The Twilight Zone between Scientific Certainty and Legal Sufficiency: Should a Jury Determine the Causation of Schizophrenia?

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In lawsuits involving complex scientific issues of causation, dispute resolution requires that a final decision be reached in each case, regardless of whether science is able to provide definitive answers to the questions of causation raised at trial. Proving causation before science has is a concept that scientists may find disconcerting and foreign to some of their basic assumptions. This paper explores the foregoing issues, discusses medical versus legal concepts of causation, outlines the legal tests for admissibility of novel scientific evidence (including Federal Rule of Evidence 702 and the *Frye* test of general acceptance by the relevant scientific community), and presents a toxic tort case in which expert psychiatric testimony addressed the issue of causation of schizophrenia. The paper articulates concerns about the "misleading aura of certainty" posed by scientific evidence and the burden of decision making that is cast upon the legal system in such scientific issue cases.

The number of lawsuits involving complex scientific issues of causation, not infrequently in the area of medicine or psychiatry, has been increasing. For example, lay juries* have been asked to decide such questions as whether or not physical trauma causes breast cancer, whether or not Bendectin causes birth defects, and whether or not exposure to toxic chemicals causes schizophrenia. Likewise, the Dalkon Shield and the Agent Orange cases raised complex questions regarding the causation of diverse illnesses in the plaintiffs and received extensive media coverage.

Although definitive scientific answers to these causation questions that are raised at trial may not exist, under our present legal system jurors can and must decide the scientific issues before them. In considering scientific issues of causality, the law recognizes that medical science is unable to answer certain questions with absolute certainty. Indeed, if the test of legal proof were absolute certainty, few people, if any, could ever

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* In order to avoid repetition, throughout this article I will refer to the fact-finding tribunal as *the jury*. It is to be assumed in each instance that the fact finder could also be a lay (nonscientist) judge.

hope to obtain justice:

> [T]he law is pressed for time and, if justice is to be dispensed, the claimant cannot be forced to wait adjudication of his claim until medical science has advanced to the point of being able to supply positive answers. Thus, while pure science may seek an absolute cause, exclusive of all doubt, before postulating on a subject of inquiry, the law is much less exacting[1, pp. 13, 15]†

According to Younger, the primary purpose of litigation is not to discover the scientific truth but to resolve disputes (hopefully as much in line with the scientific truth as possible).[2] In order for the legal system to operate, a final decision must be reached in each case. Such a procedure was never meant to be scientific. Merely because a jury decides an issue of scientific causation does not mean that their decision has any scientific validity.[3]‡

The growth of complex litigation in the areas of science, medicine, and psychiatry requires the participation of expert witnesses. Whereas the ultimate resolution of the issue of causation in a particular case rests with the jury, the assistance of an expert witness is usually required in order for the jury to reach an informed and intelligent decision, when complex scientific questions are at issue. The function of experts is to impart their specialized knowledge to the jury in terms it can understand. When faced with invariably divergent expert opinions at trial on the same causative issue, the jury resolves the dispute by weighing all the testimony and adopting one expert's opinion over that of another.§

This paper explores the foregoing issues in some detail, discusses the legal standards and tests for admissibility of novel or controversial scientific evidence, and reports a toxic tort case in which psychiatric expert testimony addressed the issue of causation in schizophrenia. I have attempted to articulate my concerns about the burden of decision making that is cast upon the legal system in such scientific issue cases.

A Note on Medical versus Legal Causation

Causation has occupied the attention of philosophers, scientists, and lawmakers from the time of the ancient Greeks to the present. The problems with the conception of causation form a large literature in philosophy, science, and the law. (An excellent exposition of the subject of causation in philosophy and in science is set forth in Carnap's book *An Introduction to the Philosophy of Science.*[5] Hart and Honore present an

† The standard of proof in a civil lawsuit is a preponderance of the evidence, i.e., it is more likely than not that an incident, episode, accident, trauma, factor, or condition caused the plaintiff's illness, injury, disability, or death. What is required is merely a tilting of scales toward one expert's theory over another, just a slight preponderance of the evidence rather than proof positive of cause.

