ENVIRONMENTALLY INDUCED CANCER AND THE LAW. By Frank B. Cross. New York: Quorum Books, 1989. 229 pages.

Dioxin, saccharin, benzene, asbestos, PCB's, DDT, vinyl chloride, acrylonitrile, and formaldehyde — at some point in the past generation, each of these chemicals has seized public and regulatory attention in this country as a suspected or known carcinogen. While the list of industrial and commercial carcinogens has lengthened, the state of scientific knowledge about cancer has remained incomplete, the number of Americans who die from cancer each year has risen, and public frustration with a seemingly intractable problem has developed, often venting itself in protest against industry and calls for action from regulators. However, recent years have seen a shift in emphasis among many policymakers and scientists from industrial and commercial carcinogens to personal lifestyle choices, such as smoking and diet.[1] Although the shift may be attributed to the deregulatory policies of the Reagan era, it also reflects a growing consensus in the scientific community that only a small percentage of cancer deaths are caused by chemical pollutants or additives such as those in the list above.[2]

Frank B. Cross, author of *Environmentally Induced Cancer and the Law*, does not think that environmental cancer has reached epidemic proportions in America. He agrees that the industrial and commercial chemicals to which the bulk of traditional cancer regulation efforts and public attention have been directed account for only a small percentage of environmentally induced cancer,[3]but he acknowledges that even this small percentage ac-

1. *The Parade of Chemicals that Cause Cancer Seem Endless*, N.Y. Times, March 20, 1984, at C1, col. 2.

2. *See* Doll and Peto, *Causes of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today*, 66 J. NAT. CANCER INST. 1191 (1981). The authors estimate that exposure to commercial and industrial chemicals causes only ten percent of annual cancer deaths. *See also* Lave, *Risk Assessment and Regulatory Priorities*, 14 COLUMBIA J. ENVTL. LAW 307, n. 11 (1989).

3. Cross uses the Doll and Peto results in reviewing the number of cancers attributable to various environmental sources. F. CROSS, ENVIRONMENTALLY INDUCED CANCER AND THE LAW 20 (1989). The Doll and Peto study did not address radon as an environmental cause, but Cross ascribes 10,000 to 20,000 lung cancer deaths annually, or up to five percent of all cancer deaths, to indoor radon exposure. Id. at 31. Cross does not document the source of his data, but a three year study by the National Research Council released in 1988 is in general agreement, concluding that indoor radon appears responsible for about 13,000 lung cancer deaths annually. *See 13,000 Deaths a Year Indicated by Science Academy Radon Study*, N.Y. Times, Jan. 6, 1988, at A1, col. 3.

counts for some forty thousand cancer deaths annually.[4] This number warrants a serious attempt at reform of this country's present, and often ineffective, legal response to cancer. Cross does sketch a few proposals for regulatory and common law reform, but the principal contribution of his book is to help the reader understand the complexity of the cancer problem and realize that there are no easy solutions. Since the United States is not in the throes of an epidemic, Cross adopts a pragmatic and realistic approach; he rejects a polarization of attitudes and criticizes environmentalists whose rhetoric tends to exaggerate trivial risks, as well as industries that seek to avoid all regulation.

Environmentally Induced Cancer and the Law does not address itself exclusively to the scientist, administrator, or lawyer. Rather, Cross has written a book that can serve any reader with an interest in the subject. The book is divided into three parts: the first provides a rudimentary scientific background and introduces the sources and characteristics of environmental cancer; the second covers federal regulation, with an overview of risk assessment, risk management, past regulatory practice and failures, and proposals for reform; the third discusses the tort liability system as a means of recovery by individuals injured by cancer, providing an overview of the present common law and proposals for reform. To which sources of cancer the author directs his regulatory proposals is not entirely clear. Presumably he is concerned with the sort of man-made, preventable industrial sources listed above, but his introduction and comments at several places throughout the book point in other directions. The introduction and first part of the book address the natural carcinogens (such as aflatoxins and natural radon) and personal lifestyle choices to which Cross attributes the majority of cancers. However, these types of sources are by nature different than the man-made, preventable industrial sources — exposure to them is voluntary (e.g., smoking) or not attributable to any human action that may be regulated (e.g., radon). Cross seems to recognize this when he moves on to discuss the industrial and commercial sources that account for a smaller but still significant number of cancers; nevertheless, he raises a question but leaves it unanswered: what can be done about natural and voluntary cancers?

