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Competing Conceptions of Risk

Paul B. Thompson & Wesley Dean*

Introduction

Risk issues are unarguably contentious. People evaluate risks in incompatible ways and propose conflicting proposals for mitigating or litigating risk issues. The sources of contention are multiple. Sometimes people differ because they have different information; sometimes they differ because they have incompatible interests. This paper addresses one of the more philosophical and systemic bases for differing opinions and approaches: The possibility that people have fundamentally or substantially different conceptions of risk. The philosophical basis for contention over risk is most evident in the scholarly and scientific literature. Experts who study risk or risk issues are more likely to develop well-defined, internally consistent conceptions of risk than members of the lay public. If distinct philosophical and linguistic presumptions underlie competing conceptions of risk, it should be possible to formulate the contentiousness over alternatives in terms of a principled philosophical debate, with implications for risk analysis, risk evaluation and risk communication.

Concepts, Conceptions and Definitions

Do experts who differ on risk issues have different concepts of risk, as Judith Bradbury claims,¹ or do they simply employ different definitions? It depends. The terms “concept,” and “definition,” are themselves often used in overlapping ways. First, we stipulate how each term will be applied to risk debates in the following analysis, then develop a usage for the term “conception.” We will assume that the

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¹ Judith Bradbury, *The Policy Implications of Differing Concepts of Risk*, 14 *Sci. Tech. & Human Values* 380 (1989).

concept of risk is shared by all speakers of English, and indeed by speakers of any language for which there is a direct cognate. The concept of risk is fixed by broad parameters that allow people to parse and interpret sentences in which the word "risk" occurs, and that link the verb and noun forms of the word to its adjectival (risky) and adverbial (riskily) forms. Standard lexical or dictionary definitions attempt to articulate the meaning of a concept by paraphrasing common usage in roughly equivalent terms. In scientific, technical or scholarly contexts, however, it is often necessary to stipulate a more precise meaning. Stipulative definitions establish a narrower set of equivalent terms or operational procedures for determining when a term applies, and indicate how it is connected to other theoretical terminology. A stipulative definition of risk specifies formulae, data, quantitative relationships and other terms that determine procedures for using the term "risk" in a specific context. Such a definition specifies substitution criteria that permit the replacement of references to risk with definitional equivalents.

Conceptually ambiguous words and failure to stipulate definitions can lead to simple miscommunication or disputes about the meaning of terminology, but such disputes do not usually evidence deeper philosophical differences. The word "revolting" can be used to express two distinct concepts, leading to ambiguous sentences such as "The peasants are revolting." One who interprets the sentence as a statement about the peasant's political activism may misconnect with another who interprets it as a statement about peasant demeanor and comportment. This is a case where different concepts are being applied. Two social scientists who study peasant revolution may also misconnect over this sentence, if one defines "revolt" to mean armed resistance for example, while the other does not. Here there are two definitions for a single concept, and redress of the miscommunication consists simply in stipulating the definition for terminology more carefully.

Of course it may turn out that the difference of opinion between these two social scientists cuts deeper. One may think that "revolt" should be defined in terms of armed resistance, while the other does not, and these reasons may connect up with broad philosophical commitments to methods of social inquiry. In such cases, clarifying

definitional differences does not end the disagreement; it is in fact only the first salvo in an extended philosophical debate. John Rawls distinguished a similar kind of philosophical dispute over the meaning of “justice” from mere definitional disputes and conceptual confusions by characterizing it as a debate between competing conceptions of justice. Opponents in this debate share a common concept of justice; it is not that one group uses the word “justice” to mean accurate criminal verdicts, for example, while the other uses it to evaluate the basic structure of society. Rawls was concerned with social justice and found that opponents had profoundly different conceptions of social justice. Philosophical disagreements reflecting different conceptions of justice are not simply definitional disputes, since many who shared the same conception of justice would apply different definitions in their work, and noting definitional differences between those who had different conceptions solved nothing.²

Rawls hoped that distinguishing concept from conception would allow those with different conceptions of justice to agree on those matters where their conceptions were not in conflict. Our purposes are less ambitious. The claim that there are competing conceptions of risk means first that when experts analyze or study risk, they are appealing to a general concept that unifies all uses of the word according to the broadest patterns of language. It also means that the concept of risk can be interpreted in at least two distinct ways, and that distinct interpretations form the basis for philosophically incompatible statements about risk. Disputes about competing conceptions of risk take the form of principled and reasoned disputes, as opposed to simple misunderstandings. The claim that there are competing conceptions of risk implies that the concept of risk is like contested concepts such as “causality,” “reality,” “justice” and “truth” in that competing interpretations reflect philosophical differences that are long-standing and systematically linked. Such differences will not be settled merely by stipulating definitions for the disputed terms. Generally speaking, stipulative definitions for risk will be useful only when the discourse community (author and readers, speaker and audience) already possesses a shared conception of risk. For example, when people already agree that risk is a relationship between probability and future events, it

² John Rawls, *The Theory of Justice* 5–6 (1971).

becomes useful to stipulate definitions that specify the relationship as a curve, a set of curves mapped over probability distributions, or as a simple product. Many definitions can be found in the risk analysis literature, and, again, different definitions do not imply important philosophical differences.