‡ Younger opines that if we can accept the decisions for what they are, i.e., a decision made because a decision has to be made, and not necessarily the truth, then having lay juries decide these issues presents no problem. Others would disagree, questioning whether the courtroom is an appropriate place for decisions of complex scientific issues. They contend that an arbitration system, utilizing a panel of scientific experts, would be better than a jury which knows nothing about the scientific questions.[4]

§ It is questionable, under such circumstances, whether the jury's decision is based on science at all, rather than on other diverse considerations, such as the credibility of the expert witnesses, the consistency of the expert testimony with the juror's personal view of the world, and, last but not least, "lawyer theatrics."[7]

equally excellent discussion of causation from the legal perspective in their book *Causation in the Law.*[6])

Lawyers usually divide the idea of causation into two parts, *cause in fact,* or *factual cause,* and *proximate cause* or *legal cause.* It is the former, cause in fact, that is closely related to the concept of medical causation. It would encompass, for example, the scientific question of whether cigarette smoking causes lung cancer.‖ Cause in fact can be formulated by the "but for" or the "sine qua non" rule, which states that one event is a cause of another when the first event is indispensable to the existence of the second. Thus, a particular event (e.g., cigarette smoking) is not the cause of a second event (e.g., lung cancer), if the second event would have occurred without it. (Thus, to be a cause in fact, smoking must be a "necessary condition.") Another, and probably better, legal rule for cause in fact is the "substantial factor" test, which states that a defendant's tort is a cause of the damage complained of if it was a material element and a substantial factor in bringing it about.

Once it is established that the defendant's conduct has in fact been one of the causes of the plaintiff's injury, there remains the question of whether the defendant should be legally responsible for what he has caused. The term proximate cause is applied by the courts to those considerations that limit liability even where the fact of causation has been clearly established. The proximate cause requirement is a policy determination, arising out of a judicial concern that a defendant, even one who has acted negligently, should not automatically be held liable for all the consequences, no matter how improbable, remote, or far-reaching, of his act. Quite often this has been stated as an issue of whether the defendant is under a legal *duty* to protect the plaintiff against the event that in fact did occur. If the defendant could reasonably have foreseen a risk of harm to the plaintiff as a result of his conduct, he would then be held liable for any damages he caused the plaintiff, i.e., the defendant's conduct will be held to be the proximate cause of the plaintiff's injuries. Once the plaintiff suffers any foreseeable injury, even if relatively minor, as a result of the defendant's negligent conduct, the defendant is then liable for any additional unforeseen physical consequences. (An example is the hypothetical case of a plaintiff who, unbeknownst to the defendant, has a skull of egg-shell thinness. If the defendant inflicts a minor impact on this skull, and because of this hidden defect the plaintiff dies, the defendant will then be liable for his death. This rule is sometimes expressed by saying that the defendant "takes his plaintiff as he finds him.")

Physicians sometimes have difficulty understanding the legal approach to causation. The legal definition of cause

‖ In science and medicine, such questions are studied by using the scientific method, i.e., those techniques used in the systematic pursuit of scientific knowledge (e.g., formulation of a specific problem, collection of data through observation and controlled, double-blind experiments, and use of mathematical analysis to test hypotheses and to describe causal and other relationships existing in a particular area of study).[8] Although, in order to be a cause in fact, an event must be a "necessary condition" for another event to occur, medical causation appears to be a more complex phenomenon, wherein an event may be a "necessary condition," a "sufficient condition," both, or neither, in producing a particular effect.

includes not only the initiation of physical or psychologic injury, but also the production of additional damage or dysfunction in individuals with preexistent disease. A causal factor, although only one of many involved in the ultimate total picture of an injury, may be legally significant if it can be shown to have played some role, not necessarily the major one, in initiating, contributing to, accelerating, or aggravating the plaintiff's injury.