4. F. CROSS, *supra* note 3, at 20.

The unique and complex scientific nature of cancer and its magnitude as a public health problem[5] add competing characteristics to the cancer problem: uncertainty and urgency. The United States' legal system requires a level of certainty in deciding whom to regulate and whom to compensate (and at whose expense), but in the context of cancer such certainty is elusive. Cross summarizes six reasons: lack of basic scientific knowledge, including the degree to which results from experiments on mammals are applicable to humans; the complex biological process of initiation, promotion, progression, and metastasis of cancer in the body; the difficulty in many cases of determining what substance initiated a given cancer; a latency period of twenty years from the time of exposure to metastasis and detection; the apparent unpredictability of determining whether cancer will develop, also attributable to lack of scientific knowledge along with interaction of many environmental factors and genetic susceptibility; and the absence of a known threshold level for individual carcinogens.[6] As Senator Edward Kennedy stated in the Congressional hearings on the banning of saccharin, when the extent of uncertainty over carcinogens gained national attention, "The reason that the answers are unclear is that the science is unclear."[7]

I. Federal Regulation

Regulation of environmental carcinogens proceeds according to the source of exposure. Whether exposure to a carcinogen occurs through air, water, food, the workplace, or another source determines which federal agency regulates it, and there is an obvious degree of overlap between agencies. For example, the Occupational Safety and Health Administration regulates workplace exposures to vinyl chloride under the Occupational Safety and Health Act,[8] the Environmental Protection Agency has a standard for vinyl chloride emissions under the Clean Air Act,[9] and the

5. Cancer is the second leading cause of death in the United States. One out of every four Americans alive today will die from cancer. Cross, *supra* note 3, at 3.

6. *Id.* at 11-15.

7. The Banning of Saccharin, 1977: Hearing Before the Subcomm. on Health and Scientific Research of the Senate Comm. on Human Resources, 95th Cong., 1st Sess. 2 (1977) (statement of Senator Edward Kennedy, Chairman of the Subcomm.).

8. 29 C.F.R. § 1910.1017 (1989), promulgated under Occupational Safety and Health Act § 6(b)(5), 29 U.S.C. § 655(b)(5) (1985).

9. 40 C.F.R. §§ 61.60-61.71 (1989), promulgated under Clean Air Act § 112(b), 42 U.S.C. § 7412(b) (1983).

Consumer Product Safety Commission has banned all household products containing vinyl chloride under the Federal Hazardous Substances Act.[10] Each agency, regulating under separate statutory authority, applies a separate standard.

Cross summarizes past agency efforts at carcinogen regulation as mistakes to be learned from; he introduces the topic by calling agency practice to date "a broad experiment in conducting the undeniably difficult task of carcinogen regulation."[11] Cross concludes that a decade of experience has seen delay, ineffectiveness, and inconsistency in regulatory decisions.[12] He attributes this to discordance between the statutes that grant regulatory authority and administrative reality,[13] but does not propose new, more realistic legislation. Instead, he outlines a way for the agencies, working within their present statutes, to inject honesty, moderation, and coordination into their regulatory procedures.