It is not clear whether our claim of competing conceptions of risk is itself disputable. Most literature on risk either proposes or presupposes a general conception of risk, then proceeds immediately to offer definition and qualification of the favored conception without acknowledging the existence of alternatives. This practice might reflect a belief that risk is an uncontested concept, but it is typical for papers on justice or truth-unarguably contested concepts—to follow a similar pattern. Debates over conceptions of justice or truth have a long philosophical history, however, while debates over risk do not. Frank Knight, in 1921, reviewed the economic debate over the meaning of risk, concluding that investments where the probability of success is known do not count.³ A substantially different view was introduced into economic literature by Friedman and Savage, who argued that any choice of options with multiple outcomes, each of which can be assigned a conditional probability contingent upon selecting a given option, is made under conditions of risk.⁴

The basic elements of this approach had been present in von Neumann and Morgenstern's influential *Theory of Games and Economic Behavior*, although this book makes few uses of the word "risk" and does not introduce it as a technical term.⁵ Luce and Raiffa

³ Frank Knight, *Risk, Uncertainty and Profit* (1921), at 46, takes up the subject in an attempt to analyze profit and makes the following *reductio* argument:

If risk were exclusively of the nature of a known chance or mathematical probability, there could be no reward of risk-taking; the fact of risk could exert no considerable influence on the distribution of income in any way. For if the actuarial chance of gain or loss in any transaction is ascertainable, either by calculation a priori or by the application of statistical methods to past experience, the burden of bearing the risk can be avoided by payment of a small fixed cost limited to the administrative expense of providing insurance.

Risk-taking justifies profit for him precisely because ordinary business decision making is based upon inherently incomplete forms of knowledge quite unlike those in which statistics can be used to make an accurate assessment of probability; *id.* at 197.

⁴ Milton Friedman & Leonard J. Savage, *The Utility Analysis of Choices Involving Risk*, 56 *J. Political Econ.* 279 (1948).

⁵ John Von Neumann & Oskar Morgenstern, *The Theory of Games and Economic Behavior* (1944).

further clarified the Friedman and Savage approach, and many economists adopted the practice of treating risk not as a quantity but as a class of decisions.⁶ It is worth noting that a strict application of the Luce and Raiffa terminology does not lend itself to risk comparisons. Decisions are either risky or not under their definition; but practice has not been so strict—a good example of how multiple definitions thrive under a common conception of risk.

The history of debate in the philosophy of economics has not been widely recognized in more recent discussions of technological risk. Recognition that disputants hold different conceptions of risk is implicit in papers by Granger Morgan⁷ and in a book by Mary Douglas and Aaron Wildavsky.⁸ Recent literature on risk, risk assessment and risk communication reflects a growing acknowledgment that there are multiple conceptions of risk,⁹ but the literature often obscures the distinction between psychological patterns in risk perception and truly competing philosophical conceptions of risk. Kristin Shrader-Frechette offered a systematic classification for competing conceptions of risk in a 1991 book.¹⁰ Her approach forms a starting point for understanding the potential for philosophical debate.

Shrader-Frechette's Risk and Rationality

Shrader-Frechette describes two positions in the philosophical debate over risk. On one side, positivists think that risk is a purely scientific concept admitting complete characterization and analysis through data collection and quantitative methods. Opposed are

⁶ R. Duncan Luce & Howard Raiffa, *Games and Decisions: Introduction and Critical Survey* 13 (1957).

⁷ M. Granger Morgan, *Probing the Question of Technology-Induced Risk*, 18 *IEEE Spectrum* 58 (1981).

⁸ Mary Douglas & Aaron Wildavsky, *Risk and Culture* (1982).

⁹ See, e.g., Paul Slovic, *Perception of Risk*, 236 *Science* 280 (1987); S. Rayner, *Risk and Relativism in Science for Policy*, in *The Social and Cultural Construction of Risk* 5 (Brandon B. Johnson & Vincent T. Covello, eds. 1987); Sheila Jasanoff, *Bridging the Two Cultures of Risk Analysis*, 13 *Risk Anal.* 123 (1993); Abraham H. Wandersman & William K. Hallman, *Are People Acting Irrationally?* 48 *Am. Psychologist* 681 (1993); James Flynn, Paul Slovic & C. K. Mertz, *Gender, Race, and Perception of Environmental Health Risks*, 14 *Risk Anal.* 1101 (1994); and Camille Lomoges, Alberto Cambriosio & Louis Davignon, *Plurality of Worlds, Plurality of Risks*, 15 *Risk Anal.* 699 (1995).

¹⁰ Kristin S. Shrader-Frechette, *Risk and Rationality* (1991).

relativists who think that risk is a purely subjective reaction to phenomena encountered in personal or social experience. Two conceptions of risk emerge. The positivist interprets risk as referring objectively to the circumstances of the physical world. The relativist takes risk to a purely mental construct expressing emotional, moral or political reactions. Shrader-Frechette uses Chancey Starr's work on risk to exemplify the positivist, and Douglas and Wildavsky's to exemplify the relativist, conceptions.¹¹

In fact, the positivist/relativist divide misses much of what is truly contested among various disputants she places in either camp. The article upon which Starr built his reputation in risk studies drew upon differences between voluntary and involuntary risks to account for differential rates of acceptance of new technologies. Starr's treatment of risk implies that perception of voluntariness is a subjective reaction. The differential in acceptability of voluntary and involuntary risks reveals social preferences about risky technologies. It is clear that Starr favors scientific studies for assessing the level of risk over popular opinion, yet it does not seem fair to classify his conception of risk as "admitting complete characterization and analysis through data collection and quantitative methods." Values have a role for Starr. Neither do there appear to be good reasons to classify Douglas and Wildavsky as relativists in Shrader-Frechette's sense. *Risk and Culture* is a terse and often obscure book. Throughout her other work, Douglas argues that the specific content of beliefs about purity, danger and social taboos is arbitrary. Beliefs, e.g., about what is and what is not food vary from culture to culture, and any specific culture's belief is arbitrary. These beliefs are distributed in any culture so as to establish an invariant structure of social relationships.¹² *Risk and Culture* compared the arbitrary content of belief systems of several cultures to make the point that risk beliefs are part of political culture.¹³

¹¹ *Id.* at 29-46.