Admissibility of Novel Scientific Evidence

> Rule 702. Testimony by Experts. If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training or education, may testify thereto in the form of an opinion or otherwise.
>
> Federal Rules of Evidence[9]

Psychiatrists are sometimes called upon to testify in complex lawsuits involving scientific issues of a psychiatric nature. Whether such psychiatric expert testimony should be admitted into evidence in a particular case depends upon "whether the untrained layman would be qualified to determine intelligently and to the best possible degree the particular issue without enlightenment from those having a specialized understanding of the subject involved in the dispute."[10] Because an intelligent evaluation of the facts in a particular case is often difficult or even impossible without the application of scientific knowledge, which an expert witness can supply, it would seem at first blush that such testimony would always "assist the trier of fact" and therefore should be routinely admitted into evidence. However, the courts have long been suspicious of scientific evidence. Judges may be skeptical of the claims of scientists that their techniques or theories are virtually infallible. More importantly, the courts fear that jurors may be so impressed by the scientific evidence that the expert witness will effectively usurp the jurors' fact-finding duties. The scientific evidence will overwhelm the jury and the jurors will uncritically accept the expert testimony. For these reasons, most courts require an extraordinary foundation for scientific evidence in order to ensure that the subject matter of the testimony is reliable. An inquiry is made into whether the scientific technique or theory is sufficiently reliable to enable the jury to reach an accurate result. On this basis, most courts hold that expert testimony may not relate to scientific evidence that is speculative or accepted by only a few members of the particular learned profession. The rationale for the court's required scrutiny in this situation had its origin in a 1923 decision, *Frye v. United States*,[11] in which the evidence derived from a crude precursor to the polygraph was considered and rejected. The *Frye* court stated the problem and the reason for rejecting such novel scientific evidence as follows:

> Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well recognized scientific principle or discovery, the thing from which the deduction is made must be suffi-

> ciently established to have gained general acceptance in the particular field in which it belongs.[12]

Thus, the *Frye* test requires that, in order for expert testimony to be admissible, the scientific subject matter of the testimony must be *generally accepted* by the relevant community of experts. Until the mid-1970s, *Frye* was the governing standard in 45 states.[13] It has recently come under attack because the term *general acceptance* is a nebulous concept and difficult to define; also, because it is a relatively strict standard, there is concern that its use might unnecessarily deprive courts of relevant evidence. Thus, there is an ongoing controversy concerning whether the *Frye* test should remain an independent basis for exclusion of expert testimony, whether indeed *Frye* has been superseded by Federal Rule of Evidence 702, or whether the considerations enunciated in *Frye* should be incorporated into a general Rule 702 analysis (balancing the testimony's probative value against its potential for prejudice).[14] A discussion of the controversy over these conflicting evidentiary standards as applied in various state and federal jurisdictions is beyond the scope of this paper and can be found elsewhere.[15] Although the majority of federal courts still apply it, a growing number of both state and federal courts have rejected the *Frye* test on the basis that "[a]ny relevant conclusions which are supported by a qualified expert witness should be received unless there are other reasons for exclusion. Particularly, probative value may be overborne by the familiar dangers of prejudicing or misleading the jury. . . ."[16] Thus, all courts require that testimony based on a novel scientific theory or technique must first undergo the court's scrutiny (whether under *Frye* or another standard) in order to determine its reliability and, hence, its admissibility. In *Huntington v. Crowley*,[17] which dealt with the admissibility of blood tests to establish paternity, the court stated:

> We must continue to allow our trial judges to exercise their sound discretion in protecting both litigants and jurors against the misleading aura of certainty which often envelops a new scientific process, obscuring its currently experimental nature.[18]

In the same regard, Justice Blackmun has noted:

> . . . the fate of a [litigant] should not hang on his ability to successfully rebut scientific evidence which bears an 'aura of special reliability and trustworthiness,' although in reality the witness is testifying on the basis of an unproved hypothesis . . . which has yet to gain general acceptance in its field.[19]

Psychiatric Testimony on the Issue of Causation of Schizophrenia

> [T]he great tragedy of Science—the slaying of a beautiful hypothesis by an ugly fact (p. 244).
>
> T. H. Huxley[20]