Quantitative risk assessment, although riddled with uncertainty,[14] has become entrenched in carcinogen regulation. Pragmatically, Cross defends its use as the best method available: "Even uncertain estimates are preferable to no estimates."[15] He does not view quantitative risk assessment as a purely scientific exercise.[16] Rather, Cross proposes conservative policy assumptions in risk assessment. He also proposes that their use, as well as the role of uncertainty, be explicitly acknowledged.[17] Although "superficially appealing and theoretically logical,"[18] the separation of policy from the process of quantitative risk assessment is rejected as contrary to the primitive state of the science of carcinogenicity.[19] The politician's promise of "good science" risk assessments when no scientific consensus exists may even be

10. 16 C.F.R. § 1500.17(10) (1989), promulgated under Federal Hazardous Substances Act § 2(q)(1)(B), 15 U.S.C. § 1261(q)(1)(B) (1982).

11. F. CROSS, *supra* note 3, at 97.

12. *Id.* at 129.

13. *Id.* Unrealistic statutes force administrative agencies to expend more resources on rationalizing their decisions than on actual regulation. *Id.* at 129-30.

14. Ruckelshaus, *Science, Risk, and Public Policy*, 221 SCIENCE 1026-27 (1983).

15. F. CROSS, *supra* note 3, at 65.

16. *See also* Bazelon, *Risk and Responsibility*, 65 ABA J. 1066, 1068 (1979) ("There is no bright line between questions of value and fact. Even if a problem is appropriately characterized as one of scientific fact, consensus and certainty very often may be impossible, even in the scientific community.").

17. F. CROSS, *supra* note 3, at 137.

18. *Id.* at 136.

19. *Id.* Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 YALE J. ON REG. 89, 121 (1988), states that inadequate scientific knowledge concerning causal mechanisms, ex-

harmful, since it acts as a smokescreen to obscure policy choices that inevitably must be made.[20]

"Honest" risk assessments[21] can be put to good use in developing regulatory priorities. Even admittedly imperfect risk assessments provide a systematic approach to analyzing complex problems.[22] Regulatory agencies have historically had a difficult time with prioritization; in the 1970's critics said the Environmental Protection Agency suffered from "Carcinogen of the Month" syndrome, because of its practice of constantly rechannelling resources to the latest cancer scare.[23] Cross proposes the use of quantitative risk assessment to rank health threats so that the most serious ones may be addressed first, as well as to improve regulatory efficiency and credibility.[24] While industry objects to use of risk assessment by itself and calls for consideration of additional factors, and environmentalists contend that risk assessment is too uncertain, Cross concludes that some means must be used to prioritize regulatory action.[25]

Cross cites indoor radon as an example of failure of regulatory prioritization.[26] However, his criticism of federal regulatory inaction does not seem appropriate, since the radon to which most cancer deaths are attributed is a natural carcinogen, created by the decay of radium in soil and rocks.[27] Natural carcinogens do not lend themselves to the traditional type of regulation of industry in which the agencies have engaged, and which Cross here analyzes. Environmental commentators actually noted a "burst of energy and fanfare" when the Environmental Protection Agency called for individual homeowners to act on the radon threat; ra-

trapolative relationships, special sensitivities, synergistic effects, and present exposure levels, among many other areas, precludes reliable risk assessments.

20. F. Cross, *supra* note 3, at 137. Latin, *supra* note 19, at 126-34.

21. F. Cross, *supra* note 3, at 135-38. Cross uses the adjective "honest" to describe risk assessments reached through openly made and acknowledged policy assumptions about science, and acknowledgement of uncertainties and the role of policy assumptions.

22. Lave, *supra* note 2, at 314.

23. *Id.* at 309.

24. F. Cross, *supra* note 3, at 139. *See also* Stewart, *The Role of the Courts in Risk Management*, 16 Envtl. L. Rep. 10208, 10210 (1986).

25. *Id.* at 141.

26. *Id.* at 139.