¹² Mary Douglas, *Environments at Risk*, in *Implicit Meanings* 230 (1975).

¹³ The theory of political culture is a crucial component of Douglas and Wildavsky's view, but further discussion of cultural theory lies beyond the scope of the present paper. See Michael Thompson, R. Ellis & Aaron Wildavsky, *Cultural Theory* 216-7 (1990).

According to Douglas and Wildavsky, the central role of beliefs about purity and danger is to constitute a system of signs that structure social relationships. This means that there is little point in arguing the scientifically assessed probabilities with the Hima of Africa, who believe that it is risky for women to come in contact with cattle. This belief in Hima culture does not identify an objective threat but organizes Hima society. Douglas and Wildavsky assert that individuals and groups within any society will establish relationships which form a fixed structure that establishes the hierarchy of power within the society, and that an individual's statements or beliefs about risk are indicative of their place within that society.¹⁴ Douglas and Wildavsky's view entails that statements about risk are as much (and often more) a reflection of deep social structure as they represent the world. This view does not deny facts about risks in general, and it most certainly does not entail relativism with respect to specific well-characterized elements of risk, such as the statistical probability of events.

Shrader-Frechette introduces the positivist/relativist dichotomy to establish the basis for her own view of risk. Shrader-Frechette is surely correct to place Starr's conception of risk in contrast with the conception in *Risk and Culture*. It is fair to say that her view moderates between the positivist and relativist conceptions, as she describes them. Yet, close reading of Starr and Douglas fail to support a claim that they advocate these two philosophies. In the next section, we offer an alternative schema for characterizing contrasting conceptions of risk, and argue that it more accurately reflects the contested nature of risk.

The Probabilist/Contextualist Dichotomy

Prior to 1980, decision theorists had developed variations on the Friedman and Savage interpretation that defined risk as a function of the probability and utility (or value) of events. The decision theoretic treatment of risk held that the utility or value of a choice to a decision maker was a function of the relative value of potential outcomes. The decision maker's desire for each potential outcome must be discounted by its probability to calculate utility, producing an expected value for each choice that could then be compared and ranked with the expected value of other options. The decision theoretic notion had been widely

¹⁴ Douglas & Wildavsky, *supra* note 8, at 40-48.

accepted as an analysis of rational risk taking behavior for investment and gambling choices, and continues to be accepted as a standard of rationality by many today.¹⁵ Granger Morgan has noted that attitudes toward risky technology were influenced by dimensions other than probability and harm (or consequence).¹⁶ The list of dimensions that influence attitudes toward risky technology included voluntariness (whether those exposed to risk were coerced), catastrophic nature (whether harms were cumulative of many isolated events, or associated with a single event), reversibility (whether unwanted consequences could be repaired or the original situation could be restored) and many others. Yet, Morgan was unclear in stating how these dimensions relate to risk as such. At least two ways to understand this relationship lie at the heart of philosophical disagreements over risk.

In 1993, Hornig offered a dichotomous schema that is in many ways similar to Shrader-Frechette's. She characterized scientific views of risk in a manner largely consistent with Shrader-Frechette's positivism, but in place of relativism Hornig offered a contextualist (or constructivist) view.¹⁷ On this view, the social context in which issues or decisions arise determine which dimensions of risk are most important. Hornig does not propose, as one of Shrader-Frechette's relativists might, that lay assessments of risk are just as accurate as expert assessments, but she does assert that lay assessments can be more sophisticated than scientific assessments. While expert assessment is quite likely to be more accurate in measuring dimensions of risk deemed important by the scientific community, experts may fail to recognize other dimensions (e.g., voluntariness) that may be more relevant to the points of decision in a given context. We will follow Shrader-Frechette and Hornig in proposing a dichotomy, but rather than suggesting two conceptions of risk in diametrical opposition, we

¹⁵ See Ronald N. Giere, *Knowledge, Values and Technological Decisions: A Decision Theoretic Approach*, in *Acceptable Evidence: Science and Values in Risk Management* 183 (Deborah G. Mayo & Rachele D. Hollander, eds. 1991).

¹⁶ Morgan, *supra* note 7.

¹⁷ Susanna Hornig, *Reading Risk: Public Response to Print Media Accounts of Technological Risk*, 2 *Pub. Understanding Sci.* 95.(1993); Paul Thompson offers arguments for contextualism in *Risk: Ethical Issues and Values*, in *Agricultural Biotechnology, Food Safety and Nutritional Quality for the Consumer* 204 (June Fessenden MacDonald, ed. 1991) but does not use that term.

suggest that our dichotomous terms represent opposite ends of a continuum. Each represents an extreme and logically incompatible view. Few if anyone truly holds the extreme views, but several different conceptions can be mapped out in between.

At one extreme lies a purely probabilist conception. This sees risk as essentially characterized by the probability of events or their consequences. The characteristics found on Morgan's list are secondary or accidental dimensions of risk, just as coloration might be thought of as a secondary or accidental dimension of the organ for sight. Accidental dimensions might be extremely influential in the formation of attitudes toward risk, just as blue, green or brown are influential in forming attitudes toward eyes. Further, it may be that all risks possess some accidental dimensions, just as all eyes are colored. Nevertheless, accidental dimensions do not serve as criteria for determining whether something is or is not a risk, just as coloration is irrelevant to whether something is or is not an eye. One understands risk if and only if one understands probabilities. Probability is the essential or primary dimension of risk, other dimensions are inessential and accidental.

