Docket No. 89679-Agenda 21-March 2001.

ZACHARY DONALDSON *et al.*, Appellees, v. CENTRAL ILLINOIS PUBLIC SERVICE COMPANY *et al.* (Central Illinois Public Service Company, Appellant).

Opinion filed February 22, 2002.

JUSTICE FITZGERALD delivered the opinion of the court:

This is a toxic tort case. Plaintiffs are the parents of four children suing, on their own behalf and on behalf of their children, *inter alia*, Central Illinois Public Service Company (CIPS), the owner of a former manufactured gas plant in Taylorville, Illinois (Site). The plaintiffs alleged that certain acts or omissions by CIPS, and three of its contractors, during the cleanup of the Site caused their children to develop neuroblastoma, a rare form of cancer. The litigation spanned six years and included the exchange of hundreds of thousand of documents and more than 250 depositions of numerous witnesses. After a four-month jury trial, at which 77 witnesses testified, a jury returned a $3.2 million verdict for plaintiffs against CIPS. The appellate court affirmed the trial court judgment (313 Ill. App. 3d 1061), and we granted CIPS's petition for leave to appeal (see 177 Ill. 2d R. 315). For the reasons discussed below, we now affirm the judgment of the appellate court.

BACKGROUND

In this toxic tort case, plaintiffs allege that exposure to an environmental condition caused their children to develop neuroblastoma, a peripheral nervous system cancer. In most cases, neuroblastoma develops in young children and infants. Statistics show that 9 out of every 1 million children born develop neuroblastoma.

Taylorville, located in Christian County, is a town which recorded 520 live births in 1988. Statistically, a case of neuroblastoma occurs one time every 29 years in a community the size of Taylorville. Between March 1989 and August 1991, during approximately a two-year period, three infants and a teenager in Taylorville were diagnosed with neuroblastoma. Zachary Donaldson was conceived in December 1987 and was born on September 7, 1988. Six months later, in March 1989, Zachary was diagnosed with neuroblastoma. At the time of trial, Zachary was in remission from his illness. Chad Hryhorsysak was conceived in April 1989 and was born January 12, 1990. Chad was diagnosed with neuroblastoma six months after his birth, in March 1990. As a result of his illness, Chad is paralyzed from the waist down. Erika May was conceived in February 1989 and was born November 27, 1989. She was diagnosed with neuroblastoma two months later, in January 1990. At the time of trial, she was in remission from her illness. Lastly, Brandon Steele was born on March 17, 1978. On August 9, 1991, at age 13, Brandon was diagnosed with neuroblastoma. Brandon died on January 19, 1993.

Plaintiffs claim that the statistical excess of neuroblastoma cases in Taylorville was caused by their exposure to potent chemical carcinogens released, in part, during the cleanup of the Site. The Donaldsons lived one mile from the Site, the Hryhorsysaks lived three miles from the Site, and between 1985 and 1989 the Mays lived in several locations near the Site, the closest one-half mile away and the farthest eight miles away. During his lifetime, Brandon Steele lived two miles from the Site. We now turn to the Site.

Prior to the widespread use of natural gas, the United States relied upon gas produced from fossil fuels, generally coal, to generate heat and light. In 1892, Taylorville Gas and Electric Company constructed a

gas plant on the southern edge of Taylorville. CIPS purchased the Site in 1912 and continued plant operations until 1932. During this 20-year period, CIPS produced gas at the Site through a commonly used gasification process. This process produced tar byproducts called coal tar. Coal tar was often stored in underground tanks and later sold for use as roofing tar, road oil, or weed killer. In 1939, CIPS decommissioned the Site. This included the destruction and dismantling of above-ground structures. However, large underground tanks and containers with 50,000 gallons of residual coal tar were left buried. CIPS used the Site for storage until its sale in 1961, at which time the 50,000 gallons of residual coal tar buried underground was not disclosed.

In 1980, Congress passed the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (42 U.S.C. §9601 *et seq.* (1982)) to facilitate the cleanup of hazardous waste sites. CERCLA imposed retroactive liability for the disposal of hazardous waste and ordered all companies that owned and operated hazardous waste facilities to notify the federal Environmental Protection Agency (USEPA). 42 U.S.C. §9603(c) (1982). An internal CIPS memorandum, dated May 1981, indicates that CIPS understood this reporting provision, but determined that because the notification requirement was not "mandatory," there was "no advantage to be gained in prematurely notifying *** because of the potential consequences of such a disclosure." Therefore, CIPS did not disclose to the USEPA the existence of the underground coal tar storage tanks at the Site.

In the early 1980s, the carcinogenic potential of coal tar gained increased publicity and concern in the utility and regulatory industries. For example, one newspaper article, entitled "Coal Gasification May Yield Cancer-Causing Chemicals," discussed coal tar and its cancer-causing potential. CIPS internally circulated this article and noted that the issue was generating increased "concern at the national and state level." Additionally, a published study in the Handbook on Manufactured Gas warned that some chemicals in coal tar "are among the most powerful carcinogens known to exist." Aware of the risk, CIPS, through its environmental affairs department, conducted an independent on-site investigation of its manufactured gas plants and drafted a final report discussing the condition of, and potential risk at, each of its abandoned gas-manufacturing sites, including the Site. CIPS forwarded this report to its insurer and applied for "Gradual Environmental Impairment" insurance to cover "potential claims." CIPS did not report the coal tar sites to any state or federal agency or notify current owners of the potential risk.

In October 1985, contamination was discovered at the Site by its then owner, Apple Contractors. A contractor for Apple Contractors, while attempting to place a private septic line in the ground for sewage disposal, noticed strong odors, discolored soil, and a dark viscous material throughout the soil. Unaware that the soil was hazardous, the contractor removed the surface soil and transported it to a farm in nearby Moweaqua, Illinois. At the same time the surface soil was disturbed, Taylorville authorities recorded complaints about strange odors near the Site and in the adjacent public park. Notably, the Site is bordered by private residences to the north, a wooded area to the south where some homes exist, and Manners Park, a public recreation area to the east.