27. *Radon Alert: The EPA Goes After the Carcinogen That Nature Made*, N.Y. Times, Sept. 18, 1988, Section 4 at 1, col. 1.

don was the perfect environmental enemy for the Reagan era, since no industry had to be regulated.[28]

Risk management refers to the regulatory goals agencies follow in seeking to prevent identified cancer risks; it necessarily reflects a legislative policy judgment. Cross evaluates four different risk management paradigms and measures their effectiveness in carcinogen regulation: zero risk, significant risk, cost-benefit analysis, and feasibility analysis. Although Cross would keep the risk assessment and risk management functions of regulatory agencies separate, he disagrees with those who advocate separating policy from science.[29] As discussed above, he proposes the use and acknowledgement of policy assumptions in risk assessment. While good enough for prioritization purposes, risk assessment is too imprecise a tool for setting regulatory control levels, and Cross would exclude it from a moderate risk management strategy.[30] Instead, carcinogen regulation should rely primarily on feasibility analysis, which is a technology-based standard that does not require risk assessment. A no-risk standard is rejected as unrealistic, and significant risk and cost-benefit analysis require risk assessments as well as being subject to delay.[31]

The author's choice of feasibility analysis among risk management paradigms is rooted in pragmatism-regulatory provisions employing technology-based standards have proved most effective in the past.[32] Cross admits the shortcoming that feasibilty analysis does not consider the magnitude of a risk, making it irrational "in theory."[33] However, it is difficult to see how the problems with feasibility will be restricted to theory when the crucial issue in implementation of such a technology-based standard is the financial burden each industry can bear.[34] Cross himself states that "feasibility analysis holds public health protection hostage to industrial profitability."[35] Even from a practical perspective, the feasibility approach is criticized for penalizing new

28. *Id.*
29. *See* Ruckelshaus, *supra* note 14, at 1027-28.
30. F. CROSS, *supra* note 3, at 147.
31. *Id.* at 146-47.
32. *Id.* at 147.
33. *Id.* at 92.
34. L. LAVE, THE STRATEGY OF SOCIAL REGULATION 14 (1981).
35. F. CROSS, *supra* note 3, at 93.

investment and providing little incentive for development of more profitable industries.[36]

Furthermore, it is unclear how Cross would implement feasibility analysis as a risk management strategy. The risk management paradigm a regulatory agency employs is usually statutorily mandated, but Cross does not propose a change in legislation. Also, a feasibility approach only makes sense in regulating some sources, where the presence of the carcinogen is incidental or the result of industrial processes, but not others such as food additives where the carcinogen is an intentional ingredient. The problem with the author's proposal here is essentially the same as where he discusses radon - he seems to disregard that the nature of the source determines how regulation can proceed.

The author's final proposal to improve federal carcinogen regulation does not involve regulatory agencies, but calls for judicial restraint in reviewing agency choices. Cross sees his conclusion that judges should defer to administrative judgments as "largely lacking in adherents."[37] Judicial review of risk regulation is an area that has spawned much scholarly debate and goes well beyond Cross's simply stated proposal - essentially, that courts not question the substance of agency policy judgments or scrutinize their science but simply require that fair procedures be used in regulation.[38] However, there actually appears to be a nucleus of consensus as far as Cross's proposal is concerned;[39] the result varies in each judge's inclination toward judicial restraint or activism.

36. Stewart, *supra* note 24, at 10211.

37. F. Cross, *supra* note 3, at 152.

38. *Id.* at 154-55.

39. The "hard look" approach to judicial review of administrative decision-making, endorsed by the Supreme Court in Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc., 435 U.S. 519 (1978), assumes that judges are capable of informing themselves about scientific matters and may scrutinize and overturn administrative decisions, although they should avoid procedural innovation or substitution of more rigorous process. O'Brien, *The Courts and Science-Policy Disputes: A Review and Commentary on the Role of the Judiciary in Regulatory Politics*, 4 J. Energy L. & Pol'y 81, 108 (1983). However, in adhering to the "hard look" approach in name, the D.C. Circuit has actually adopted a moderate posture and refrained from substantive review of administrative regulations while emphasizing the propriety of judicial deference to agencies in matters of scientific uncertainty. *Id.* at 111-12. *See also* Rodgers, *Benefits, Costs, and Risks: Oversight of Health and Environmental Decisionmaking*, 4 Harv. Envtl. L. Rev. 191, 215 (1980) ("The focus of the hard look is to understand what the agency did, as a prelude to testing that action against congressional purposes, not to reasses the judgments bound up in any cost-benefit inquiry.").