At the opposite extreme is the contextualist conception, that places probability at parity with voluntariness, familiarity and all the rest. The contextualist believes that risk will always be characterized by some subset of attributes on the list, but that no single attribute will be understood to characterize every instance or risk. On the contextualist view, the concept of risk is more like the concept of a game than the concept of an eye. Games have time limits, rules of play, opponents and criteria for winning or losing, but none of these attributes is essential to the concept of a game, nor is any of them characteristic of all games.¹⁸ Similarly, a contextualist view of risk takes it that risks are characterized by some combination of attributes such as voluntariness, probability, intentionality, and so on, but that no one of these attributes is essential.

As described above, probabilist and contextualist conceptions of risk are both extreme views, unlikely to be held by anyone. Strictly speaking, the probabilist takes probability to be the only essential characteristic of risk, but even those closest to the probabilist pole usually presume that risk is also characterized by some element of negative or unwanted consequence. The movement toward the

¹⁸ Ludwig Wittgenstein, *Philosophical Investigations* 34 (1953).

probabilist pole is most often recognizable when those inclined toward the view speak informally. It is typical to hear probabilists refer to risk in ways that permit direct substitution of the word probability without substantial transformation of meaning. When a probabilist speaks of the risk of an earthquake, for example, the term "risk" functions as a synonym for probability. Nevertheless, the harm and damage associated with an earthquake is implicit; few would apply the concept of risk so as to anticipate the risk of positive or satisfactory events. The important implication of the probabilist view is that estimation of probabilities is the *sine qua non* of risk.

The contextualist, on the other hand, claims that no single attribute is a necessary condition for the existence of risk. In this the contextualist appears committed to the view that some instances of risk involve no elements of probability or chance. It is, again, important to recall that the pole positions of the probabilist/contextualist dichotomy represent limit cases. We do not claim that working conceptions of risk reach the limit case where probability, uncertainty, and indeterminism are entirely absent. The more important implication of the contextualist view is that there will be some cases in which estimation and clarification of probabilities are largely irrelevant to understanding risk, as well as to assessment, acceptability and even mitigation of risk.

In summary, the probabilist/contextualist dichotomy yields a schema for charting conceptions of risk. It does not yield important conceptions of risk at either extreme, but relative emphasis upon probabilistic characteristics shapes distinct understandings of risk that can be plotted between the poles. Extreme probabilism and extreme contextualism will be unusual, but a review of the literature on risk reveals both strong probabilists and strong contextualists, each close to, yet not quite reaching the extreme. There are also relatively weak versions of both positions. An advocate of any given conception will be able to advance sophisticated arguments in its favor, but the balance of this paper does not offer such an argument. Instead, we identify some representative points along the spectrum, then analyze some broad implications of each view. The representative viewpoints are not intended as exhaustive. Any thorough review of conceptions of risk would need to take up the so-called "social construction" or

constructivist school of risk scholarship. Douglas and Wildavsky's book was arguably one of the first efforts in this school, but many others have followed. In the most general terms, social constructivists are interested in the way that individuals and groups make claims about risk, and in the ultimate affect that this activity has on the way that risk issues are understood, not only by individuals but also by the public at large.¹⁹

Clearly, many constructivists themselves make claims that appear to have important philosophical content. Some imply a nominalist view of language, others appear to deny any that risk claims have any reference beyond the minds of people who make them. If constructivists are serious about the apparent philosophical implications of their claims, then there are important points of philosophical difference that are not captured by the probabilist/contextualist continuum. It is quite possible that some constructivists are adopting the relativist view Shrader-Frechette describes. We are convinced, however, that the majority of risk constructivists have simply not thought about the epistemological and ontological implications of their claims. We think that many constructivists overstate their position in an attempt either to stress the importance of social context in selecting and framing which risk issues to address, or to stress how factors we identify in the contextualist view may be more important than probability or consequence. We think that they might choose words more carefully if they were aware of the fits that they cause. Our contextualism is, thus, not equivalent to social constructivism, though we would expect to find many social constructivists adopting contextualist conceptions of risk. Any attempt to further categorize and interpret the claims of constructivists is beyond the scope of the present paper.

Probabilist Conceptions of Risk

The strong probabilist position is exemplified by the classic risk analysis paper "Risks of Risk Decisions" by Chauncey Starr and Chris Whipple. For Starr and Whipple the fundamental core of any risk assessment is a quantitative analysis. Risk in the broadest sense is to be determined by a scientific analysis of potential harm per segment of the population. Starr and Whipple define analysis as "a process based on

¹⁹ Joel Best, *Images of Social Issues: Typifying Contemporary Social Problems* (1989).

collected data, anecdotal cases, and statistics, any of which may or may not be correct; and, based on these, we invent simplified models to predict an outcome.”²⁰ By “predict an outcome,” it is clear that Starr and Whipple mean “assign a probability to an outcome.” Starr and Whipple are neither unsophisticated nor dismissive in their analysis of the different social factors that come into play whenever risk is an issue. They pay close attention to non-analytical evaluations of risk, which they refer to as intuitive. Starr and Whipple give little credence to intuitive analysis as a legitimate form of knowledge; however, they do acknowledge that it possesses a great deal of influence in the political arena. In fact Starr and Whipple contend that, “For specific types of risk, in which intuitive evaluations of risk and benefit contradict analytical evaluations, the necessary consensus may not develop, but rather a conflict requiring political resolution is likely to result.”²¹ In such situations, Starr and Whipple encourage making quantified forms of estimated probability the key point of discussion in the debate. They argue that estimated frequency risk analysis data should assuage the public’s fears if it is used to directly address the issues.

