

Before any findings as to duty or negligent breach of duty may be applied to determine the question of liability, each plaintiff must show that he has suffered injury as a result of the defendant's conduct, at least in part. L. Green, et al., *Cases on the Law of Torts* 3 (2d ed. 1977).

The plaintiff's starting point on the road to a tort recovery is to be able to pick the defendant out of the crowd: that is, to demonstrate factually that there is a reason why this particular person is the defendant. This is usually called the causation or factual causation issue. I find "factual connection" to be a more accurate term. Factual connection in the manner in which the term is used herein, carries no connotation of fault or of lia-

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bility. It is the means of selecting a particular defendant on whom to focus the process of the legal system. It is the statement of what happened between plaintiff and defendant. Whether the factual connection between plaintiff's injury and defendant will lead to liability depends upon plaintiff successfully establishing the remainder of the issues that are relevant to the determination of liability.

Thode, "Tort Analysis: Duty-Risk vs. Proximate Cause and the Rational Allocation of Functions Between Judge and Jury," 1977 *Utah L.Rev.* 1, 2 (footnotes omitted).

The reason for this requirement was stated long ago by Professor Beale:

Starting with a human act, we must next find a causal relation between the act and the harmful result for in our law—and, it is believed, in any civilized law—liability cannot be imputed to a man unless it is in some degree a result of his act.

Beale, "The Proximate Consequences of an Act," 33 *Harv.L.Rev.* 633, 637 (1920). As Dean Prosser explains, "Causation is a fact. It is a matter of what has in fact occurred." W. Prosser, *Handbook on the Law of Torts* 237 (4th ed. 1971).

In most cases, the factual connection between defendant's conduct and plaintiff's injury is not genuinely in dispute. Often, the cause-and-effect relationship is obvious: A's vehicle strikes B, injuring him; a bottle of A's product explodes, injuring B; water impounded on A's property flows onto B's land, causing immediate damage.

 In this case, the factual connection singling out the defendant as the source of the plaintiff's injuries and deaths is very much in genuine dispute. Determination of the cause-in-fact, or factual connection, issue is complicated by the nature of the injuries suffered (various forms of cancer and leukemia), the nature of the causation mechanism alleged (ionizing radiation from nuclear fallout, as opposed to ionizing radiation from other sources, or other carcinogenic mechanisms), the extraordinary time factors and other variables involved in trac-

ing any causal relationship between the two.?

At this point, there appears to be no question whether or not ionizing radiation causes cancer and leukemia. It does. Once more, however, it seems important to clarify what is meant by "cause" in relation to radiation and cancer:

When we refer to radiation as a cause, we do not mean that it causes every case of cancer or leukemia. Indeed, the evidence we have indicating radiation in the causation of cancer and leukemia shows that not all cases of cancer are caused by radiation. Second, when we refer to radiation as a cause of cancer, we do not mean that every individual exposed to a certain amount of radiation will develop cancer. We simply mean that a population exposed to a certain dose of radiation will show a greater incidence of cancer than that same population would have shown in the absence of the added radiation.

J. Gofman, M.D., *Radiation and Human Health* 54-55 (1981), PX-1046.

[The question of cause-in-fact is additionally complicated by the long delay, known often as the latency period, between the exposure to radiation and the observed cancer or leukemia.] Assuming that cancer originates in a single cell, or a few cells, in a particular organ or tissue, it may take years before those cells multiply into the millions or billions that comprise a detectable tumor. As Dr. John Gofman explains, cancer is characterized by "the unregulated, uncontrolled proliferation of the descendants of a single changed cell. It is not that cancer cells divide more rapidly than normal cells; rather it is that they keep on dividing when there is no need for them." *Radiation and Human Health*, supra, at 60 (1981), PX-1046. Cf. *BEIR-III Report* (1980), DX-1025 at 11-27.

The problem of the latency period is one factor distinguishing radiation/cancer causation questions from the cause-in-fact relationships found in most tort cases; normally "cause" is far more direct, immediate and observable. e.g., A fires a gun at B.

seriously wounding him. The great length of time involved (e.g., A irradiates B, who develops a tumor 22 years later) allows the possible involvement of "intervening causes," sources of injury wholly apart from the defendant's activities, which obscure the factual connection between the plaintiff's injury and the defendant's purportedly wrongful conduct. The mere passage of time is sufficient to raise doubts about "cause" in the minds of a legal system accustomed to far more immediate chains of events.