Less than one month later, in November 1985, CIPS notified the Illinois Environmental Protection Agency (IEPA) that the Site contained buried contaminants. CIPS hired an independent contractor, Hanson Engineering, Inc. (Hanson), to complete a "remedial investigation/feasibility study" to assess the extent of soil contamination at the Site and the area south of the Site. Monitoring revealed extremely high concentrations of volatile chemicals on the Site, in the area surrounding the Site, and in the adjacent public park to the east. In some areas, monitoring detected soil contamination at a depth of 95 feet. A Hanson employee recommended "use of the lot south of the building be immediately prohibited." A second contractor, hired by CIPS to detect and minimize emissions, observed that the presence of such high levels of volatile agents, coupled with the Site's close proximity to residents living to the north, required "a strong effort to detect and reduce these emissions."

Soon after, CIPS met with the IEPA. The IEPA notified CIPS that it would review cleanup activities to ensure their adequate completion. Before beginning soil excavation, CIPS assessed the Site to determine the extent of contamination in the soil, tank, and groundwater, and to identify potential off-site contamination. CIPS called this assessment "Phase I." Coal tar may contain up to 10,000 different chemicals; CIPS tested for approximately 190 different compounds. This testing detected the presence of various carcinogenic compounds, including polynuclear organic (aromatic) hydrocarbons (PAHs) and volatile organic compounds (VOCs). Although contained in initial drafts of the Phase I report, risk assessment and health information was deleted from the final report submitted to the IEPA.

Approximately six months later, in July 1986, the IEPA issued a notice under section 4(q) of the Illinois Environmental Protection Act (hereinafter, 4(q) Notice) (415 ILCS 5/4(q) (West 2000)), a formal administrative order. The 4(q) Notice imposed deadlines and reporting requirements and required that CIPS conduct an "immediate removal action" to excavate the underground structures and other contaminated material on the Site before April 1987. CIPS was required to submit cleanup plans, including air monitoring, safety and quality assurance plans, and a feasibility study for the immediate removal action. Cleanup plans were developed by CIPS's contractors, approved by CIPS, and submitted to the IEPA to guarantee regulatory compliance. Five months later, CIPS completed its assessment and submitted a "Phase II" report to the IEPA. This final report detailed the substances at the Site, discussed their impact upon the public and the environment, and outlined procedures planned for the immediate remedial action.

As part of the immediate removal action, CIPS implemented an air-monitoring plan to measure particulate emissions and identify the ambient air quality during the excavation. Emissions particles vary in size, such that matter may be small enough to be easily respirable and undetectable to sensory perception such as smell, taste, or sight. Particles, including coal tar chemicals, may bond to soil particles. Moreover, wind speed and temperature influence emissions. Therefore, CIPS approved the use of stationary equipment placed in trailers to monitor emissions 24 hours a day, while technicians also performed spot testing several times a day with portable hand-held instruments. If the ambient air quality reached certain levels, defined within the remediation plan, workers took safety precautions and the Site was shutdown.

CIPS initiated air monitoring, in part, to "minimize liability from 'real' or frivolous lawsuits." Internal documents encouraged "minimal data collection necessary to quantitatively document the principal compounds of concern, thus providing a data base for use in response to potential inquiries or claims from the nearby residents or Manners Park users" because "without [emissions data] they [CIPS] have no data if neighbors claim damages." By the time of discovery, the computer data base and original data had disappeared. In its place, CIPS offered a summary of the data, prepared internally, called the Air Monitoring Report, as its "best evidence." The report was offered during trial, and to government agencies during final remediation discussions, as a basis to show that exposure did not occur.

CIPS began the remediation on January 20, 1987. Workers removed building debris, an above-ground gas holder, two underground structures (separators), and 9,000 cubic yards of soil. CIPS required the use of gas masks and protective clothing during removal of the buried structures. Hanson and Parsons Engineering Services, Inc. (Parsons), the on-site contractors, recommended relocating residents during removal of the buried structure, but CIPS declined to follow their suggestion. Excavated material and soil were removed from the Site by truck, and soil that was not trucked away at the end of the day was covered with plastic foam.

Air monitoring detected emissions above the National Air Quality Standards (NAAQS) primary health based standard for particulate emissions on seven days during the first three months of excavation. Additionally, on February 8, 1987, a Site security guard reported that high winds blew dust "all over."

Two days later, on February 10, 1987, an air-monitoring station reported a NAAQS exceedance, and a local resident was hospitalized with an intense headache, nausea, blurred vision, and convulsions. She was diagnosed with an acute attack caused by some toxic cause. The Site diary indicates that CIPS was advised of the incident. On February 11, 1987, the Site project manager expressed "great concern" about air emissions at the Site, and "wanted to be on record as pushing for shutdown and resident relocation." During this same time, truck drivers removing the soil and waste complained of nausea. As a result, the drivers were advised to wear respirators once they crossed the railroad tracks near the Site. However, residents living in this same area were not warned or relocated. At trial, CIPS maintained that NAAQS exceedances were the result of other sources, such as truck exhaust and burning leaves, and not the excavated soil.

The Site was shutdown, and the initial cleanup completed, on March 2, 1987. CIPS did not backfill the excavation with soil. CIPS and the IEPA disagreed about the scope of further remediation and the proper depth of excavation; the IEPA believed that further excavation and soil removal were necessary. Internal CIPS documents state that the meetings were "adversarial (swearing, rolling of eyes, threats of bad communication)." The IEPA attributed CIPS's refusal to conduct further remediation to "economic concerns rather than best judgment." During this conflict, with IEPA approval, CIPS covered the hole with styrofoam and plywood sheets to reduce dust emissions and volatilization.

For two years, between March 1987 and spring 1989, plywood and stryofoam covered the hole. CIPS and the IEPA continued to disagree about further remediation measures. In July 1987, CIPS discontinued particulate testing and dismantled the air-monitoring program and, instead, took weekly emission measurements around the perimeter of the Site. CIPS discontinued particulate matter testing because once excavation was completed, CIPS felt that an increase in particulate matter was not likely. The readings gathered from the weekly tests did not detect unusual emissions or NAAQS violations. Eventually, in April 1989, the IEPA granted CIPS approval to permanently backfill the hole.

The Illinois Department of Public Health (Department) examined the unusually high statistical incidence of neuroblastoma cases in Taylorville. Initially, the Department studied the genetic relatedness between families; scientific testing defeated this theory. In June 1990, the Department prepared a final draft "Preliminary Health Assessment" report for the Site. The report was available to the public for review and made available to CIPS for comment. The report concluded that the Taylorville "population had been exposed to *** dust entrained contaminants *** largely as the result of limited remedial action on the part of CIPS." Further, the report stated that the Site "is considered to be of potential public health concern because of the risk to human health caused by the possibility of exposure to hazardous substances. *** The contaminants are present at the site in large quantities and the presence of significant quantities of contaminated soils represents a source of continuing release to the environment."