Psychiatrists have been criticized for sharing a passion for generating a host of hypotheses, frequently untestable and too often based on data that have been unsystematically selected and of dubious validity.[21] Should a psychiatrist be allowed to testify that his "beautiful hypothesis" as to the causation of schizophrenia is scientifically reliable, when the "ugly fact" is that no single theory of causation has gained the general acceptance of the wider psychiatric com-

munity? The scientific reliability of psychiatric testimony has been successfully challenged in a number of cases in other areas. For example, psychiatric expert testimony has been deemed inadmissible in many cases in which the subject matter involved rape trauma syndrome[22] and pathological gambling disorder.[23] Many of these cases found that the psychiatric evidence proffered would be unreliable from a scientific standpoint, prejudicial, and/or unhelpful to the trier of fact.

In contrast to the foregoing, in litigation involving personal injury and product liability lawsuits, psychiatrists have been permitted to testify on behalf of the plaintiff and offer their opinion that the traumatic event in question (be it physical injury, psychologic stress, and/or exposure to a noxious substance) was the proximate cause of the plaintiff's ensuing schizophrenia. In such cases, the defendants attempted unsuccessfully to exclude such testimony on the basis that it was unsubstantiated, speculative, and based on novel scientific hypotheses that have not been generally accepted by the relevant scientific community, i.e., psychiatrists generally. In the following case illustration, the defendant was unable to exclude the psychiatric testimony on the issue of the causation of the plaintiff's schizophrenia. The issue of causation then became a question of fact to be decided by the jury, i.e., the jury of six laymen would decide whether or not the traumatic event *caused* schizophrenia in this case. If reasonable jurors could conclude from the evidence that the traumatic event more likely than not caused the plaintiff's schizophrenia (the burden of proof in a civil lawsuit is a preponderance of the evidence, i.e., more likely than not), the fact that another jury might reach a different conclusion or that science would require more evidence before conclusively considering the causation question resolved was held to be irrelevant. The court followed the reasoning that the test for allowing a plaintiff to recover in a tort suit of this type is not scientific certainty but legal sufficiency. Thus, a cause-effect relationship need not be conclusively proven by animal or epidemiologic studies before a psychiatrist can testify that, in his opinion, such a relationship exists. The court distinguished between the introduction of evidence based on novel scientific techniques or methodologies (e.g., polygraph testing), which would have to meet a higher standard of reliability, and the admissibility of scientific *opinion* testimony, which, although controversial in its conclusions, is based on well-founded methodologies. (Also, the court noted that the stricter standard of reliability is more applicable to criminal prosecutions and should be rejected in civil cases. The interests at stake in civil litigation are not the same, the burden of proof is lower, and "the extent of discovery is greater in civil cases. Both parties presumably enter the courtroom equally prepared to address the scientific evidence"[24] [p. 219].) Thus, the court allowed the psychiatric expert to testify on the issue of the causation of the plaintiff's schizophrenia.

Case Illustration

A 23-year-old graphic illustrator, while weeding in a garden, was exposed to an organophosphate pesticide that had recently been sprayed

in the area. He had been unaware that a pesticide had been applied. Shortly thereafter, he developed a toxic reaction to the organophosphate exposure, manifested by panic, disorientation, confusion, difficulty breathing and swallowing, gastrointestinal complaints, weakness, headache, and visual disturbances. Later, after recovering from the acute physiologic symptoms, he gradually developed a delusional belief that his immune system had been irreversibly destroyed by the exposure. He consulted so-called clinical ecologists, who reinforced his ideas, telling him that he had become a *universal reactor* and was hypersensitive to his environment. He became progressively isolated and withdrawn, fearing that his everyday environment was lethal for him. He became convinced that, in order to survive, he had to live in a specially sanitized environment, eat a chemically pure organic-type diet, and wear specially treated clothing. Of course, he had to avoid all forms of travel and social intercourse. He lived in virtual isolation in a specially treated apartment, ate specially prepared food, and abandoned his career and all efforts to resume his former level of independent functioning.

