

BOOK NOTE

PHANTOM RISK: SCIENTIFIC INFERENCE AND THE LAW

Edited by Kenneth R. Foster¹, David E. Bernstein²
and Peter W. Huber.³

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While the general public harbors lingering concerns about the invisible hazards of everyday life, the scientific and legal communities daily confront issues which accompany these phantom risks. Both the specter of liability spelling financial ruin for some of America's most productive businesses and the public concern when tragedies plague unexpected workers or consumers mandate earnest efforts to grapple with issues of science within the American judicial system.

The introduction of scientific evidence into the courtroom can be problematic, and various court players may find it difficult to fulfill their roles. Lawyers may feel they need to match experts number for number. Expert witnesses may have trouble framing their opinions in terms appropriate in the legal context, juries may be perplexed by scientific testimony, and judges may find themselves presiding over legal quagmires.

Legal literature is rife with proposals to clarify the science expert's role in the courtroom, the admissibility of scientific evidence,⁴ and the theories of liability where injury results from man-made technologies.⁵ *Phantom Risk: Scientific Inference and the Law (Phantom Risk)*, a new book by the Manhattan Institute, fills a noteworthy void in these legal debates with a timely consideration of the litigation problems associated

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4. The Supreme Court recently has announced a new standard for admissibility of expert testimony. *Daubert v. Merrell Dow Pharmaceutical*, 113 S.Ct. 2786 (1993).

5. See, e.g., David Rosenberg, *The Causal Connection in Mass Exposure Cases: A "Public Law" Vision of the Tort System*, 97 HARV. L. REV. 849, 851-929 (1984).

with risk, technology, and the scientific contribution to the adjudication of legal questions. *Phantom Risk* focuses on a perspective that is seldom reflected upon—that of the scientific community. This work takes a step back from the usual discussions of admissibility and adopts a more *ex ante* look at general problems emerging within science before discussing their legal implications.

Phantom Risk is a self-proclaimed work that “examines two intersecting themes: the problems of assessing subtle environmental or occupational risks, and the havoc this creates in the courtroom” (p. vii). With over twenty contributors, the book receives its name from the common theme of the seventeen articles: problems of causation that are unamenable to legal resolution. Phantom risks are those putative risks whose very existence are yet to be proven (p. 1).

The blueprint the editors have constructed facilitates an easy conceptualization of the issues surrounding science and the law. The editors begin by establishing the scientific and legal perspectives towards the treatment of possible injury-causing exposures. The book is divided into three segments, each containing several chapters, written by one or more scientists, reflecting upon hazards, real or imagined, which have drawn the attention of attorneys or the media. The first section discusses phenomena whose very danger, at any levels of exposure, is in question. The second section considers the risks from low-level exposure to different agents which have been proven harmful at high dosages. The third section examines the problems arising from controversies within the medical community itself. Each segment concludes by summarizing the controversies within their legal context.

All of the issues examined in *Phantom Risk* revolve around a central theme: the difficulties which stem from proof of harm (i.e., risk assessment). Although these problems are exacerbated in the courtroom, the editors clearly indicate that risk assessment problems exist within science generally. They argue that the methodological limitations of science and the theoretical controversies raging within the scientific community should be, but seldom are, systematically considered when science enters the realm of law.

The two primary methods of gathering evidence of risk, epidemiology and animal studies, are both troubled with limitations. Epidemiology is the field of science which most squarely deals with the issues of pathogens in human populations. The problem with epidemiology, and hence the pursuit of risk assessment via observation generally, is its

reliance on statistics. Association between an exposure and a response is a necessary but never sufficient condition for assessing causation. The predicament at the interface of law and science is that "the irreducible uncertainties in epidemiology are frequently large enough to be legally significant" (p. 7).

Animal studies provide scientists with information regarding exposure risks. However, these studies are troubled by the assumption that animal exposure to massive and unrealistic doses of possible hazards can be extrapolated to a finding of human risks at lower exposure levels.

A third source of evidence, "junk science"⁶ composes the last significant realm of evidence typically appearing at science trials. For example, clinical ecologists, who often appear as plaintiff expert witnesses in personal injury suits, employ methodologies that are "widely criticized" and lead to "bizarre theories" (pp. 16-17).⁷ Problems associated with each of these three types of evidence (epidemiological, animal, and junk science) are revisited in concrete terms throughout the subsequent chapters.

Chapter 2 contrasts the missions of science and modern day courts. The notion that everyone is entitled to one's day in court⁸ significantly differentiates law from science. Whereas science tends to converge (p. 19), the legal judgment surrounding a given risk does not. After considering all available sources of evidence, science asks: Is this exposure strongly associated with this effect? The tort question is usually: Is it *likely enough* that *this* exposure caused *this* harm? Furthermore, science can never prove safety (absolute absence of risk) while it can identify a hazard (p. 15).⁹ Finally, legal disputes are disposed of on a shorter time frame than are scientific theories. Science knows no closure (p. 28), whereas the practical mission of law requires it.