CIPS argued to the Department that its report was misleading, stating that more recent CIPS air-monitoring data contradicted the Department's assessment and that the report "should be based on current Site conditions." CIPS maintained that this current data was available in its Air Monitoring Report, the only available source of information regarding ambient air at the Site. Based upon CIPS's Air Monitoring Report, the Department's report was modified to state that "the lack of likely completed exposure pathways makes the CIPS site an unlikely cause of the neuroblastoma excess." The Department's report was finalized as modified despite commentary from the USEPA that because "air emissions occurred during the excavation and likely occurred while the excavation was left open for two years, it appears to be likely that some exposure occurred to residents surrounding the Site."

In 1991, the May and Hryhorsak families filed a complaint against CIPS and Hanson in Christian County. This complaint contained counts of negligence, nuisance, conspiracy, willful and wanton

conduct, and spoliation of evidence. Approximately four years later, plaintiffs voluntarily dismissed this lawsuit, and refiled a second action three months later in Sangamon County, adding conspiracy and negligent remediation counts, as well as additional plaintiffs, the Donaldson and Steele families, and additional defendants, Haztech, Inc., and Parsons. In 1996, upon CIPS's joint motion to tranfer for *forum non conveniens*, the cause was transferred to Christian County.

Prior to trial, Haztech, Inc., settled with plaintiffs, and the trial court dismissed the Steeles' claims against Hanson and Parsons. Further, the trial court denied plaintiffs' claims for punitive damages. At trial, plaintiffs called three experts to connect the neuroblastomas to the toxins at the Site. Plaintiffs called Dr. Shira Kramer, an epidemiologist specializing in childhood cancers; Dr. Harlee Sue Strauss, a toxicologist specializing in molecular biology; and Dr. Thomas Winters, a physician specializing in occupational and environmental medicine. CIPS responded with numerous experts and plaintiffs' own treating physicians, all of whom testified that the cause of neuroblastoma is unknown, and that they could not testify within a reasonable degree of medical certainty that exposures from the Site caused the particular neuroblastomas in this case.

At the close of plaintiffs' case, the trial court denied CIPS's motion to strike plaintiffs' expert testimony and its motion for a directed verdict. The jury returned a $3.2 million verdict in favor of plaintiffs against CIPS alone, finding CIPS liable for negligence and public nuisance. The trial court entered judgment on the verdict on March 27, 1998, and CIPS appealed.

On appeal, the appellate court affirmed the judgment of the circuit court on both negligence and public nuisance. 313 Ill. App. 3d 1061. The appellate court concluded that "there was adequate evidence of causation," and that the verdict was not contrary to the manifest weight of the evidence. 313 Ill. App. 3d at 1079. This appeal followed. See 177 Ill. 2d R. 315.

ANALYSIS

I. The Admission of Expert Testimony

As an initial matter, CIPS suggests that the trial court committed reversible error when it denied CIPS's motion for a *Frye* evidentiary hearing to determine whether the testimony of plaintiffs' experts, Drs. Kramer, Winters, and Strauss, was admissible. See *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). Under the circumstances of this case, we conclude that any error was harmless.

CIPS filed its *Frye* motion two weeks before trial. On October 21, 1997, the trial court denied the motion. As observed by the appellate court, on October 21 the trial court "dealt with 30 separate motions or issues and [the order] was nine pages in length." We also recognize, as did the appellate court, that CIPS's late effort played a part in the trial court's ruling: "[a] *Frye* hearing would not only be extremely time consuming in light of the time remaining until trial, but it would be a considerable expense to the parties."

Furthermore, in effect, although informally, the trial judge conducted a *Frye* hearing. The hearing transcripts from October 21 indicate that the issues subject to the *Frye* hearing were discussed during the hearing and previously addressed on numerous occasions by the court in the months before the trial. CIPS conceded during the hearing that it was motivated to seek a *Frye* hearing simply to "create a good articulable record that is zeroed in on those very points [*Frye* issues]." In prior motions before the trial court, such as CIPS's "Motion to Exclude Testimony of Plaintiffs Expert Witnesses Kramer, Strauss, and Winters" and its "Joint Motion for Summary Judgment on Issue of Generic Causation," the trial court addressed the same issues subject to a *Frye* hearing. In ruling on these motions, the trial judge examined

thousands of pages of deposition testimony, including four depositions of Dr. Kramer, two depositions of Dr. Strauss, and three depositions of Dr. Winters. As a result, the trial judge was well versed in the experts' methodologies, as his commentary during the pretrial hearings show. Thus, although the trial court denied CIPS's request for a formal *Frye* hearing immediately before trial, we find that CIPS was not prejudiced and any error was harmless.

Second, CIPS maintains that, contrary to *Frye*, the "trial court failed in its role as 'gatekeeper' by permitting unfounded expert opinion testimony." We review *Frye* issues under an abuse of discretion standard. *People v. Miller*, 173 Ill. 2d 167, 187-88 (1996); *People v. Eyler*, 133 Ill. 2d 173, 211-12 (1989).

Illinois law is unequivocal: the exclusive test for the admission of expert testimony is governed by the standard first expressed in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). *Miller*, 173 Ill. 2d at 187-88; *People v. Thomas*, 137 Ill. 2d 500, 517 (1990); *Eyler*, 133 Ill. 2d at 211-12; *People v. Zayas*, 131 Ill. 2d 284, 293 (1989); *People v. Jordan*, 103 Ill. 2d 192, 208 (1984); *People v. Baynes*, 88 Ill. 2d 225, 241 (1981). The *Frye* standard, commonly called the "general acceptance" test, dictates that scientific evidence is only admissible at trial if the methodology or scientific principle upon which the opinion is based is "sufficiently established to have gained general acceptance in the particular field in which it belongs." *Frye*, 293 F. at 1014.