The strong probabilist conception exemplified by Starr and Whipple takes the probability of events as essential to any knowledge claim about risk. Although Starr and Whipple are quite interested in the sources of political controversy over risk, they permit only two sources of disagreement: different beliefs about the value of outcomes and about probabilities.²² As such, those who base attitudes or reactions to risk upon dimensions such as familiarity, reversibility, voluntariness and the like form intuitive assessments of risk, but what this means to Starr and Whipple is that qualitative elements either substitute for knowledge of probability or reflect relative judgments of the value of consequences. Energy technology, especially nuclear power, was the point of reference for Starr and Whipple’s discussion. They evidently believed that different estimates of the probability of a nuclear accident explain the deviation between expert and lay risk assessments. Hence they advocate

²⁰ Chauncey Starr & Chris Whipple, *Risks of Risk Decisions*, 298 *Science* 1115 (1980).

²¹ *Id.* at 1119.

²² *Id.* at 1116.

a program of education to correct widespread misperceptions of probability.

Shrader-Frechette appears to be a weak probabilist. She refers to herself as a scientific proceduralist. The scientific proceduralist recognizes that risk evaluation is not solely a matter of scientific investigation: "but also a political procedure to be negotiated among experts and the public."²³ She claims that scientific proceduralism lies somewhere between the radical positions of naive-positivism and relativism. She claims that the proceduralist uses objective data in the practice of risk analysis. Like Starr and Whipple, she assumes that the objective component of risk analysis lies in the assignment of probabilities to potential events. However, the risk proceduralist also allows that risk evaluation is affected by politics and presupposes the adoption of scientific values or postulates. Assessment of probabilities is itself a value-laden procedure for Shrader-Frechette. Decisions about the reference population, the treatment of uncertainty and statistical procedures will affect the assessment of probability. She believes that it is impossible to make such decisions apart from value judgments. Hence there must be an opportunity for multiple assessments, each informed by the values of contending groups in political culture.

Shrader-Frechette's view exemplifies probabilism because any discussion of risk will be characterized by facts about probability. She believes that the centrality of facts about probability militates against any view of risk that does not employ technical assessment of probabilities. However, other dimensions can be equally important not only for the acceptability and communication of risk, but for key decisions the empirical assessment of risk itself. For example, the relative frequency of cancer or other diseases may vary for different groups. The poor may be especially vulnerable due to more frequent occupational or residential exposure to hazardous substances. Risk analysts who define the reference population in light of such specific vulnerabilities may well arrive at different assessments of probability. This results shows that values associated with dread, with powerlessness, or with involuntary risks can permeate the technical assessment process; it does not, however, represent a non-probabilist conception of risk. Probabilities are still considered to be the essential core of risk.

²³ Shrader-Frechette, *supra* note 10, at 56.

Contextualist Conceptions of Risk

A strong contextualist will hold the position that the relevance of any given dimension for risk is fixed by the context in which a risk issue arises and is debated. Put another way, people who raise questions and warnings about the risk of practices or technologies may use risk language to make entirely different sorts of claims, all legitimate applications of the concept of risk. Saying that something is risky may be a way of saying, e.g., that it is unfamiliar or untraditional, and this claim may not be intended to imply that there are *any* known or suspected hazards associated with the risky practice, much less that hazards can be estimated as a probability of harm.²⁴ While the probabilist will find such forms of speech as anomalous or inappropriate for understanding risk issues, the contextualist will interpret them as entirely legitimate and meaningful. They point toward different issues than uses of the work "risk" that imply the quantification and ranking of hazards, but both uses of the word are legitimate, and both deserve respect and accommodation in risk management.

It is plausible to read Douglas and Wildavsky as strong contextualists, but the cultural theory interwoven into their position complicates analysis. A clearer example of the strong contextualist approach can be found in Alonzo Plough and Sheldon Krimsky's paper, "The Emergence of Risk Communication Studies: Social and Political Context." They frame it as a discussion of risk communication, but their analysis implies a contextualist conception of risk. They show that when lay persons talk about technological risk they make selective reference to some attributes described by Morgan, often excluding others. For example, the attribute of control comes to the fore in much talk about risk. So that people raise concerns about risk as ways of expressing anxiety about loss of control, irrespective of the association between control and harm. For Plough and Krimsky, even scientists and manufacturers can be deeply interested in talking about risk to demonstrate confidence and control.²⁵ This need not imply that lay

²⁴ See Paul B. Thompson, *Agricultural Biotechnology and the Rhetoric of Risk: Some Conceptual Issues*, 9 *Env'l Prof.* 316 (1987) and *Biotechnology, Risk, and Political Values: Philosophical Rhetoric and the Structure of Political Debate*, in *Biotechnology: Assessing Social Impacts and Policy Implications* 3 (D. J. Webber, ed. 1990).

²⁵ Alonzo Plough & Sheldon Krimsky, *The Emergence of Risk Communication*

persons equate risk with control in every communicative context. Lay persons will presumably shift to emphasize probability or harm, e.g., in the context of discussing insurance or gambles. Plough and Krimsky show that no dimensions or risk are essential to every instance of talking about risk, but any dimension might be relevant, depending on context.

Plough and Krimsky claim that risk must be studied within the social context in which risk debates or discussion arise. They distinguish the “symbolic” meaning of risk from the meaning attributed to it by the technical risk assessment community.²⁶

[To] understand the symbolic meaning of risk communication, we have to study risk in its social context... the symbolic definition of risk communication differs substantially from the conventional view. While the former includes cultural and experiential inputs, the latter generally is reductionistic, focusing on quantifiable variables.