The non-specific nature of the alleged injury further obscures the causal relationship between the defendant's conduct and the biological effects which are identified as consequences. Wounds and injuries from firearms, knives, heavy machinery, or other dangerous implements, for example, have particular qualities which are readily traced to source. Acute poisoning by specific toxic chemicals may be identified by specific symptoms or effects coinciding with the detected presence of the substance itself. Even acute radiation syndrome resulting from short-term exposure to 25 or more rads is fairly easily traced to source by blood counts and more externalized symptoms now identified to such exposure.

When the injury alleged, the biological consequence, is some form of cancer or leukemia, such specific clues as to cause, or source, are usually lacking.

First, it must be emphasized and reemphasized that when a cancer is induced by ionizing radiation, the structural and functional features of the cancer cells, and the gross cancer itself, show *nothing specific to ionizing radiation*. Once established, a radiation-induced cancer cannot be distinguished from a cancer of the same organ arising from the unknown causes we so commonly lump together as "spontaneous." *Spontaneous* is an elegant term for describing our ignorance of the cause. The fact that radiation-induced cancers cannot be distinguished from other cancers itself indicates that there are profound com-

mon features among cancers, likely far more important than the differences.

J. Gofman, M.D., *Radiation and Human Health*, *supra*, at 59 (1981), PX-1046 (emphasis in original). Ionizing radiation—or other carcinogens—seem to add to the number of cancers already occurring in people, rather than producing new, distinct varieties of cancer. See *id.* PX-1046. The intrinsic nature of the alleged injury itself thus restricts the ability of the plaintiffs to demonstrate through evidence a direct cause-in-fact relationship between radiation from any source and their own cancers or leukemias. At least within the scope of our present knowledge, the injury is not specifically traceable to the asserted cause on an injury-by-injury basis.

This does not, however, end the inquiry. That the court cannot now peer into the damaged cells of a plaintiff to determine that the cancer or leukemia was radiation-induced does not mean (1) that the damage was not in fact caused by radiation; (2) that the radiation damage involved did not result from the defendant's conduct; or (3) that a satisfactory factual connection can never be established between plaintiff's injury and defendant's conduct for purposes of determining liability. Experience and the evidence in the record indicate that indeed it can.

If plaintiff cannot establish a cause-in-fact connection between his injury and defendant's conduct that will support liability, . . . plaintiff should attempt to establish the most exclusive factual connection that he can between his injury and the defendant. This will normally involve some kind of a relationship between plaintiff and defendant. . . .

Thode, *supra*, 1977 *Utah L.Rev.* at 5 (footnote omitted). The more exclusive the factual connections that may be established by evidence, the stronger the rational basis for focusing the tools of legal analysis upon a specific defendant's conduct.

For example, the fact that both plaintiff and defendant are members of the human race is one of the less exclusive connections possible and does nothing to

explain why this defendant is before the court. That the defendant was in the area when plaintiff was injured establishes a more exclusive connection.

Id. 1977 *Utah L.Rev.* at 6. That the defendant was engaged in risk-creating conduct of a particular type, and plaintiff's injuries are consistent with the kind of harm that is predicted and observed when such risks are created, makes the factual connection seem even more exclusive—exclusive of other defendants, other connections, other "causes".

Whether any of these factual connections will lead to liability is, as Professor Thode reminds us, "an issue involving the scope of the legal system's protection afforded to plaintiff and is not an issue of factual causation." 1977 *Utah L.Rev.* at 6 (emphasis added).