First, "general acceptance" does not concern the ultimate conclusion. Rather, the proper focus of the general acceptance test is on the underlying methodology used to generate the conclusion. If the underlying method used to generate an expert's opinion are reasonably relied upon by the experts in the field, the fact finder may consider the opinion-despite the novelty of the conclusion rendered by the expert. See generally *People v. Basler*, 193 Ill. 2d 545, 551 (2000); see also *Mendes-Silva v. United States*, 980 F.2d 1482, 1485 (D.C. Cir. 1993) ("When the underlying basis or methods of an expert's opinion are of a type reasonably relied upon by the experts in the field, the court must allow the opinion to be assessed by the factfinder-even if the opinion reaches a novel conclusion"), citing *Ambrosini v. Labarraque*, 966 F.2d 1464, 1467-68 (D.C. Cir. 1992); *Ferebee v. Chevron Chemical Co.*, 736 F.2d 1529, 1535 (D.C. Cir. 1984) (distinguishing novel methodologies from controversial or novel conclusions).

Second, general acceptance of methodologies does not mean "universal" acceptance of methodologies. The medical community may entertain diverse opinions regarding causal relationships, but this diversity of opinion does not preclude the admission of testimony that a causal relationship exists if the expert used generally accepted methodology to develop the conclusion. "In determining whether a novel scientific procedure is 'generally accepted' in the scientific community, the issue is consensus versus controversy over a particular technique. *** Moreover, the mere existence of a dispute does not preclude a finding that the procedure is generally accepted." *People v. Dalcollo*, 282 Ill. App. 3d 944, 957-58 (1966); see also *Ferebee*, 736 F.2d at 1535-36 ("[A] cause-effect relationship need not be clearly established by animal or epidemiological studies before a doctor can testify that, in his opinion, such a relationship exists. As long as the basic methodology employed to reach such a conclusion is sound, *** products liability law does not preclude recovery until a 'statistically significant' number of people have been injured or until science has had the time and resources to complete sophisticated laboratory studies of the chemical"); *Frye*, 293 F. at 1014 ("[J]ust 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"). Simply stated, general acceptance does not require that the methodology be accepted by unanimity, consensus, or even a majority of experts. A technique, however, is not "generally accepted" if it is experimental or of dubious validity. Thus, the *Frye* rule is meant to exclude methods new to science that undeservedly create a perception of certainty when the basis for the evidence or opinion is actually invalid.

Further, despite CIPS's contention, *Frye* does not make the trial judge a "gatekeeper" of all expert opinion testimony. The trial judge's role is more limited. The trial judge applies the *Frye* test only if the scientific principle, technique or test offered by the expert to support his or her conclusion is "new" or "novel." *Basler*, 193 Ill. 2d at 550-51. Only novelty requires that the trial court conduct a *Frye* evidentiary hearing to consider general acceptance. We recognize that a "new" or "novel" scientific technique is not always easy to identify, especially in light of constant scientific advances in our modern era. Generally, however, a scientific technique is "new" or "novel" if it is "original or striking" or does "not resembl[e] something formerly known or used." Webster's Third New International Dictionary 1546 (1993).

Once a principle, technique, or test has gained general acceptance in the particular scientific community, its general acceptance is presumed in subsequent litigation; the principle, technique, or test is established as a matter of law. For example, DNA analysis does not require a *Frye* hearing because the principle has been found to be generally accepted. See *People v. Hickey*, 178 Ill. 2d 256, 277 (1997); see also *Miller*, 173 Ill. 2d at 187-88 (DNA analysis admissible in light of expert's testimony and appellate court decisions approving of the technique); *Thomas*, 137 Ill. 2d at 518 (the appellate court in a prior case held that electrophoresis is generally accepted; thus, "[d]efendant's challenges to the process *** were held in the proper forum; that is, in front of the jury by cross-examination of prosecution witnesses and presentation of defendant's own witnesses"); *Eyler*, 133 Ill. 2d at 211-12 (discussing the "superglue" technique to enhance fingerprints and "electrophores" to identify blood traits under the *Frye* standard); *Dalcollo*, 282 Ill. App. 3d at 955 ("[w]here the question of the general acceptance" is raised the court often "establish[es] the law of the jurisdiction for future cases"); M. Graham, Cleary & Graham's Handbook of Illinois Evidence §702.4, at 627-28 (7th ed. 1999) (hereinafter Handbook of Illinois Evidence).

CIPS suggests that Illinois law follows a modified *Frye* standard called the "*Frye*-plus-reliability" standard. We observe that this modified standard has been adopted by some appellate court panels. See *Harris v. Cropmate Co.*, 302 Ill. App. 3d 364, 365 (1999); *First Midwest Trust Co. v. Rogers*, 296 Ill. App. 3d 416, 427 (1998); see also Handbook of Illinois Evidence §702.4, at 626 ("Application of the *Frye* standard calls for a judicial determination *** that the test's reliability is generally accepted in the particular scientific field in which the test belongs"). Under the "*Frye*-plus-reliability" standard, a court considers the following questions:

"(1) Can the scientific technique or method employed be empirically tested, and if so, has it been? (2) Has the technique or method been subjected to peer review and publication? (3) What is the technique or method's known or potential error rate? (4) Are its underlying data reliable? (5) Is the witness proposing to testify about matters growing naturally and directly out of research she has conducted independently of the litigation, or has the witness developed her opinion solely for the purpose of testifying? and (6) Did the witness form her opinion and then look for reasons to support it, rather than doing research that led her to her conclusion?" *Harris*, 302 Ill. App. 3d at 375, citing *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 592-93, 125 L. Ed. 2d 469, 482-83, 113 S. Ct. 2786, 2796-97 (1993).[(1)]

In other words, under the "*Frye*-plus-reliability" standard, after having determined that a technique or methodology is generally accepted, the court must still consider whether the opinion is reliable. See *Harris*, 302 Ill. App. 3d at 374-76; *First Midwest Trust Co.*, 296 Ill. App. 3d at 427.