II. COMPENSATION FOR INDIVIDUALS

The characteristics that contribute to the "cancer problem" described in the first part of the book, particularly the long latency period and difficulty of determining causation, are also important when individuals who suffer cancer from environmental exposure seek compensation for their injuries. Cross discusses tort liability from the perspective of compensation, and largely ignores the goal of deterrence.[40] The prevailing tort liability system, he says, is inefficient and unfair to both plaintiff and defendant.[41] Besides the almost insurmountable difficulty of proving causation in some cases of cancer, future plaintiffs face the possibility of defendants bankrupted from paying out very large awards and punitive damages to earlier plaintiffs. Defendants struggle with frivolous claims and erratic jury awards, and face the possibility of being penalized for having greater assets or having kept better safety records. There is also a certain irrationality in the fact that a plaintiff's chances of success depend on the timing of suit, since the success of a single plaintiff sets a precedent that increases the likelihood of subsequent success.[42]

Cross's proposals for reform of the tort system as it applies to cancer victims are motivated by ethical concerns — since government must allow some exposure to carcinogens, victims must be adequately compensated, or the costs of technological progress are unfairly placed on a very few.[43] His proposed solution is twofold: change the substantive tort law to permit recovery for risk of future cancer, and grant administrative experts a role in tort adjudication. As a matter of institutional competence, courts are inferior to administrative agencies in formulating risk assessments.[44] Therefore, Cross proposes that some administrative agency formulate "potency assessments" for the most common environmental carcinogens, and that these assessments be admis-

40. F. CROSS, *supra* note 3, at 159.

41. *Id.* at 177.

42. *Id.* at 177-79.

43. *Id.* at 199.

44. Courts are not designed or equipped to conduct the broad-ranging, aggregative inquiries on which sensible public risk choices are built. Huber, *Safety and the Second Best: The Hazards of Public Risk Management in the Courts*, 85 COL. L. REV. 277, 332-35 (1985). Problems of expense, inaccuracy and inefficiency are also involved when risk assessments must be litigated with each subsequent plaintiff and relitigation produces different results. CROSS, *supra* note 3, at 213-14.

sible in court and presumptively valid.[45] In the section of the book that discusses regulation, Cross proposes that risk assessments cannot be purely based on science because the science of carcinogenicity is so unreliable. The author's theme of pragmatism fades in the discussion on victim compensation as he glosses over the problem of unreliability.

The procedural reform of admitting administratively determined potency assessments in court is necessary to Cross's proposed substantive reform of establishing a cause of action for future risk of cancer from another's tortious acts. Cancer victim compensation has been called the "indeterminate plaintiff" problem,[46] and Cross's solution is analogous to what courts have formulated for the reciprocal problem of the "indeterminate defendant."[47] Plaintiffs would still have to prove their exposure and the named defendant's breach of a duty or standard of liability, but the problem of causation of actual cancer would be eliminated.[48] Through the calculation of damages as the present value of the future risk discounted by its probability (as determined by potency assessments) the solution also overcomes the statute of limitations barrier imposed by cancer's long latency period.[49]

In proposing recovery for a future risk, Cross joins a sizeable body of scholars,[50] but a minority of courts.[51] Courts rejecting a

45. *Id.* at 214. Cross uses the term "potency assessment" to distinguish from risk assessment. Since risk assessments for regulatory purposes should employ conservative policy assumptions, they are not suitable for court determinations of compensation. Rather, potency assessments for compensation purposes should employ a central, "most likely" estimate of risk. *See also* Huber, *supra* note 44, at 332-35. The author proposes that in private suits for compensation, courts should defer to administrative determinations of risk. However, he approaches the problem of individual compensation from a different perspective; instead of Cross's ethical dilemma, he sees the goal as avoiding the use of private compensation cases to accomplish public risk management. For this reason, he proposes the use of administrative agencies' policy choices as well as their science.