In *Basko v. Sterling Drug, Inc.*, 416 F.2d 417 (2d Cir.1969), plaintiff was blinded as a side

effect of one or both of two drugs administered as treatment for a skin disease. Which drug "caused" the blindness could not be specifically identified. Nevertheless, the Court of Appeals for the Second Circuit, applying Connecticut law, held that "[i]n such a situation, either force can be said to be the cause in fact of the harm, despite the fact that the same harm would have resulted from either force acting alone. 2 Harper & Jones, [*The Law of Torts* § 20.2] at 1122-23." 416 F.2d at 429. The factual connection between plaintiff's injury and the defendant's conduct in issuing each of the two drugs was the administration of the drug to plaintiff and the injury to plaintiff consistent with observed side effects of the drug. Similarly, in *Sindell v. Abbott Laboratories*, 26 Cal.3d 588, 607 P.2d 924, 163 Cal.Rptr. 132 (1980) plaintiff alleged injury due to cancer resulting from her mother's ingestion of diethylstilbestrol (DES) during pregnancy. The five defendant drug companies, manufacturers of DES at the times relevant to the plaintiff's injury, were held to be properly joined in the action even though plaintiff could not specifically identify the DES taken by her mother to any or all of the companies. That defendant A, for example, cannot be proven by evidence to be the actual source of the DES-caused injury to the plaintiff does not excuse A from the lawsuit. The *Sindell* court held that being a manufacturer of DES at the time when DES was dispensed to plaintiff's mother during pregnancy is a sufficiently exclusive factual connection to rationally justify reaching the question of legal liability of A for plaintiff's injury. Where another defendant could establish, for example, that it did not manufacture DES at that time, the factual connection vanished and the defendant was dismissed from the lawsuit.

In *McAllister v. Workmen's Compensation Appeals Board*, 69 Cal.2d 408, 445 P.2d 313, 71 Cal.Rptr. 697 (1968), the California Supreme Court reversed an administrative denial of a workmen's compensation award to plaintiff, a fireman, who developed lung cancer after 32 years of fire-fighting and 42 years of smoking ciga-

rettes. Even conceding that plaintiff's own cigarettes could have caused his cancer, the court found sufficient factual connection to keep the respondent employer in the case. The court's comments are instructive:

We cannot doubt that the more smoke decedent inhaled—from whatever source—the greater the danger of his contracting lung cancer. His smoking increased that danger, just as did his employment. Given the present state of medical knowledge, we cannot say whether it was the employment or the cigarettes which "actually" caused the disease; we can only recognize that both contributed substantially to the likelihood of his contracting lung cancer. As we noted, ... the decedent's employment need only be a "contributing cause" of his injury. And in *Bethlehem Steel Co. v. Industrial Acc. Comm.*, *supra*, 21 Cal 2d 742, 744, 135 P.2d 153, 154 we pointed out a particular instance of this principle when we stated that it was enough that "the employee's risk of contracting the disease by virtue of his employment must be materially greater than that of the general public."

Although decedent's smoking may have been inadvisable, respondents offer no reason to believe that the likelihood of contracting lung cancer from the smoking was so great that the danger could not have been materially increased by exposure to the smoke produced by burning buildings.

Id. 445 P.2d at 318-319, 71 Cal.Rptr. at 702-703. The factual connection: plaintiff's injury was consistent with occupational exposure to greater-than-normal amounts of carcinogenic smoke.

In four other workmen's compensation cases similar to *McAllister*, an adequate factual connection has been established where evidence indicates that the occupational carcinogen (probably) contributed to the claimant's illness. // *

In *Bolger v. Chris Anderson Roofing Co.*, 112 N.J.Super. 383, 271 A.2d 451 (Essex County Ct.1970), a New Jersey court affirmed an administrative determination in

favor of a claimant who was occupationally exposed to fumes from tar, pitch, asphalt and asbestos in "large and intense volume" over a period of years. Noting that the chemicals in question were known carcinogens, the court affirmed the compensation award upon a finding that the exposure had contributed to the injury, notwithstanding the fact that the claimant had also smoked cigarettes. *Id.*, 271 A.2d at 457.