They are troubled by the reductionistic tendencies of traditional risk communication. They are contextualist in the sense that they claim that to make effective policy decisions and to communicate effectively about risks, it is helpful to take into account a risk’s technical or scientific, and cultural contexts.

One key difference between strong and weak contextualists is the vehemence with which probabilist conceptions of risk are criticized. Weak constructivists’ reluctance to promulgate clearly non-probabilist interpretations of risk is another. Carl Cranor is a weak contextualist in both respects. He investigates the differences between the scientific communities that determine what risk is for regulatory purposes and the legal system which responds to tort cases with evidence garnered from the scientific community. Cranor is concerned that:²⁷

[The] way burdens of proof and other procedures are used in science to establish a theory or causal relationship tend to be much more demanding than those adopted in legal institutions. This leads to a conflict between scientific and legal institutional evidentiary norms. If we uncritically adopt scientific standards for legal purposes, we risk frustrating or begging the legal issues.

Studies: Social and Political Context, 12 *Sci. Tech. & Human Values* 4 (1991).

²⁶ *Id.* at 5.

²⁷ Carl F. Cranor, *Regulating Toxic Substances: A Philosophy of Science and the Law* 5 (1993).

Legal sufficiency is defined for the tort law as consisting of “a preponderance of the evidence.”²⁸ The side with the better evidence should win the case. This is different from the attempt to establish statistical significance. The point of the tort law is to establish liability, to link a harm to an accused. It is a great deal more difficult to meet the burden of proof in the scientific arena. Cranor cites the 95 percent rule as evidence:²⁹

[At] a minimum scientists want to be at least 95 percent sure that they are not falsely adding to the stock of scientific knowledge when they report new discoveries or new statistical results.

Cranor explores the different conceptions of risk held by these two communities. The scientific community’s conception of risk results in the quantification of probabilities. Cranor seems to believe that the legal community is also probabilist, but members of the legal community make claims based on a preponderance of the evidence. A preponderance of the evidence implies sufficient probability to make reasonable claims about harm. The legal community and the scientific community both define risk in terms of verifiable observations. The difference between the two conceptions lies in the evidentiary standards that the two groups have adopted and the legal community’s substitution of conditional probability for causality.

Cranor is contextualist in that he understands the philosophical tension between the probabilist conceptions of his two communities in contextualist terms. His project was to show how two different conceptions of risk grow out of the needs of distinct communities. These conceptions make sense within these communities; however, miscommunication may result when the two communities interact with each other. Such is the case whenever the American judicial system must rule on cases involving toxic chemicals. The way to address this tension is through recognizing the context dependent elements of each community’s conception of risk, rather than trying to establish one conception as right, and the other as wrong. Cranor has provided a contextualist analysis of two different probabilist conceptions of risk. However, Cranor does not offer an alternative conception of his own.

²⁸ *Id.*

²⁹ *Id.* at 55

He is also entirely respectful of the need to establish probabilistic conceptions. He omits the question of whether any clearly non-probabilist conceptions are worthy of such respect. As such, while Cranor has offered contextual criteria for deciding which characteristics of any given conception of risk should be used, his rejection of the probabilist position in this book is of the mildest form possible.

Implications for Risk Assessment and Evaluation

This paper amends the literature represented by Bradbury and Shrader-Frechette in two ways. First, differentiating the concept of risk from risk conceptions and definitions provides a more carefully nuanced account of contentious issues at the philosophical, political and technical levels. Second, the probabilist/contextualist dichotomy reformulates some familiar elements in risk debates, and it is worth considering some of these implications. In summary, as one moves from probabilist to contextualist poles, risk assessment is seen as increasingly value laden. As such, the implications of each conception for risk evaluation can be summarized in terms of the extent to which one sees these as truly distinct processes. The strong probabilist thinks that risk assessment is a process of fact finding, while risk evaluation is a process of deciding how to use those facts. The strong contextualist, on the other hand, sees evaluative judgments permeating every stage of risk assessment, and understands risk evaluation largely as the attempt to acknowledge and justify these judgments explicitly and publicly.

The immediate practical relevance is that risk analysts should be aware of the contentious nature of debates over risk, but should not expect them to be resolved by offering more subtle definitions. The strong probabilist is likely to regard risk assessment as primarily a process of researching and assigning probabilities. The strong probabilist will regard specific events or outcomes to be analyzed, e.g., mortality, economic loss or events such as the release of radioactive material as given. Identification of unwanted outcomes might be thought relatively unproblematic, perhaps because the specific events or outcomes to be avoided are established as a component of public policy (a safe minimum standard, for example) or through administrative decisions (economic cost benefit tradeoffs).

In either case, the events of interest are given, rather than being established as part of the risk assessment process itself. Events are given in a dual sense. They function as assumptions, established values, or "facts" that frame an analysis. They are also literally given to the analyst by some external source, such as a government or corporate hierarchy. The probabilist view is therefore most plausible to individuals who work in organizations or in settings where their job is to assess probabilities for events or outcomes that have been judged to be important by others. This includes many scientific risk analysts whose orientation to risk is a response to requests for information about mortality and morbidity associated with exposure to specific or suspected toxins. Many of the value decisions will have been made prior to such requests, and most especially the decision that information on probabilities is needed. Strong probabilists see these decisions as extrinsic to risk assessment proper; they come to see their work as the whole of risk assessment, rather than only a part.