The plaintiff's psychiatrist,¶ a well-known expert on schizophrenia, was permitted to testify that, in his opinion, it was the exposure to the pesticide that had *caused* the plaintiff's illness. He concluded that before the exposure the plaintiff was a vulnerable individual by virtue of a genetic predisposition to schizophrenia. (He diagnosed him as a schizotypal personality before exposure.) His exposure to the organophosphate pesticide, a cholinesterase inhibitor, triggered schizophrenia in this predisposed individual by means of its destabilizing effect on the acetylcholine-dopamine system in the brain and/or by means of the effect of the acute and severe stress engendered by the initial toxic reaction to the pesticide exposure. He concluded that, whereas the plaintiff before exposure was a stable schizotypal personality who functioned well in a number of areas, after exposure he became a chronic paranoid schizophrenic with a poor prognosis; therefore the defendant chemical company that manufactured the pesticide was liable for the plaintiff's injuries (on a product liability theory that will not be explicated here). The plaintiff's attorney, in prevailing upon the court to admit the testimony of his psychiatric expert, had argued that his psychiatrist's reasoning was based upon accepted principles in psychiatry and psychopharmacology and therefore could not be called novel.**

¶ The author was not involved as an expert witness for either side in this case.

Discussion and Conclusion

> The schizophrenias represent a group of illnesses whose clinical features, while variable, can be characterized. *The origin of these illnesses is unknown* [emphasis supplied]; though there are good reasons to assume that biological, psychological and social components are involved. . . . Ultimately no truly scientific definition and classification of the schizophrenias can be achieved until there is an adequate taxonomy of its bio-psycho-social origins (pp. 53–54).
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> Robert Cancro[25]

Despite over half a century of intensive research, the etiology and essential nature of the schizophrenias still remain an enigma. Although the search for the "schizococcus"[26] still goes on, perhaps the only conclusion about the etiology of schizophrenia that has gained general acceptance in the scientific community is that no single specific hypothesis of causation has been clearly identified and that genetic, biochemical, psychophysiologic, psychosocial, and other factors are involved and contribute to the etiologic puzzle in ways that are poorly understood at the present time. Proponents of one theory of causation or another (once described as "those who like to look at numbers and those who like to look at patients"[27]) may sometimes

** If the expert's opinion had been entirely novel or idiosyncratic, he might have been in violation of the American Academy of Psychiatry and the Law's proposed Ethical Guidelines ("Novel ideas and unusual or personal theories should never be used in explaining behavior"; Number II, Forensic Opinions).

believe that they have all of the answers, but the consensus among the psychiatric community at large, as exemplified by Cancro's statement,[25] is that the matter is far from resolved and that many diverse causative factors play a role in ways yet to be explicated. In other words, the etiology of schizophrenia in specific terms has yet to be established with anything remotely approaching scientific certainty.

In view of this state of affairs, should a psychiatrist be permitted to testify in a lawsuit that his own pet theory of schizophrenia, whatever that theory may be, is anything more than one of many possible explanations for the causation of schizophrenia? Should he be permitted to testify that, to a reasonable degree of medical certainty, a traumatic event caused an individual to become schizophrenic? Aside from the lack of authoritative scientific status for any one specific theory of causation of schizophrenia, as noted above, there is concern that expert testimony may possess some special reliability or mythic infallibility in the minds of a jury and that, as a result, such testimony will be given undue weight. It has been argued that admission of such testimony could misdirect the fact-finding process and subject the opposing party to the unfair burden of disproving an innuendo. Finally, admission of such novel scientific evidence leads to the spectacle of a jury of laymen solemnly deciding what was or was not the cause of schizophrenia. Should laymen be given the opportunity to render such a decision when in fact the world's leading authorities on schizophrenia themselves do not have the answer? (Younger states, "Where Nobel Prize winners cannot decide, who can? The jury, the everyday ordinary citizens"[28, p. 23]

Although the clear trend in courts today is toward the admission of expert testimony whenever it will aid the trier of fact, it is important to remember that the courtroom is not a research laboratory. There is great potential for an inaccurate verdict when speculative expert testimony is cloaked in the glossy qualifications of a psychiatrist and presented as established truth.