In *Smith v. Humboldt Dye Works, Inc.*, 34 App.Div.2d 1041, 312 N.Y.S.2d 612 (1970), a workmen's compensation award was affirmed on the basis of "substantial evidence" that the claimant's 25 years of exposure to known carcinogens in the dye compounds was factually connected to his papillary tumors of the bladder. Medical testimony was in direct conflict; statistical evidence was unclear. Yet a rational relationship between work and injury was identified as the basis for an award of compensation. See also *Berman v. A. Werman & Sons*, 14 App.Div.2d 631, 218 N.Y.S.2d 315 (1961); *Casson v. A.C. Horn Co.*, 27 App. Div.2d 966, 279 N.Y.S.2d 244 (1967); Comment, "Judicial Attitudes Towards Legal and Scientific Proof of Cancer Causation," 3 *Colum.J.Envtl.L.* 344 (1977) and cases discussed therein.

In *Besner v. Walter Kidde Nuclear Labs*, 24 App.Div.2d 1045, 265 N.Y.S.2d 312, 313 (1966), another award was affirmed, this time in favor of a physicist who had contracted acute myeloblastic leukemia after working in a laboratory near cobalt-60 sources from which he received not more than 2,000 to 2,250 milliroentgens (mR) of gamma exposure. Relying in part upon presumptions available under the New York workmen's compensation statute, the appellate division affirmed, noting that the "record discloses that decedent was exposed to radiation for a substantial

part of two periods and also at other times in various amounts. The testimony of the medical experts is emphatic that there is really no 'threshold' or 'safe' dosage of radiation because at the present stage of scientific knowledge it cannot be ascertained exactly what effects radiation has on the human body. It is also admitted that each individual reacts differently to exposure to radiation." 265 N.Y.S.2d at 313. See O'Toole, "Radiation, Causation, and Compensation," 54 *Geo.L.J.* 751 (1966), and cases discussed therein.

In the most recent case, *Krumback v. Dow Chemical Co.*, 676 P.2d 1215 (Colo. App.1983), the Colorado Court of Appeals remanded a claim in which compensation had been denied following the exclusion of expert testimony by health physicists and others¹⁰⁰ which related the decedent's cancer of the colon to radiation exposures received while employed at the Rocky Flats nuclear weapons plant. On remand the State Industrial Commission reviewed the record and concluded that "jointly and severally the testimony presents competent and substantial evidence to support the referee's conclusions ... that the claimant herein had sustained the burden of proof of injurious exposure of the decedent to the radiation alleged in the claim for benefits, and that said radiation was the proximate cause of the cancer of the colon which resulted in death." *In re Leroy A. Krumback*, W.C. No. 2-923-974, (Ind.Comm. Colo., dec. Apr. 19, 1984). The requisite burden of proof was satisfied by a showing of a "reasonable probability" that radiation exposure caused the decedent's cancer; the evidence indicated that Krumback had received an external dose of over 45 rems with additional exposure due to internal

contamination by radioactive material. *Id.*, 676 P.2d at 1217.

The labors of prior courts over the problem of factual connection between radiological insult and physiological injury are of assistance in resolving the similar questions presented here. Other cases lend aid as well.

A number of cases involving destruction of property by two or more fires or sources of fire,¹³¹ or similar problems¹³² may be cited wherein a factual connection establishing a rational relationship between plaintiff's injury and a defendant's conduct has been relied upon to reach questions of liability, even though a specific cause-in-fact relationship is not clearly identified. There are several cases in which the factual connection to plaintiff's injury is the defendant's failure to warn plaintiff or otherwise safeguard the plaintiff from risk or hazard. *E.g.*, *Haft v. Lone Palm Hotel*, 3 Cal.3d 756, 478 P.2d 465, 91 Cal.Rptr. 745 (1970) (father and son drowned in motel swimming pool; motel neither provided lifeguard nor warning that none was present); *Reynolds v. Texas & Pac. Ry. Co.*, 37 La. Ann. 694 (1885) (plaintiff emerging from brightly lit train station onto unlit stairway at night, falls and is injured; negligence of railroad in not lighting stairway "multiplied" chance of accident); *Kirincich v. Standard Dredging Co.*, 112 F.2d 163, 164-65 (3d Cir.1940) (failure of crew to throw life preserver to drowning seaman); *Berry v. Farmers Exchange*, 156 Wash. 65, 286 P. 46 (1930) (failure of building owners to provide fire escape not sufficient factual connection). See also Malone, "Ruminations on Cause-in-Fact," 9 *Stan.L.Rev.* 60, 77-81 (1956).