Because assessment of probabilities is largely technical, the strong probabilist comes to resemble Shrader-Frechette's positivist, who thinks that risk is an entirely objective matter, unaffected by values. One of the key value decisions is which of many potential outcomes or events to assess. In the strong probabilist conception, these decisions are seen as outside of the assessment process; they are made prior to assessment. Once the events of interest have been identified, however, even a strong contextualist may conceive of risk assessment as a fact finding process, one in which the facts to be found relate to probabilities. All the value judgments have been made for the probability assessor, and hence appear not to be relevant to the strong probabilist conception of risk.

A weak probabilist like Shrader-Frechette herself will recognize the values implicit in the selection of events or outcomes that are quantified. The value dimension of selecting outcomes is especially evident in recent work on environmental justice.³⁰ Here it has been shown that the decision of which risk to assess may or may not include distributive elements, such as a higher level of exposure to minorities, to

³⁰ Robert D. Bullard, *Dumping in Dixie: Race, Class, and Environmental Quality* (2d ed. 1994); see also Roger E. Kasperson & Jeanne X. Kasperson, *Hidden Hazards in Acceptable Evidence: Science and Values in Risk Management* 17-20 (Deborah G. Mayo & Rachele D. Hollander, eds. 1991) for a discussion of environmental justice concerns and the risk selection process in risk assessment.

women or to children. The weak probabilist will also recognize value decisions in the practice of failing to include social consequences such as plant closings or economic dislocation from risk assessment.³¹ A weak probabilist may also recognize that the derivation of probability itself may have value dimensions. Probabilities derived from uncertainty and expert opinion, for example, may be treated quite differently from those derived from robust statistical samples. In contrast, the strong probabilist is likely to regard each of these simply as alternative sources of data, and will regard the combination of data or measurements from such diverse sources as a quantification problem that will be solved as an element of probability theory itself. The weak probabilist may prefer quantification procedures that do not combine subjective and objective probabilities and that do not represent uncertainty as probability, to facilitate the application of distinctions that will be made in the process of risk evaluation³²

Both the strong and weak probabilist conceptions of risk presume that risk is determined by probability and consequence. As such, matters such as whether a risk occurs as the result of a person's intentional action, or whether persons bearing risk have assumed it voluntarily are extrinsic questions, questions that will be answered after a risk assessment is complete. Yet it is just such questions that may need to be answered first in certain legal contexts, for it is clear that a risk has been voluntarily assumed, there may be no need for an assessment of probabilities at all. Similarly, if a risk has been imposed under coercive conditions, the probability of harm may be largely irrelevant. A weak probabilist thus will recognize certain contexts in which the key factual questions have little to do with probability, or where alternative factual burdens of proof must be met before assessment of probability and outcome becomes relevant. A contextualist, however, will presume that firm-level management, tort law, and environmental action regulation, each represent contexts in which the concept of risk will figure prominently in decision making. On a contextualist view, the empirical scientific research needed to satisfy the requirements for empirical assessment may differ dramatically from one context to another, and

³¹ Roger Kasperson & Jeanne Kasperson, *id.* at 20-23.

³² Kristin S. Shrader-Frechette, *Probabilistic Uncertainty and Technological Risks in Science, Politics and Morality* 43 (René von Schomberg, ed. 1993).

the contextualist believes that identifying those research needs is itself part of the risk assessment process. The events of interest are not given, and assessment must include a process for systematically determining which events (if any) to assess in probabilistically.

Strong and weak contextualists differ on this point primarily in their attitude toward probabilists. A weak contextualist such as Cranor uses contextualism primarily as a way of explaining why experts differ over which probabilities to assess. Strong contextualists such as Krinsky and Plough suggest that advocating or presuming a probabilist view forecloses important questions in the risk assessment process in a manner that is morally and politically objectionable. The strong contextualist position thus politicizes conceptions of risk. A probabilist, on this view, is not simply adopting a set of epistemological or conceptual criteria for understanding risk. They are inevitably engaged in a political struggle to ensure that their preferred criteria are utilized in policy decision making. The potential for an acrimony between probabilists and strong contextualists is evident here, but engaging this debate at a philosophical rather than personal level might improve everyone's ability to understand what is at stake in establishing priorities for risk assessment.

Implications for Risk Communication

It is quite likely that probabilists and contextualists will have rather divergent perspectives on risk communication. Probabilists are likely to think that people generally do not know about probabilities, and that they need to know probabilities to have adequate information about risk. Given this starting point, risk communication is largely a process of disseminating information about probability. Contextualists are less likely to approach risk communication with any specific assumptions about what people need to know. For the contextualist, risk communication will be construed as bridge building between discourse communities-between groups who share a particular social context and have evolved patterns for conceptualizing and discussing risk within that context. The divergence between probabilist and contextualist approaches to risk communication is an example of a more general pattern in science communication studied by John Zimon.

Zimon describes three models for science communication. The deficiency model takes the general problem of science communication to be one of public ignorance, “which must by all means be overcome.”³³ This view issues out of the assumption that the great majority of ordinary people have very little understanding of science, and is typified by science communication efforts that stress knowledge of facts and theories. Zimon faults the deficiency model for presuming that scientific knowledge tends to be misrepresented and misunderstood outside the boundaries of the scientific community. He states, “Scientists themselves do not have a clear and consistent notion of what ‘science’ covers, and often disagree profoundly on what it is telling us about the world.”³⁴

The second model is the rational choice model. It “focuses on those points where a particular piece of knowledge might be expected to play an important part in people’s lives — that is when they have to make practical decisions to which this knowledge might seem relevant.”³⁵ Here, the goal of science communication is to supply the missing piece of knowledge. Zimon notes the close association between the deficiency and the rational choice models, but the problem of the rational choice model resides in the way it construes “need to know” situations. Certainly there are some circumstances in which a key piece of information (some facts about probabilities, for instance) are relevant, but many problems of everyday life are better characterized as problems of information management. Knowing where to go for information, and whom to trust is often more important than knowing key facts. It is this kind of information that comes to the fore in what Zimon calls the context model. This model recognizes that a person’s desire for information is shaped by their circumstances, that the credibility of a source depends heavily on its perceived interest in a particular context, and that scientific information will be combined with broader values in forming any individual’s personal beliefs.³⁶

³³ John Zimon, *Not Knowing, Needing to Know, and Wanting to Know*, in *When Science Meets the Public* 14 (Bruce V. Lewenstein, ed. 1992).