Today, we clarify that this is not the standard in Illinois. The trial court is not required to conduct a two-part inquiry into the both the reliability of the methodology and its general acceptance. The determination of the reliability of an expert's methodology is naturally subsumed by the inquiry into its

general acceptance in the scientific community. Simply put, a principle or technique is not generally accepted in the scientific community if it is by nature unreliable. See *Zayas*, 131 Ill. 2d at 293. Additionally, the *Frye*-plus-reliability test impermissibly examines the data from which the opinion flows, while the technique remains generally accepted. Questions concerning underlying data, and an expert's *application* of generally accepted techniques, go to the weight of the evidence, rather than its admissibility. See, *e.g.*, *People v. Pope*, 284 Ill. App. 3d 695, 702-03 (1996) (" ' "any question concerning the specific procedures used by the company or expert goes to the reliability of the evidence and is properly considered by the jury in determining what weight to give this evidence" ' " (emphasis omitted)), quoting *People v. Johnson*, 262 Ill. App. 3d 565, 569 (1994), quoting *People v. Lipscomb*, 215 Ill. App. 3d 413, 432 (1991); *People v. Dalcollo*, 282 Ill. App. 3d 944, 957 (1996) (challenges to the application of a specific technique go to the reliability and weight of the evidence); *Ferebee*, 736 F.3d at 1534 ("Judges, both trial and appellate, have no special competence to resolve the complex and refractory causal issues raised by the attempt to link low-level exposure to toxic chemicals with human disease. On questions such as these, which stand at the frontier of current medical epidemiological inquiry, if experts are willing to testify that such a link exists, it is for the jury to decide whether to credit such testimony"); Handbook of Illinois Evidence §702.4, at 629 (questions raised with respect to the actual procedures employed to conduct the particular scientific process, technique, or test are properly considered by the trier of fact as going to the weight of the evidence). Trial judges decide the general acceptance of the technique; a jury decides whether it will accept the expert's conclusion which is based on that technique.

With this background, we consider CIPS's claim that the expert testimony was inadmissible under the *Frye* standard. CIPS insists that testimony from plaintiffs' experts is inadmissible under *Frye* because the experts' conclusions are novel and are not supported by specific scientific research establishing a cause and effect relationship between coal tar and neuroblastoma. Plaintiffs' experts relied upon the technique of "extrapolation"[(2)] to form the basis of their opinions. Essentially, CIPS argues that if a true cause and effect relationship existed, scientific research could verify it. Thus, according to CIPS, extrapolation by nature is inadmissible because it is a method used only by experts who cannot support their theories. Over CIPS's objection, the trial court admitted plaintiffs' expert testimony. During pretrial hearings, the trial court expressly relied upon *Duran v. Cullinan*, 286 Ill. App. 3d 1005 (1997). *Duran* discussed the scientific technique of extrapolation, which plaintiffs' experts in the present case also utilized. The appellate court, like the trial court, relied upon *Duran* and held that plaintiffs' expert opinions were admissible because the experts "utliz[ed] the accepted extrapolation method." 313 Ill. App. 3d at 1075. The appellate court held the admission of scientific testimony which is based on the method of extrapolation is routine or settled in law, such that the trial court was not obligated to conduct a *Frye* evidentiary hearing. 313 Ill. App. 3d at 1075.

Therefore, our threshold question concerns whether *Duran* held that the scientific method of extrapolation is generally accepted. Where the question of general acceptance of a scientific technique is raised for the first time a court is generally asked to establish the law for future cases. See *Baynes*, 88 Ill. 2d at 234-37; *Dacallo*, 282 Ill. App. 3d at 955; see also *Miller*, 173 Ill. 2d at 204 (McMorrow, J., specially concurring) (" 'in attempting to establish such general acceptance for purposes of the case at hand, the proponent will also be asking the court to establish the law of the jurisdiction for future cases' "), quoting *Jones v. United States*, 548 A.2d 35, 40 (D.C. App. 1988).

In *Duran*, plaintiffs' expert relied on 43 epidemiological studies, and extrapolated from those studies to conclude that plaintiff's ingestion of Ovulen-21, a contraceptive, caused her child's multiple birth defects. Defendant filed a motion for summary judgment, arguing that the method of extrapolation used by plaintiffs' experts was not generally accepted. Plaintiffs opposed the motion for summary judgment with, *inter alia*, an affidavit stating that the method of extrapolation used by their expert was "generally accepted" in the relevant scientific community. The trial court granted the motion for summary

judgment in favor of defendant, and the appellate court reversed, holding that the trial court abused its discretion "in finding that the plaintiffs' extrapolation from the studies was not a technique sufficiently established to have gained general acceptance in this particular scientific field." *Duran*, 286 Ill. App. 3d at 1013.

At first glance, *Duran* appears to conclude that the method of extrapolation is generally accepted in the scientific community. *Duran*, 286 Ill. App. 3d at 1011 ("the principal issue at stake here is the scientific community's general acceptance of the extrapolation technique employed by the plaintiffs' experts"). However, the appellate court only considered this issue in the context of a summary judgment motion. Specifically, in granting the defendant's summary judgment motion the appellate court held, "*[t]aking as true* the plaintiffs' expert's affidavit asserting that the extrapolation method is commonly used by the scientific community as well as various federal agencies *** we find that the trial court abused its discretion ***." (Emphasis added.) *Duran*, 286 Ill. App. 3d at 1013. As has been observed in the context of *Frye*, "relying exclusively upon prior judicial decisions to establish general scientific acceptance can be a ' "hollow ritual" ' if the underlying issue of scientific acceptance has not been adequately litigated." *Basler*, 193 Ill. 2d at 554 (McMorrow, J., dissenting, joined by Freeman, J.), quoting *People v. Kirk*, 289 Ill. App. 3d 326, 333 (1997), quoting 1 J. Strong, McCormick on Evidence §203, at 870 n.20 (4th ed. 1992); see also *Miller*, 173 Ill. 2d at 206-07 (McMorrow, J., specially concurring) ("to resolve the general acceptance question, care must be taken so that the practice is not abused *** [f]or '[u]nless the question *** has been thoroughly litigated *** reliance *** is a hollow ritual' "), quoting 2 J. Strong, McCormick on Evidence §203, at 870 n.20 (4th ed. 1992). Neither the trial court, nor the appellate court in *Duran*, resolved the issue of the general acceptance of the extrapolation technique. Thus, *Duran* does not stand for the proposition that extrapolation is generally accepted.