Sometimes the connection seems too improbable to the court to establish any basis for liability. See *e.g.*, *Kramer Service,*

Inc. v. Wilkins, 184 Miss. 483, 186 So. 625 (1939) ("no probability" that plaintiff's skin cancer was caused by cut resulting from falling glass). In other cases, it does not appear improbable at all. See *e.g.*, *Daly v. Bergstedt*, 267 Minn. 244, 126 N.W.2d 242 (1964) (evidence of factual connection between injury from fall in defendant's store and subsequent tumor at site of bruise held sufficient to support verdict for plaintiff).

In some of the cases in which plaintiff has been injured, but has no means of identifying the specific cause-in-fact of the injury, the burden of proof has been placed upon the defendant to establish the factual details of the incident and show that defendant's conduct did not contribute to the victim's injury. *Summers v. Rice* is probably the best known example. Noting the inability of the plaintiff to identify which of the defendant's guns the injurious pellet came from, the court analyzed the problem as follows:

When we consider the relative position of the parties and the results that would flow if plaintiff was required to pin the injury on one of the defendants only, a requirement that the burden of proof on that subject be shifted to defendants becomes manifest. They are both wrongdoers—both negligent toward plaintiff. They brought about a situation where the negligence of one of them injured the plaintiff, hence it should rest with them each to absolve himself if he can. The injured party has been placed by defendants in the unfair position of pointing to which defendant caused the harm. If one can escape the other may also and plaintiff is remediless. Ordinarily defendants are in a far better position to offer evidence to determine which one caused the injury ... In a quite analogous situation this court held that a patient injured while unconscious on an op-

Burden A
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erating table in a hospital could hold all or any of the persons who had any connection with the operation even though he could not select the particular acts by the particular person which led to his disability. *Ybarra v. Spangard*, 25 Cal.2d 486, 154 P.2d 687, 162 A.L.R. 1258. [T]he effect of the decision is that plaintiff has made out a case when he has produced evidence which gives rise to an inference of negligence which was the proximate cause of the injury. It is up to defendants to explain the cause of the injury....

Summers v. Tice, 33 Cal.2d 80, 199 P.2d 1, 4 (1948). This shift in burden of proof reflects a sound application of important legal policies to the practical problems of trying a lawsuit: where a strong factual connection exists between defendant's conduct and the plaintiff's injury, but selection of "actual" cause-in-fact from among several "causes" is problematical, those difficulties of proof are shifted to the tortfeasor, the wrongdoer, in order to do substantial justice between the parties.¹⁴³ If direct proof of actual cause is to fail, the ultimate burden of the injury should fall upon him who was negligent and who likely is in a better position to inform the court of the facts relating to cause.

In other cases discussed above, where plaintiff has produced evidence of factual connection sufficient to permit the drawing of a rational inference of causation—of some contribution by defendant's conduct to plaintiff's injury—it has been left to the defendant to prove otherwise. In *Basko v. Sterling Drug Co.*, the U.S. Court of Appeals for the Second Circuit relied upon § 432(2) of the Restatement (Second) of Torts in holding that such an inference of causation may support a finding of liability. That section states:

If two forces are actively operating; one because of the actor's negligence, the other not because of any misconduct on his part, and each of itself sufficient to bring about harm to another, the actor's negligence may be found to be a substantial factor in bringing it about.

If defendant's negligent conduct is found to be a "substantial factor," it may in Restatement parlance be judged to be the "legal cause" of plaintiff's injury, i.e., defendant could be held liable based upon determination of the legal issues relating to liability (scope of duty, negligence, etc.). "The reason for imposing liability in such a situation," the court explains,

is that the "defendant has committed a wrong and this has been a cause of the injury; further, such negligent conduct will be more effectively deterred by imposing liability than by giving the wrongdoer a windfall in cases where an all-sufficient innocent cause happens to concur with his wrong in producing the harm." 2 Harper and James, [*The Law of Torts*] *supra* at 1123. Similarly, in *Navigazione Libera T.S.A. v. Newtown Creek Towing Co.*, 98 F.2d 694, 697 (2d Cir. 1938), Judge Learned Hand stated that "the single tortfeasor cannot be allowed to escape through the meshes of a logical net. He is a wrongdoer, let him unravel the casuistries resulting from his wrong." See also Malone, *Ruminations on Cause-in-Fact*, 9 *Stan.L.Rev.* 60, 88-94 (1956).