Part I of the book, *Phantom (Or Not So Phantom) Risks*, discusses the history and proof regarding the existence of risk related to spermicides, weak magnetic fields, video display terminals, and Bendectin. This section of the book highlights issues of causation which address the nature of the "harm" itself.

6. PETER W. HUBER, *GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM* (1991).

7. The problem, however, is that there have been many watershed moments in science where a revolutionary breakthrough had been popularly viewed as ludicrous.

8. Traditionally, it is not possible to collaterally estop future plaintiffs.

9. The book's editors refer to this as the asymmetric nature of science.

Two chapters penned by Foster regard possible hazards which have recently been reported in the media. The chief contribution of the piece on weak magnetic fields is its general discussion of interpretive difficulties involving scientific studies. For example, in occupational studies, most researchers simply compare a worker in a given field with a person not in that field but do not control for different levels of magnetic field exposure within the ranks of a given occupation (p. 66), and there are other confounding variables which have not been controlled (p. 66). Foster emphasizes that the studies conducted thus far do not allow one to draw any conclusions whatsoever about the carcinogenicity of long-term exposure to weak magnetic fields (p. 65).

The possibility of a causal link between exposure to video display terminals (VDTs) and miscarriage is the subject of Foster's second chapter. This chapter brings into focus two difficulties within the science community itself. The first is the problematic use of clusters in scientific studies. The fact that there are communities where an extraordinarily disproportionate number of miscarriages occur can be a statistically predicted situation that has nothing to do with epidemiology. Miscarriages are common enough that every now and then a given community may experience a tragic string of bad luck (p. 123). The second problematic practice revealed in the VDT controversy, also rampant in other areas, is the use of highly questionable species of animals to analogize human response to exposure. Indeed, in the VDT case, several experiments have been conducted on chicken eggs to simulate the effects of VDTs on human embryos (pp. 125-26). It is startling that scientists are attempting to generalize from non-mammalian species to humans.

Whereas VDTs and weak magnetic fields are still contentious areas, the remaining lessons in Part I of the book are presented against the backdrop of resolved controversies. The piece by James L. Mills¹⁰ on the incidence of birth defects relating to a woman's use of spermicides illustrates two important general concerns within risk assessment. The first is called the phenomenon of multiple comparisons. A multiple comparison problem may arise when researchers begin searching for associations between an agent and an effect (pp. 92-93). Mills explains that if enough comparisons are conducted, then a significant-looking relationship will show up by mere chance. The problem with identifying

10. Chief of the Pediatric Epidemiology Section of the Prevention Research Program at the National Institute of Child Health and Human Development.

teratogens in this way is that there is no independent association between the cause and the effect. Secondly, in determinations of causation, common sense plays a crucial role. Indeed, Mills states that biological plausibility is the crucial threshold of cause and effect relationships (p. 92).

Within the context of the Bendectin litigation, Louis Lasagna¹¹ and Sheila Shulman¹² make two important proposals for future toxic tort litigation. Both of their suggestions are driven by the differing meanings of causation in law and epidemiology. First, the authors discuss the idea, as suggested by Chief Judge Carl B. Rubin, of a "blue ribbon jury" or a "blue, blue ribbon jury." Before jury selection got under way, the parties of over eight hundred consolidated Bendectin cases were given the opportunity (p. 110) to stipulate acceptance of a jury of knowledgeable persons familiar with the areas of expert witness testimony (the "blue, blue ribbon jury") or a jury of generally highly educated individuals (the "blue ribbon jury") (p. 110). The complexity of the conflicting evidence set to be presented seemed to indicate that this was a good idea. The plaintiffs, however, refused both options. It appears that a confused jury is the last refuge of a plaintiff who has a weak case or no case at all.

The author's second proposal is one of substantive law, not procedure. The authors suggest that the all-or-nothing character of the traditional tort burden of proof, "preponderance of the evidence," may not make sense when applied to toxic tort trials involving the presentation of complex scientific evidence. Instead, a proposal for proportional liability¹³ such as the one developed by Professor Rosenberg¹⁴ would be desirable. The authors fail, however, to convincingly describe how this would help juries make decisions. Perhaps, they are suggesting a replacement of jury fact-finding with a type of fact-finding that is constrained by epidemiological conceptions of causation, thus preempting the preponderance of the evidence standard with a scientific inquiry into quantifiable risk.

Part II of the book, *Just a Little Bit of Poison*, contains chapters evaluating the risks involved with environmental pollution, the asbestos scare, polychlorinated biphenyls (PCBs), trichloroethylene (TCE), dioxin,

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13. Under this standard, the probability that a defendant caused (somewhere between zero and one hundred percent) the harm via its agent determines the proportion of liability for which it is responsible.

14. *Supra* note 5.

the Three Mile Island disaster, radiation fallout from weapons testing, and uranium radiation. The primary weakness of this section of the book is also its strength. Rather than introducing novel views on the problems of risk assessment, Part II is a series of comprehensive applications of the theoretical objections raised previously to specific hazards. Thus, what it lacks in economy it counterbalances with an easy to command account of the scientific evidence that trial courts have dealt with in recent years.