However, we disagree with CIPS's contention that plaintiffs' expert testimony is inadmissible under *Frye*. Although not controlling, *Duran* does contain a helpful discussion of extrapolation, explaining that extrapolation is commonly used by scientists in certain limited instances. *Duran*, 286 Ill. App. 3d at 1011-13. Specifically, extrapolation is utilized in the scientific community when the medical inquiry is new or the opportunities to examine a specific cause and effect relationship are limited. *Duran*, 286 Ill. App. 3d at 1012 (discussing *Ferebee*, 736 F.2d 1529, and the issue of frontier medical inquiries); but see *Zayas*, 131 Ill. 2d at 295 (holding that evidence of hypnotically induced recall is inadmissible under *Frye* because it is not generally accepted and the scientific literature is "replete with articles imploring courts to reject such evidence because of its many flaws"); *Lynch v. Merrell-National Laboratories*, 830 F.2d 1190 (1st Cir. 1987) (plaintiff's expert testimony based on extrapolation was not generally accepted because the cause and effect relationship offered in the opinion was the subject of extensive studies and no study showed a cause and effect relationship). In some cases, medical science is simply unable to establish the cause and origin of disease. In others, medical science does not seek to establish the existence of a cause and effect relationship-for example, in this instance, the small number of neuroblastoma cases limits study of the disease. As a result, extrapolation offers those with rare disease the opportunity to seek a remedy for the wrong they have suffered. Thus, in these limited instances, an expert may rely upon scientific literature discussing similar, yet not identical, cause and effect relationships. The fact that an expert must extrapolate, and is unable to produce specific studies that show the exact cause and effect relationship to support his conclusion, affects the weight of the testimony rather than its admissibility. *Duran*, 286 Ill. App. 3d at 1013.

We also find instructive *Ferebee v. Chevron Chemical Co.*, 736 F.3d 1529 (D.C. Cir. 1984), which considered the admission of expert testimony when that testimony offered a new causal link. In *Ferebee*, plaintiff's experts testified that exposure to a toxic chemical caused the decedent's illness and death. Defendant argued that the opinion was inadmissible because no study ever suggested a link between plaintiff's injury and the toxic chemical. The federal appeals court held:

"As long as the basic methodology employed to reach such a conclusion is sound, such as use of tissue samples, standard tests, and patient examinations, products liability law does not preclude recovery until a 'statistically significant' number of people have been injured or until science has had the time and resources to complete sophisticated laboratory studies of the chemical. In a courtroom, the test for allowing a plaintiff to recover in a tort suit of this type is not scientific certainty but legal sufficiency; if reasonable jurors *could* conclude from the expert testimony that [the chemical] paraquat more likely than not caused Ferebee's injury, the fact that another jury might reach the opposite conclusion or that science would require more evidence before conclusively considering the causation question resolved is irrelevant. That Ferebee's case may have been the first of its exact type, or that his doctors may have been the first alert enough to recognize such a case, does not mean that the testimony of those doctors, who are concededly well qualified in their fields, should not have been admitted." (Emphasis in original.) *Ferebee*, 736 F.2d at 1535-36.

See also *Mendes-Silva*, 980 F.2d at 1487 (admitting expert testimony even though the epidemiological question "is on the frontier of medical science in the sense that no clear answer has been found").

Furthermore, we observe that the method of extrapolation does not concern a technique new to science that may instill a sense of "false confidence" or carry a misleading sense of scientific "infallibility." See *Zayas*, 131 Ill. 2d at 294 (observing that hypnotically induced evidence of recall intrudes upon the "proper functioning of the jury by the admission of evidence which 'is likely to be shrouded with an aura of near infallibility, akin to the ancient oracle of Delphi' "), quoting *Baynes*, 88 Ill. 2d at 244. For example, in the case of "machines or procedures which analyze physical data *** [l]ay minds might easily, but erroneously, assume that such procedures are objective and infallible." *People v. Stoll*, 49 Cal. 3d 1136, 783 P.2d 698, 265 Cal. Rptr. 111 (1989) (a jury may find that machines are objective and infallible, and may assume testimony based upon procedures which analyze physical data provides a definitive truth). By contrast, extrapolation by nature admits its fallibility-the lack of specific support to establish the existence of a known cause and effect relationship. The jury is left to judge the veracity of the expert's conclusion. See *Zayas*, 131 Ill. 2d at 295 ("modern evidence rules *** allow the jury to hear all the evidence and draw its own conclusions, unless the trial judge determined that certain evidence was excessively prejudicial").

In the instant case, plaintiffs' experts offered opinions about a new medical epidemiological inquiry. Medical research does not specifically establish a cause and effect relationship between coal tar and neuroblastoma. However, it is also true that medical research does not specifically reject that a cause and effect relationship exists. The relationship between coal tar and neuroblastoma has simply not been the subject of extensive study and research. One expert explained that because few people are diagnosed with neuroblastoma, the disease is simply not the subject of extensive funding and study. Further, plaintiffs' experts testified that few studies exist regarding the specific cause and effect relationship at issue in this case because ethical considerations prevent exposing the human population to coal tar for research purposes. Moreover, plaintiffs' experts explained that scientific research is limited because the cases of environmental exposure are often detected after the onset of illness, which prevents proper controlled settings to study the effects of exposure. Therefore, all of plaintiffs' experts testified that they utilized the method of extrapolation, and that the technique is generally accepted in their fields. Like plaintiffs' experts in *Duran*, however, plaintiffs' experts in the instant case relied upon the only available source of information to form the basis of their conclusions-similar, yet not identical, scientific studies and theories. From these studies, plaintiffs' experts concluded that coal tar caused these plaintiffs' neuroblastomas. CIPS offers no evidence to suggest that this method, extrapolation, is not utilized or generally accepted among the scientific community. Instead, CIPS insists the *conclusion* is not generally accepted in the scientific community; therefore, the methodology is not generally accepted. Again, in the interest of clarity, an expert's conclusion is subject to challenge by traditional efforts such as cross-examination. The general acceptance test should not replace the role of the advocate, who may expose

shaky but admissible evidence by vigorous cross-examination or the presentation of contrary evidence.

As the *Frye* standard does not demand unanimity, consensus, or even a majority to satisfy the general acceptance test, we find that extrapolation is sufficiently established to have gained general acceptance in these limited circumstances. Traditional methods, such as cross-examination and rebuttal witnesses, offered CIPS the opportunity to challenge the experts' conclusions in the proper forum, during trial in front of the jury. Accordingly, the trial court did not err in admitting the testimony of plaintiffs' experts.