Id. 416 F.2d at 429. Implicitly the *Basko* opinion shifts the burden to defendant to produce evidence refuting causation if he is to escape liability once plaintiff has established a "substantial" factual connection between defendant's conduct and her own injuries.¹⁴⁴ The principle expressed in *Re-*

statement (Second) of Torts § 432(2) "applies not only when the second force which is operating ... is generated by the negligent conduct of a third person, but also when it is generated by an innocent act of a third person or when its origin is unknown." Restatement (Second) of Torts § 432 comment b (1965). Thus a defendant may be held liable for negligent conduct with factual connections to plaintiff's injuries even where other concurrent forces of human, "natural" or unknown origin have similar connections.¹⁵⁵ Whether he is held liable, of course, is a question governed by distinct ethical, legal and public policy considerations. See Thode, "Tort Analysis: Duty-Risk Proximate Cause and the Rational Allocation of Functions Between Judge and Jury," 1977 *Utah L.Rev.* 1; Green, "Duties, Risks, Causation Doctrines," 41 *Tex.L.Rev.* 42 (1962).

The case of *Haft v. Lone Palm Hotel*, highlights an additional reason for assigning to the tortfeasor the burden of extricating himself from a tangle of causal forces. The defendant hotel's failure to maintain a lifeguard at its swimming pool did not merely aggravate the risks which took effect in the drowning of plaintiff's decedents; it also deprived the parties and the court of a potentially important witness on

the subject of cause-in-fact: the lifeguard himself.

Indeed, in some respects the instant action presents a stronger case for shifting the burden of proof to defendants than *Summers*, because the present defendants are in a sense more "culpably" responsible for the uncertainty of proof than were the hunters in *Summers*. Although the difficulty in proof in *Summers* was attributable to the coincidence of the defendant's actions, each hunter was negligent, not because he shot simultaneously with the other defendant, but only because he shot in direction of the plaintiff In the instant case on the other hand, the absence of definite evidence on causation is a direct and foreseeable result of the defendants' negligent failure to provide a lifeguard. Defendants may thus more appropriately be designated as "fault" for the factual deficiencies that are present.

478 P 2d at 476, 91 Cal.Rptr. at 756 (emphasis in original). [Likewise, the Government's negligent failure to adequately monitor and record the actual external and internal radiation exposures of off-site residents on a person-specific basis has yielded many glaring deficiencies in the evidentiary

record as it relates directly to the question of causation. The current multi-million dollar effort to reconstruct the radiation dosages received by plaintiffs or their decedents is constantly hampered by the failure of the off-site radiation safety personnel to gather whole categories of exposure data at the time that the exposures actually took place. Furthermore, had Government personnel provided adequate warnings of risk and information as to precautions minimizing the amount of exposure, a materially different picture as to appropriate inferences about factual connection and cause-in-fact might now be presented. Accurate monitoring of persons largely was not undertaken; adequate warnings and information were almost entirely omitted from the operational radiation safety activities. A strong additional reason for shifting the burden of proof on the cause-in-fact question is thus readily apparent from the record.

This is not to say that this court presumes a causal relationship from the Government's negligence.

Yet so long as the evidence will support an inference that defendant's conduct contributed to the victim's injury, even though other inferences can be drawn that it did not, or that his injury was due to other causes, "it is for the finder of fact"—this court—"to draw the most appropriate inference using the court's own best judgment, experience and common sense in light of all the circumstances." Green, "The Causal Relation Issue in Negligence Law," 60 *Mich. L. Rev.* 543, 560 (1962) (footnotes omitted). This is true even in cases when it may be extremely difficult to establish a factual connection, where "the parties may have to rely almost wholly on scientific proof, i.e., the opinions of experts, and they may differ widely in their

opinions." 60 *Mich. L. Rev.* at 561 (footnote omitted).

