3 million to $7 million spent on regulatory costs may lead to one additional premature death. Shere, The Myth of Meaningful Environmental Risk Assessment, 19 Harv. Envtl. L. Rev. 409, 472 (1995).

Is this an effective argument? Are these costs commensurable? For a critique of the estimates cited by Shere, see Heinzerling & Ackerman, The Humbugs of the Anti-Regulatory Movement, 87 Cornell L. Rev. 648, 666-670 (2002).

3. **Stephen Breyer and other risk reformers.** Huber argued that (1) courts over-deter investment in public risk, and (2) reliance on administrative agencies is more likely to achieve acceptance of the optimal amount of public risk. Justice Stephen Breyer, in a book published shortly before his appointment to the U.S. Supreme Court — Breaking the Vicious Circle: Toward Effective Risk Regulation (1993) — makes similar arguments and recommends the creation of a centralized federal administrative group that would develop, coordinate, and supervise federal risk regulation through a decisional structure similar to an agency of experts on a military command model.

Justice Breyer noted that there was no "detailed federal government list that prioritizes health or safety risk problems so as to create a rational, overall agenda." He decried the "tunnel vision" occurring when an agency "effectively carries single-minded pursuit of a single goal too far," thereby doing more harm than good. He pointed to the EPA ban on asbestos pipe featured in the *Corrosion Proof Fittings* case, discussed in Chapter 13, which allegedly imposed extra costs of $200–300 million in order to save seven or eight lives over 13 years, while in the same period twice as many deaths could be expected from ingested toothpicks! Breyer proposed the development of a system by which regulatory resources could be shifted from areas of minimal risk to fields in which they "could buy the largest amount of safety per dollar."

Such calls for risk-based regulation have been echoed in radio talk shows, the 104th Congress, and a popular collection of anecdotes castigating government regulations as intemperate and disproportionate, like Philip Howard's The Death of Common Sense: How Law Is Suffocating America (1994), calling, like Justice Breyer's book, for a body of statistical risk experts to reform regulatory practice. Analyzing this debate, two scholars have written:

> The "cures" proposed by the ["Contract with America"] Congress...and by Breyer and Howard... — both of them "tyrannies of the rational" —are themselves risky and may very likely be worse than the "disease." Although it may not seem terribly exciting, the best solution may be for the public to demand more rational regulation through existing channels. The give-and-take among the branches of government and with the public may be a necessary, even desirable, characteristic of risk regulation. Democracy and cost-effective, rational regulation are not incompatible....
>
> Pending legislative proposals quite obviously would exacerbate the less desirable aspects of the current system rather than ameliorate them. In context, it is difficult to characterize the use of risk assessment in the legislative vehicles currently proposed as anything other than an abuse of that methodology, designed not to promote regulatory reform but to impede desirable or necessary regulatory activity. Wirth & Silbergeld, Risky Reform, 95 Colum. L. Rev. 1857, 1895 (1995).

Professor Donald Hornstein, after canvassing the virtues of comparative risk analysis, provided an array of arguments against uncritical reliance on comparative risk analysis as anything more than a useful datum in setting environmental protection priorities and policies. See Hornstein, Reclaiming Environmental Law: A Normative Critique of Comparative Risk Analysis, 92 Colum. L. Rev. 562 (1992). The article, marshaling arguments developed in social sciences literature, asserted that (like "efficiency") the comparative risk analysis process is sufficiently problematic that it should not be adopted uncritically as a normative touchstone.

4. **Attacking Huber's assessment of institutional competence.** Professors Clayton Gillette and James Krier, in their article entitled Risk, Courts, and Agencies, 138 U. Pa. L. Rev. 1027 (1990), directly attack Huber's arguments. They propose a method for deciding whether courts are being too generous or too stingy toward plaintiffs who challenge activities involving public risks. There are two lines of inquiry, one into process bias and one into access bias:

> Process bias arises from the interplay of legal doctrine and adjudicative decision-makers. It concerns the ways in which judges and juries interpret and apply the law that defines the rights and liabilities of the parties before them. Access bias, on the other hand, arises from the interplay of legal doctrine, the structure of litigation, and the nature of public risk. It concerns the ways in which victims decide whether (given prevailing doctrine, among other things) litigation is worthwhile, and the ability of victims to initiate claims. Access is anterior to process; only when obstacles to access are overcome, so that claims are actually filed and prosecuted, can process bias come into play. 138 U. Pa. L. Rev. at 1045.

They then focus on the failings of professional risk assessment (i.e., hazard alone) to account for the multidimensional character of the layperson's perception of risk:

> Whatever its motivations, the experts' approach to risk is obviously not senseless. Yet neither is the public's approach. This is why...the problem comes down to one of competing rationalities. Admit this, and it unarguably follows that the choice of approach is an ethical and political one that technical experts have neither the knowledge nor the authority to dictate, because the issue transcends technocratic expertise. Were we to defer to agencies simply on the basis of their technical proficiency, the ethical-political question would be begged entirely. Agencies could be expected to resort to methods the use of which denies the very values at stake (it is, after all, the claim of methodological proficiency that grounds the argument for deference in the first place). And, to return to the idea with which we began this section, methodological proclivities would bias agency risk processing in the direction of too much public risk — as viewed from the public's perspective. 138 U. Pa. L. Rev. at 1085.