II. Judgment Notwithstanding the Verdict

a. *The Standard of Review*

In its post-trial motion, CIPS sought a judgment notwithstanding the verdict, which the trial court denied. Before this court, CIPS argues that insufficient evidence of causation required that the trial court grant its motion. CIPS maintains that this error is subject to *de novo* review. Plaintiffs, however, argue that the denial of a motion for judgment notwithstanding the verdict is reviewed under the same standard applied by the trial court. Specifically, plaintiffs argue that this court must consider whether " 'the evidence, when viewed in its aspect most favorable to the opponent, so overwhelmingly favors movant that no contrary verdict based on that evidence could ever stand.' " *Maple v. Gustafson*, 151 Ill. 2d 445, 453 (1992), quoting *Pedrick v. Peoria & Eastern R.R. Co.*, 37 Ill. 2d 494, 510 (1967).

Although it appears the parties ask us to apply different standards, in reality, the parties request the same standard. See *Gaffney v. City of Chicago*, 302 Ill. App. 3d 41, 48 (1998). A denial of a judgment notwithstanding the verdict motion is reviewed under the *de novo* standard. *McClure v. Owens Corning Fiberglas Corp.*, 188 Ill. 2d 102, 132 (1999). In doing so, a reviewing court considers that: " '[j]udgment notwithstanding the verdict should not be entered unless the evidence, when viewed in the light most favorable to the opponent, so overwhelmingly favors the movant that no contrary verdict based on that evidence could ever stand.' " *McClure*, 188 Ill. 2d at 131-32, quoting *Holton v. Memorial Hospital*, 176 Ill. 2d 95, 109 (1997); *Thacker v. UNR Industries, Inc.*, 151 Ill. 2d 343, 353-54 (1992); *Maple*, 151 Ill. 2d at 453; *Pedrick v. Peoria & Eastern R.R. Co.*, 37 Ill. 2d 494, 510 (1967). In making this assessment, a reviewing court must not substitute its judgment for the jury's, nor may a reviewing court reweigh the evidence or determine the credibility of the witnesses. *Maple*, 151 Ill. 2d at 452-53; *Gaffney*, 302 Ill. App. 3d at 48.

b. *Causation*

CIPS maintains that plaintiffs failed to satisfy their overall burden to show causation. CIPS points to the record as support, and argues that it shows only a "mere possibility" of causation, rather than that causation is "more probably true than not." According to CIPS, a showing of causation includes both "generic causation"-*i.e.*, coal tar is capable of causing neuroblastoma-and "specific causation"-*i.e.*, exposure to coal tar from the Site did in fact occur and actually caused the neuroblastomas. CIPS also argues that in toxic tort litigation, causation also includes a showing of "exposure," which must be quantified with evidence of the level or dose of exposure. CIPS asserts that a plaintiff may establish this exposure requirement with evidence of biological markers, such as trace fibers or particles found in the body, proximity to the defendant's product, or personal or environmental monitoring.

We disagree with defendant's characterization of Illinois law on causation. First, Illinois law does not define causation in terms of "generic" or "specific" causation. Rather, our case law clearly states that in negligence actions, the plaintiff must present evidence of proximate causation, which includes both "cause in fact" and "legal cause." *Thacker*, 151 Ill. 2d at 354; *Smith v. Eli Lilly & Co.*, 137 Ill. 2d 222,

232 (1990). A plaintiff may show "cause in fact" under the substantial factor test, showing that the defendant's conduct was a material element and substantial factor in bringing about the alleged injury. *Thacker*, 151 Ill. 2d at 354-55; *Lee v. Chicago Transit Authority*, 152 Ill. 2d 432, 455 (1992). "Legal cause" examines the foreseeability of injury-whether the injury is " 'of a type which a reasonable man would see as a likely result of his conduct.' " *Lee*, 152 Ill. 2d at 456, quoting *Masotti v. Console*, 195 Ill. App. 3d 838, 845 (1990). Defendant does not allege that plaintiffs failed to show legal cause.

Turning to "cause in fact," a plaintiff may meet his or her burden of causation with circumstantial evidence-evidence from which a " 'jury may infer other connected facts which usually and reasonably follow according to *** common experience.' " *Thacker*, 151 Ill. 2d at 357, quoting *Devine v. Delano*, 272 Ill. 166, 179-80 (1916). This is to say, Illinois law does not require unequivocal or unqualified evidence of causation. *Dixon v. Industrial Comm'n*, 60 Ill. 2d 126 (1975); *National Castings Division of Midland-Ross Corp. v. Industrial Comm'n*, 55 Ill. 2d 198, 204 (1973); see also *Dominguez v. St. John's Hospital*, 260 Ill. App. 3d 591 (1993). To the contrary, we have held that where "there exists limited medical knowledge of a malady *** medical testimony pertaining to causation may not be unqualified and unequivocal." *National Castings*, 55 Ill. 2d at 204.

Additionally, we reject CIPS's assertion that causation includes a showing of exposure, which must be quantified. A plaintiff must establish that he or she came into contact with chemicals produced by the defendant. See *Mitchell v. Gencorp, Inc.*, 165 F.3d 778, 781 (10th Cir. 1999). In this context, however, Illinois law does not require that plaintiffs quantify the level of exposure. CIPS relies upon cases that address exposure to asbestos-containing products in an occupational setting. See, *e.g.*, *Kessinger v. Grefco, Inc.*, 173 Ill. 2d 447 (1996) (plaintiffs alleged exposure while working for Union Asbestos and Rubber Company and its successor company); *Thacker*, 151 Ill. 2d 343 (plaintiffs alleged exposure while working for Union Asbestos and Rubber Company and its successor company); *Johnson v. Owens-Corning Fiberglas Corp.*, 313 Ill. App. 3d 230 (2000) (plaintiffs alleged exposure during their tenure at Keystone Steel & Wire Company). These cases hold that in order to show causation *in an asbestos case*, a plaintiff must "produce evidence of exposure to a specific product on a regular basis over some extended period of time in proximity to where the plaintiff actually worked," commonly called the "frequency, regularity and proximity" test. *Thacker*, 151 Ill. 2d at 363 (adopting the "frequency, regularity and proximity" test as the rule of law in Illinois asbestos cases). In this instance, we are not compelled to adopt this rule and depart from traditional concepts of causation. Environmental exposure cases, like the instant case, do not afford litigants the opportunity to specify with such certainty the exact level and dose of exposure. In most instances, the details of exposure, including information of exactly when or where exposure occurred, is not available. Here, plaintiffs were not required to show the exact amount of exposure. See *La Salle National Bank v. Malik*, 302 Ill. App. 3d 236 (1999) (the inability to show the level of exposure did not bar an expert's opinion); *Harris*, 302 Ill. App. 3d at 371 (discussing causation testimony that did not calculate the concentration of exposure, but instead reached the conclusion that exposure occurred based upon their "generalized knowledge *** and firsthand experience with and observations of the effects of exposure").