A useful analogy may perhaps be drawn from some of the currently proposed schemes for compensating long-term injuries to health allegedly caused by exposure to toxic chemicals and chemical wastes. The causation problems facing many toxic waste plaintiffs are strikingly similar to those facing plaintiffs alleging nuclear fallout injuries in this and other cases. Consider, for example, the problem of the "indeterminate plaintiff":

We may know, for example, that a group of people has a specific type of cancer and that some of them contracted that cancer from exposure to the defendant's waste, but we do not know which individuals of that group were affected by the waste. The character of toxic waste injuries causes this uncertainty. We know what causes a broken leg or a black eye and can decide liability based on whether or not those causes were controlled by the defendant, but we do not know the mechanics of causation of cancers and nervous disorders. We are still at the elementary stage of knowing simply that they can be caused entirely or in part by exposures to certain substances; we cannot tie the exposures more precisely to the injuries.

Note, "The Inapplicability of Traditional Tort Analysis to Environmental Risks: The Example of Toxic Waste Pollution Victim Compensation," 35 *Stan. L. Rev.* 575, 582 (1983) (hereinafter cited Note, "Inapplicability of Traditional Tort Analysis") (emphasis in original); Delgado, "Beyond *Sindell*: Relaxation of Cause-in-Fact Rules for Indeterminate Plaintiffs," 70 *Cal. L. Rev.* 881, 881-83 (1982). As the Note explains, "a toxic tort plaintiff typically can show only a 'causal linkage' between the toxic substance to which he was exposed and his type of disease or affliction." Like exposure to ionizing radiation, "most toxic tort injuries are of indeterminate causation. The etiology of the disease is unclear and the disease may occur in the absence of the suspect toxic contaminant." *Id.* 35 *Stan. L. Rev.* at 583 & n. 31 (footnotes omitted).

The concept of "causal linkage," coined by Professor Calabresi, refers to an empirically based belief that the act or activity in question will, if repeated in the future, increase the likelihood that the injury under consideration will also occur, see Calabresi, "Concerning Cause and the Law of Torts: An Essay for Harry Kalven, Jr.," 43 *U. Chi. L. Rev.* 69, 72 (1975)—a concept perhaps comprising one type of "factual connection" as developed earlier in this Part.¹⁴⁶

Several recent legislative proposals make an effort to accommodate these practical complexities. Under three bills introduced in Congress in 1979,¹⁴⁷ persons claiming toxic waste injuries need only establish a "sufficient" relationship between the toxic contaminant, the injury, the geographical proximity and temporal extent of exposure. Negligence or other "fault" was not required to be proven before compensation would be paid. See Note, "Inapplicability of Traditional Tort Analysis," *supra*, 35 *Stan. L. Rev.* at 589. A bill¹⁴⁸ introduced in the United States Senate in 1980 provided that once a claimant made a prima facie showing of causal connection, the burden of producing evidence shifted to defendant to demonstrate that exposure to its toxic chemicals was an insignificant contribution to claimant's injuries. Establishing a prima facie case required a showing that

(1) the claimant had been exposed to a hazardous substance released by the defendant; (2) the exposure was in sufficient concentration and of sufficient duration to create a "reasonable likelihood" that it caused or contributed to the claimant's injury; and (3) there is a "reason-

able likelihood" that exposure to that substance causes or contributes to the type of injury sustained by the claimant.... The defendant could rebut this showing only by demonstrating by a preponderance of the evidence that the contributing causes to the disease were apportionable and that its contribution was insignificant....

35 *Stan. L. Rev.* at 590 n. 57 (citations omitted). While these specific proposals were not enacted, Congress did require a formal study of the toxic chemical injury problem,¹⁴⁹ which in 1982 made recommendations for a compensation scheme similar to the 1980 Senate bill. See *Injuries and Damages from Hazardous Wastes—Analysis and Improvement of Legal Remedies: Report to Congress in Compliance with Section 301(e) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (P.L. 96-510)*, pt. 1 at 206-219 (comm. print 1982).