46. Stewart, *supra* note 24, at 10213.

47. *See* Sindell v. Abbott Laboratories, 26 Cal. 3d 588, 163 Cal. Rptr. 132, 607 P.2d 924 (1980).

48. F. CROSS, *supra* note 3, at 209.

49. *Id.* at 209, 212.

50. *See, e.g.*, Elliott, *The Future of Toxic Torts: Of Chemophobia, Risk as a Compensable Injury and Hybrid Compensation Systems*, 25 HOUSTON L. REV. 781 (1988) ("Two distinct harms are involved when people are exposed to chemicals without their consent: (1) the involuntary exposure to risk; and (2) any physical harm to health that may be provable").

51. Cross states that a majority of jurisdictions adhere to the traditional rule of denying recovery for a risk, but does not cite any actual cases where a plaintiff has recovered on an enhanced risk theory. F. CROSS, *supra* note 3, at 185. Cross does discuss an intermediate, "reasonable certainty" standard for recovery that is based on probability rather than mere

future risk cause of action have reasoned that people are exposed to potential, albeit remote, harms in their daily life, and that future risk recovery raises the spectre of claims increasing boundlessly.[52] However, Cross's argument for future risk recovery is convincing. Litigation would not be worth the cost to the vast majority of potential plaintiffs whose recovery would be very small; a system of small claims courts could be established for individuals whose injuries fall below a certain threshold, and the problems of proof involved in larger claims would decrease by allowing suit at the time of exposure.[53] One response to critics who fear over- or under- compensation from an *ex ante* liability system is that our present *post facto* compensation system is no more precise.[54] More persuasive is Cross's rebuttal that an effectively functioning insurance market makes future risk compensation much more precise and fair than the traditional system.[55]

III. CONCLUSION

Environmentally Induced Cancer and the Law provides a valuable summary of the problems inherent in reconciling a legal system that demands certainty with an inchoate and complex body of scientific knowledge. It is a comprehensive work that addresses every federal agency and statute concerned with cancer at least briefly but in the end leaves the reader wondering precisely how the author defines "environmentally induced." Initially the author seems to draw his definition broadly, but most of the book concentrates on a subset of the original definition — industrial and commercial carcinogens — with a few exceptions whose placement may confuse the reader. However, this is at most a failure of categorization. The author's proposals for reform are not as comprehensive as his discussion of the problems, but he offers a well-balanced perspective on a topic often characterized

risk. *Id.* Courts have allowed recovery based on this probability theory. *See* Jackson v. Johns-Manville, 781 F.2d 394 (5th Cir. 1986). However, it appears that no court has accepted the enhanced risk theory for plaintiffs seeking compensation for environmentally induced cancers. *See* Annotation, *Future Disease or Condition, or Anxiety Relating Thereto, as Element of Recovery*, 50 A.L.R.4th 13, 216 (1986).

52. *See* Ayers v. Township of Jackson, 189 N.J. Super. 561, 568, 461 A.2d 184, 187 (1983).

53. F. CROSS, *supra* note 3, at 211.

54. *Id.* at 210. Cross cites Brooks and Jacob, *Responses to Robert L. Rabin*, 24 HOUSTON L. REV. 58, 62 (1987).

55. *Id.* at 210-11.

by a polarization of attitudes. His proposals are moderate and pragmatic, and difficult to criticize unless one disagrees with his premise that action on the cancer problem is not urgent.

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