On the other hand, plaintiffs' attorneys argue that every new development must have its day in court. A plaintiff's case may be the first of its exact type, or his doctors may have been the first alert enough to recognize such a case. In that case, why should those doctors, concededly well qualified in their field, be excluded from testifying? A preeminent authority on the law of evidence, in discussing the admissibility of novel scientific evidence, rejects the *Frye* standard of general acceptance by the relevant scientific community in favor of an analysis of the following factors:

1. Probative value: A technique (or theory) unable to garner any support or only miniscule support within the scientific community would be found unreliable by a court
2. The expert's qualifications and stature
3. The extent to which the issues posed by novel evidence were explored before trial and whether the party opposing admissibility is adequately prepared
4. The availability of competent experts to explore the limitations of the novel techniques (or theories)[29]

To the extent that an expert's testimony lacks certainty, that uncertainty can be probed extensively during cross-

examination. Also, the opposing party can present its own experts to testify as to the unreliability of the technique or theory presented. This approach, with its built-in safeguards, would allow the trier of fact to decide a case before it assisted by the most advanced thinking on the issues in question in complex areas of ongoing scientific research. It provides the plaintiff with the benefit of permission to present his case in the best possible light, bolstered by state-of-the-art scientific support, without requiring that such support must have attained the level of scientific certainty or dogma. Furthermore, it has been argued that this approach, predicated on legal sufficiency rather than scientific certainty, is more attuned to the nature of scientific inquiry itself:

> The *Frye* test is disconcerting because of the apparent assumption that the scientific community speaks with a single voice on the acceptance of novel scientific procedures (and theories). Scientific journals might not publish research results that contradict earlier articles tending to show that a scientific technique (or theory) is valid. Many novel techniques over the years have been touted as panaceas, only to be disproved later, and it takes time for the credibility of earlier methods (and theories) to be eroded and for their use no longer to be considered reliable. Consensus on novel methods (and theories) is not attained overnight.[30]††

Thus, it is argued, scientific certainty itself is an illusory and nebulous concept and should not be a precondition for admissibility. In regard to the concerns about the "aura of special reliability and trustworthiness" associated with expert testimony, recent studies suggest that such a concern may be unwarranted.[31] Jurors were shown to process expert testimony in a reasoned and systematic fashion, feeling at liberty to disbelieve it when it is improbable, incredible, false, or mistaken. However, the nagging concern continues to be whether a jury, like a patient who is deciding about a treatment to be undertaken, is not entitled to something akin to informed consent before reaching a decision. In the same way that an individual patient has a right to know the risks and benefits of a proposed treatment before deciding to accept or reject it, a jury should also have a right to be informed in a reliable fashion as to the current state of psychiatric knowledge on a particular issue, and the limits of that knowledge, before it reaches a verdict.

The controversy about the admissibility of novel psychiatric evidence, what legal test should apply, when such evidence is properly excluded, and whether the adversary system itself is an adequate corrective for unreliable testimony has not been resolved. The courts are divided on these questions and both sides have marshaled compelling arguments to support their respective positions. Meanwhile, in the twilight zone between scientific certainty and legal sufficiency, it is likely that psychiatrists will continue to testify with apparent authority and juries will continue to reach decisions with apparent finality on the issue of the causes of schizophrenia.‡‡ For the rest

†† *Frye* was rejected in a recent Georgia case involving the Sodium Amytal test: see *Harper v. State*, 249 Ga. 519, 292 S.E.2d 389, 395 ("*Frye* rule of 'counting heads' in the scientific community is not an appropriate way to determine" admissibility).

‡‡ In the case reported here, the jury found for the defendant. However, the jury did not reach the issue of whether organophosphate insecticides can cause schizophrenia. They determined that the plaintiff was already schizophrenic *before* exposure to the insecticides.

of us, such a query has no easy or certain answer.

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