Each of these proposals relies upon proof by the claimant of a series of factual connections which establish a rational, reasonably exclusive relationship between defendant's conduct in releasing lethally hazardous chemicals into the environment and each claimant's asserted injury. At least as to the cause-in-fact issue, such approaches are wholly consistent with the tort law analysis expressed in this Part.¹⁵⁰ Each of the prior cases analyzed has dealt to some extent with the problem of indeterminate causation. In each case, the court has applied common-law principles to fashion a remedial process that fairly compen-

sates plaintiff's injuries while relieving the defendant of the burden of those harms which defendant can reasonably prove were not in fact a consequence of his risk-creating, negligent conduct.

A remedial framework can certainly be fashioned to meet the circumstances and requirements of the parties and issues now before this court in this action. To that end, this court now holds as follows:

[61] Where a defendant who negligently creates a radiological hazard which puts an identifiable population group at increased risk, and a member of that group at risk develops a biological condition which is consistent with having been caused by the hazard to which he has been negligently subjected, such consistency having been demonstrated by substantial, appropriate, persuasive and connecting factors, a fact finder may reasonably conclude that the hazard caused the condition absent persuasive proof to the contrary offered by the defendant.]

[62] In this case, such factors shall include, among others: (1) the probability that plaintiff was exposed to ionizing radiation due to nuclear fallout from atmospheric testing at the Nevada Test Site at rates in excess of natural background radiation; (2) that plaintiff's injury is of a type consistent with those known to be caused by exposure to radiation; and (3) that plaintiff resided in geographical proximity to the Nevada Test Site for some time between 1951 and 1962. Other factual connections may include but are not limited to such things as time and extent of exposure to fallout, radiation sensitivity factors such as age or special sensitivities of the afflicted organ or tissue, retroactive internal or external dose estimation by current researchers, a latency period consistent with a radiation etiology, or an observed statistical incidence of the alleged injury greater than

the expected incidence in the same population.

[63, 64] The Restatement (Second) of Torts offers some guidance for determining whether defendant's conduct amounts to a "substantial factor":

The following considerations are in themselves or in combination with one another important in determining whether the actor's conduct is a substantial factor in bringing about harm to another:

(a) the number of other factors which contribute in producing the harm and the extent of the effect which they have in producing it;

(b) whether the actor's conduct has created a force or series of forces which are in continuous and active operation up to the time of the harm, or has created a situation harmless unless acted upon by other forces for which the actor is not responsible;

(c) lapse of time.]

Id. § 433 (1965). One consideration is easily resolved: exposure to ionizing radiation from nuclear fallout cannot fairly be described as "a situation harmless unless acted upon by other forces." See also *id.* §§ 440-452. Others are more difficult:

Experience has shown that where a great length of time has elapsed between the author's negligence and harm to another, a great number of contributing factors may have operated, many of which may be difficult or impossible of actual proof.... However where it is evident that the influence of the actor's negligence is still a substantial factor, mere lapse of time, no matter how long, is not sufficient to prevent it from being the legal cause of the other's harm.

Id. § 433, comment f. Implicit in the finding of "substantial factor" based upon relevant considerations is the exercise of sound judgment in light of the evidence.¹⁶¹ As



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WEAK
Prep Rule

both the court of appeals and the Restatement remind us, "the plaintiff need not prove his case beyond a reasonable doubt. In fact, 'He is not required to eliminate entirely all possibility that the defendant's conduct is not a cause.'"

It is enough that he introduces evidence from which reasonable men may conclude that it is more probable that the event was caused by the defendant than that it was not. [The fact of causation is incapable of mathematical proof, since no man can say with absolute certainty what would have occurred if the defendant had acted otherwise. If, as a matter of ordinary experience, a particular act or omission might be expected to produce a particular result, and if that result has in fact followed, the conclusion may be justified that the causal relation exists. In drawing that conclusion, the triers of fact are permitted to draw upon ordinary human experience as to the probabilities of the case.]

Yazzie v. Sullivan, 561 F.2d 183, 187 (10th Cir.1977) quoting Restatement (Second) of Torts § 433B comment b (1965); accord, W. Prosser, *Handbook of the Law of Torts* 242 (4th ed. 1971).