Gillette and Krier also conclude that access bias unduly restricts the number of public risk cases heard by the courts and that access bias skews the administrative process in favor of over-acceptance of public risks.

5. **Is everyone crazy (in Huber's sense)?** The number and scope of environmental concerns have burgeoned in recent years, with the result that they cannot all be addressed simultaneously. Even if there were agreement that all environmental problems are worthy of action, to take on all of the perceived problems at once would demand more resources, human and fiscal, than society is willing to commit to the task.

Inevitably, priorities must be set that select some problems for more immediate attention while postponing action on others. Setting those priorities is a vital form of policymaking, but it is not easy. How, for example, do we choose between spending $1 million to clean up contaminated groundwater in Wichita, Kansas, or to remove lead-based paint from aging single family homes in Detroit, Michigan? There does not seem to be a ready common denominator for making such policy decisions. However, at least when the risks involved relate to human health, it seems that setting priorities that maximize risk reduction offers a form of cross-medium comparison. The greatest amount of risk reduction means, in effect, that the aggregate environmental hazard has been reduced by the greatest amount. EPA, in response to demands for consistency and rationality in priority setting, began to embrace risk reduction as a priority-setting mechanism in the late 1980s. In 1987 it published Unfinished Business: A Comparative Assessment of Environmental Problems, which attempted to make relative risk reduction a part of EPA's policymaking process. William Reilly, then EPA Administrator, wrote, "To the extent permitted by our statutory mandates, sound science can help us set priorities based on risk. Indeed, the rigorous analysis of risk is fundamental to all of EPA's regulatory programs. Without some way of determining relative levels of risk, we would quickly become mired in a regulatory swamp, wherein all problems were equally important; all risks would have to be addressed with equal urgency; and accordingly, nothing would get done."[44] A more substantial EPA document soon followed. In Reducing Risk: Setting Priorities and Strategies for Environmental Protection, Report of the Science Advisory Board: Relative Risk Reduction Strategies Committee (RRRSC), Science Advisory Board A101, SAB-EC 90-021, Sept. 1990, EPA found that in some ways its regulatory priorities did not reflect a focus on the greatest risks. EPA found, for example, that risk-based priority setting would support giving more attention to the hazards of indoor air pollution and rather less attention to cleaning up abandoned hazardous waste sites.

6. **"Hormesis" — the benefits of toxins?** In recent years new arguments have emerged asserting the hormesis hypothesis — that a number of environmental toxins may actually fulfill beneficial functions for human health. At low doses both dioxin and DDT have been shown to reduce some cancers in lab animals. Low doses of cadmium, which can be highly toxic, reduces liver cancer in rats. The implications for standard premises about exposure avoidance and the Precautionary Principle are obvious, but hardly justify calls to retreat from toxics regulation. A toxin that has a beneficial effect on one physical parameter may well cause malignant effects in other areas. Because it so clearly has policy implications, the hormesis theory will doubtlesslessly prompt continuing political arguments as well as scientific debate. See Calabrese & Baldwin, Chemical Hormesis: Its Historical Foundations as a Biological Hypothesis, 27.2 Toxicol. Pathol., 195 (1999). Cf. Heinzerling and Lechleider, Hormesis and the Law, 20 Human Experimental Toxicology No. 3, at 150 (2001).

44. William Reilly, Taking Aim Toward 2000: Rethinking the Nation's Environmental Agenda, 21 Envtl. L. 1359, 1361 (1991).

7. **Competing proposals for setting environmental priorities.** Resources for the Future sponsored a national Worst Things First conference on potential uses of risk-based analysis in setting the federal regulatory agenda. Several competing paradigms emerged from that conference.[45] Barry Commoner, director of the Center for the Biology of Natural Systems at Queens College, offered a pollution prevention-based approach to setting priorities. He proposed that the general public should set U.S. environmental priorities, based on what it decides are the most important opportunities to transform industries from polluting to non-polluting. John Graham, professor of health policy at Harvard University, argued that pollution prevention and comparative risk assessment-based approaches are complementary. Robert Bullard, professor of sociology at University of California-Riverside, argued that environmental protection is not a privilege to be doled out but is a right for all individuals. He argued that a strictly risk-based priority system may perpetuate the failure to identify and remediate "hot spots" of environmental risk that exist in communities with significant minority populations. Instead, EPA's priority should be to clean up hazardous waste sites in communities where minorities and the poor face multiple risks from multiple sites and to limit imposition of new risks in these areas. A third alternative, "directed innovation," which focuses on evaluating the causes of environmental problems, was urged by Nicholas Ashford, a professor of technology policy at MIT. He argued that strict regulation, properly designed, can trigger technological innovation that allows for more risk reduction at equal or lower costs. James Wilson of Monsanto, the chemical company, argued that individual companies do not always know when a particular innovation will succeed, and thus it's folly to believe that the federal government can reliably choose targets for directed innovation. Chapter 15 discusses this problem in the context of technology-forcing.

"If seven maids with seven mops,
Swept if for half a year,
Do you suppose, the Walrus said,
That they could get it clear?
I doubt it, said the Carpenter,
And shed a bitter tear."

— Lewis Carroll, Through the Looking Glass, 1871

45. Finkel & Golding, eds., Worst Things First? The Debate over Risk-Based National Environmental Priorities (1994); see also K. Arrow et al., Benefit-Cost Analysis in Environmental, Health, and Safety Regulation: A Statement of Principles 3 (1996).