³⁴ *Id.* at 16.

³⁵ *Id.*

³⁶ *Id.* at 18-19.

Following Zimon's rational choice model, the probabilist is likely to see risk communication as the dissemination of information about probability and consequence. Facts about probability and consequence will be presumed to be what the ordinary person "needs to know," to make better decisions. Following the deficiency model, the probabilist may also see risk communication as involving the promotion of a conceptual framework for making use of probability and consequence information in personal choice and public policy. When the two are combined, the probabilist sees risk communication as publicizing facts about probability and consequence, as correcting false perceptions, as dissociating accidental dimensions from people's understanding of risk, and as encouraging a choice procedure that interprets every choice as involving risk. The probabilist approach to risk communication, in other words, includes a broad philosophic commitment to a particular view of decision making and rational choice.

The contextualist does not assume that the word "risk" means just one thing. Contextualists presume that people acting from different social or problem solving contexts have distinct notions of risk and demands for both factual knowledge and evaluative judgment about risky situations. Risk communication is, on Zimon's context model, a process of attempting to establish dialog between individuals and groups with very different conceptions of risk. Because of these differences, risk assessment is a process fraught with opportunity for confusion, distrust and even deceit. A successful risk communicator is one who succeeds at negotiating meanings and mediating diverse discourse communities who have some need to interact.

For example, one group requesting information about risk may presume that risks are intentional actions, to be distinguished from familiar hazards and freak occurrences. If they request information from another group that does not recognize a distinction between risk and either familiar hazards or freak occurrences, seeing all of them as characterized in terms of the probability of an unwanted event, the communication may easily misfire. The information seekers may feel misled by the information providers, and they may interpret this as evidence that someone is trying to harm them. The information providers may interpret this response as emotional, at best, and perhaps

as evidence that the information seekers are irrational. Any and all of the responses would be expected by the contextualist; any and all are reasonable given the divergent conceptions of risk. The probabilist risk communicator, however, is unlikely to have much sympathy with the information seekers in this example. What they appear to want, after all, has little to do with the probability of unwanted outcomes. The probabilist goal for risk communication would be to help them see the facts about probabilities and outcomes. The seekers will be more rational when they adjust their behavior in accordance with the relative probability of those unwanted outcomes, irrespective of whether they are also associated with accidental dimensions of human agency.

Hornig makes the case for the context model in risk communication by suggesting that scientists have a less sophisticated understanding of risk than the lay public.³⁷ It is true that probabilist conceptions of risk tend to presume Zimon's deficiency and rational choice models and that these models represent a somewhat unsophisticated understanding of communication. Yet, it is unclear that scientists, as a group, are committed to the probabilist conception of risk, nor is it obvious that probabilist conceptions of risk are less sophisticated than contextualist conceptions.

Conclusion

Bradbury, Shrader-Frechette and Hornig offer dichotomous schemes for classifying opposing views but overstate and misidentify the points of contention. The debate between probabilists and contextualists is a debate over how to understand risk, and both are appealing to a common concept of risk in constructing their respective positions. It is not a debate in which positivist and relativist epistemologies are pitted against one another, nor is it a debate between well defined interest groups, each utilizing a rhetoric of risk to advance a political position. While these other debates do influence the way that particular risk issues are negotiated, they do not carve the field of risk studies into opposing philosophical and methodological positions.

Risk probabilism and risk contextualism represent the opposite ends of a continuum for conceptualizing risk. Scientists and scholars who study risk and risk issues will likely adopt conceptions of risk that fall

³⁷ Hornig, *supra* note 17.

somewhere along the axis between extreme probabilism and extreme contextualism. Their relative positions will fix many of their methodological assumptions for risk analysis and risk communication, and will probably reflect other philosophic commitments, such as their broader view of how science should play a role in public policy or in the personal decision making of ordinary people. Clearly, the continuum between probabilism and contextualism does not map every contentious issue in risk studies. Even probabilists who share the same general conception of risk can find much to dispute when choosing the particular quantitative representation of that conception, and such controversies pale in comparison to those in which large commercial interests are affected by key choices in risk assessment methodology.³⁸ Yet the probabilist/contextualist continuum is one key dimension of controversy in risk issues, and one that should be recognized as such by everyone with an interest in understanding the implications of their opponent's positions, as well as their own.



³⁸ See John D. Graham, Laura C. Green & Marc J. Roberts, *In Search of Safety: Chemicals and Cancer Risk* (1988) for a study of how different assessment methodologies were debated on scientific grounds, but with thinly veiled links to commercial and political interests. This book indicates how politics and money can make risk issues extremely contentious. Yet it seems likely that virtually everyone involved in the issues discussed (as well as Graham, Green and Roberts themselves) accepted a strong probabilist conception of risk. No doubt these scientific and political debates seem much more important to those who already share a given conception of risk, and perhaps that explains why engaging the philosophical debate between distinct conceptions of risk has been so difficult.