In their discussion of asbestos, Ralph D'Agostino, Jr.,¹⁵ and Richard Wilson¹⁶ illustrate how decisively the assumption set by the court or the scientist influences the result obtained. Specifically, the choice of a linear dose-response model (extrapolating from results from high exposure to lower levels in a linear fashion) will usually result in far greater levels of risk than will a threshold model (at some level, exposure no longer has hazardous effects) (p. 189).

Another key idea which this piece develops is the problem presented by joint causation. Scientists have had enormous troubles attributing different harms to agents which act in concert with other agents. For example, while the synergistic character of asbestos exposure and smoking are well documented, scientists have been unable to disaggregate the risks (p. 196).¹⁷ Hence, we see tobacco companies remain unaccountable in asbestos litigation while manufacturers are forced into bankruptcy. The authors suggest political pressure visited upon the EPA by senators from tobacco-growing states may have deterred some studies from controlling for the risk from tobacco (p. 204).¹⁸

D'Agostino and Wilson make a rather unconvincing point later in the piece. They make comparisons between the risk of typical asbestos exposure with the risks of voluntary activity such as driving an automobile, and with the "risks . . . of childhood death among blacks and minority groups" (p. 204). Though they are right to say society must prioritize resources in response to risks, the comparison of voluntary activity is inapposite¹⁹ and the discussion of race is so attenuated from the ideas of causal risk that the authors lose credibility.

In his chapter on dioxin, *Dioxin: Perceptions, Estimates, and*

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17. See also pp. 230-31 (synergistic effects of TCE and alcohol).

18. The risk of lung cancer from tobacco is probably five times as great as that from asbestos exposure (p. 197).

19. See the discussion on how regulatory agencies allow higher exposure for those who voluntarily work in an environment than for those who involuntarily bear the risk (p. 305).

Measures, Michael Gough²⁰ paints a captivating picture of how regulatory policy and risk assessment can be a product of history and political stakes. In particular, if dioxin (the most dangerous animal carcinogen) were proved to be harmless to humans, the ramifications for environmental groups would be enormous (p. 272).

Part III, *Medical Controversy*, purports to consider the effects of questionable medical theories upon legal issues (p. 357). Its chapters address trauma and cancer, multiple chemical sensitivities (MCS) and immunologic laboratory tests. Unfortunately, the first two of these three chapters seem ill conceived (pp. 359-78). The trauma and cancer piece is predominantly a historical sketch of the disfavored theory connecting physical injury with the onset of cancer at the trauma site. The MCS piece gives more attention to a theory than it deserves. MCS has no agreed upon harms (i.e., no way to diagnose it), let alone any specific evidence that these ambiguous effects are brought on by any set of multiple chemicals (p. 381).

Richard S. Cornfeld²¹ and Stuart F. Schlossman²² authored the last chapter in this section. This chapter stands apart from others in the book in two ways. First, it focuses its attention on a single court case: *Elam v. Alcolac, Inc.*²³ Second, it proposes a specific policy recommendation.²⁴ While this is a good piece on immunology, its stark break of pattern from the rest of the book makes it seem out of place. Furthermore, the authors' policy recommendation that the court more tightly control testimony that the jury is allowed to consider overlooks the most basic question presented some four hundred pages earlier of how judges view science itself (p. 22). It is not enough to state that judges ought to be made to follow certain guidelines. The endeavor is instead to educate lawyers, judges, and the public about science itself.

Although *Phantom Risk* reviews many legal cases, these disputes are not treated in detail but rather are used to illustrate a more general scientific/legal problem. The book seldom loses sight of the legal aspect, however its strength is in relating the problems that scientists face. Burdens of proof in tort cases are old hat to an attorney. What *Phantom*

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22. Professor of Medicine, Harvard Medical School.

23. 765 S.W.2d 42 (Mo. Ct. App. 1988).

24. The piece proposes "a four-pronged evidentiary standard for the consideration of immunologic claims" (p. 17).

Risk can do is inform lawyers of the issues at stake and let them begin to understand the raw data themselves.

All of the contributors are very optimistic about the role of science in enhancing human life. Indeed, the fact that lawyers may sometimes feel uncomfortable with portions of the analysis tends to highlight the value of the scientific perspective. The book's value is that it is written by scientists rather than lawyers milling over doctrine. Policy recommendations, by and large, are clearly absent, but I think that this too is an attribute of the project. When it comes down to it, the political process (hopefully informed, enlightened, and humane) must make the normative decisions about compensation and culpability. Those decisions are not amenable to scientific proof. Conceptions of legal cause can be informed by science,²⁵ but they are normative at root. *Phantom Risk* starts on the path to understanding what science can and cannot do to help make those tough decisions.

Phantom Risk serves as an important and timely tool for judges and lawyers who wish to understand the controversies brewing within the scientific community itself as well as the nature of the inherent scientific ambiguities with which the courts are confronted. This collection of essays is an important contribution to the literature on law and science.

Andrew W. Yung

25. Legal sufficiency does not require scientific certainty (p. 111).