Accordingly, we review whether there was evidence from which a jury could conclude that CIPS's conduct was a material element and substantial factor in bringing about the neuroblastomas.

Plaintiffs presented testimony from Dr. Winters, an expert in occupational and environmental medicine. Dr. Winters testified that in the case of environmental exposure, like the instant matter, it is difficult to quantify exposure to individual community members. However, his review of evidence in this case, including the IEPA 4(q) immediate removal action plans, Department reports, USEPA reports, family medical histories and interviews, and Site reports that discussed the level of soil contamination and methods of removal, as well as the open and unmonitored status of the Site for two years, led him to conclude that cumulative exposure occurred here.

Further, plaintiffs presented circumstantial evidence of community exposure. The jury heard evidence regarding the potential of particulate matter to travel undetected for several miles. The jury was advised of Taylorville weather conditions during the period of remediation, including high wind and unseasonably warm weather, which facilitate the travel of air-borne contaminants. Plaintiffs offered evidence that during the period of remediation, on-site workers complained of symptoms consistent with exposure to toxic substances. At that same time, the record shows that a local resident, who lived within several hundred feet of the Site, was hospitalized with dizziness, headaches, vomiting, and seizures, and later diagnosed with exposure to an unknown toxic cause. This individual testified that "[e]verything just reeked from it [coal tar]. It even penetrated into the homes." She later added the Site cast a "heavy mist over the whole area, like a fog" and that workers at the Site dressed in protective gear.

Additionally, air-monitoring results showed emissions above the NAAQS primary health based standard for particulate emissions on seven days during the first three months of excavation. In 1987, preremediation soil monitoring revealed extremely high concentrations of volatile chemicals on the Site, in the area surrounding the Site, and in adjacent Manner's Park. Plaintiffs presented testimony that they frequented Manner's Park, as well as homes and businesses near the Site. Moreover, the record shows that each plaintiff lived within four miles of the Site. Plaintiffs lived within this radius during the remediation and following the remediation when the Site was an open 10-foot hole with unsupported side walls covered with plywood and styrofoam.

Moreover, in 1990, the Department in its final "draft" health assessment acknowledged human exposure to site contaminants by dust-entrained contaminants. Although later revised at CIPS's request, the USEPA concurred with the Department's original draft and wrote that because "air emissions occurred during the excavation and likely occurred while the excavation was left open for two years, it appears to be likely that some exposure occurred to residents surrounding the Site."

Plaintiffs presented testimony from Dr. Kramer, an expert witness who testified regarding causation. Dr. Kramer received her Ph.D. in epidemiology from Johns Hopkins University, a master's degree in human genetics from Johns Hopkins University, and a bachelor's degree in bio-chemistry from Johns Hopkins University. During her 20-year career as an epidemiologist, Dr. Kramer published a textbook of epidemiology, studied the etiology of childhood cancer at the Children's Hospital of Philadelphia, and published studies on the etiology of neuroblastoma. Her field of study, epidemiology, is the field of public health and medicine that studies the incidence, distribution, and etiology of disease in human populations. Scientists in this field assume that disease is not distributed randomly in a group of individuals and that identifiable subgroups, including those exposed to certain agents, are at increased risk of contracting particular diseases. Dr. Kramer explained that epidemiology concerns whether a particular agent is capable of causing a disease or injury. Further, she testified that an epidemiologist may conduct one of many studies to determine whether an agent is related to the risk of disease or adverse health affects. As she explained, study design varies depending upon the circumstances, including resource limitations, time constraints, or the subject of the study. Both parties agree that under the current scientific literature, several epidemiologic criteria are used to judge the relation between an agent and the risk of disease, including the temporal relationship between the disease and the exposure; the statistical strength of association; the dose-response relationship; the replication of findings; the biologic plausibility; alternative causes; cessation of exposure; the association of exposure with a single disease; and consistency with other knowledge. According to Dr. Kramer, however, scientific literature also explains that the science of epidemiology does not demand satisfaction of each criteria, rather on occasion some may be irrelevant or impossible to determine.

Dr. Kramer testified that the carcinogens contained in coal tar and coal tar related carcinogens from the Site were the most-likely cause of the plaintiffs' neuroblastomas. She later quantified this as a "greater than 50 percent probability." Dr. Kramer admitted that no scientific consensus exists to support the

theory that coal tar causes neuroblastoma. However, in great detail she outlined the methodology used to generate her conclusion, including her own published studies on neuroblastoma, scientific literature on risk factors for nervous system cancers, animal studies regarding nervous system cancer, studies regarding the risks of expectant mothers and infants, and her Taylorville case-specific study that was based upon family history questionnaires and Illinois Cancer Registry data. Her research ruled out random variability as the cause for the sudden increase of Taylorville neuroblastoma cases.

Dr. Kramer discussed the temporal relationship between the release of ambient air emissions from the Site and the onset of neuroblastoma. However, Dr. Kramer did not rely solely on an abstract temporal connection. Dr. Kramer also examined the increased incidence of neuroblastoma through standard scientific calculation, and calculated the probability that the onset of neuroblastoma was due to random chance; she concluded that the possibility of chance was one in 10,000. Further, Dr. Kramer discussed that coal tar is a multipotential carcinogen that can cause cancer at multiple sites in the body. Dr. Kramer addressed alternative sources, and determined that although alternative sources are potential causes of neuroblastoma, only the Site was a common risk factor among all plaintiffs. Consistent with the science of epidemiology, Dr. Kramer performed a cancer incidence rate analysis to measure the rate of development of neuroblastoma and adult cancers in Taylorville. The incidence rate examines whether the sudden or dramatic increase in cases is more likely due to chance. In order to complete this study, Dr. Kramer studied the incidence of neuroblastoma in four different comparison groups during the period 1986 through 1991, including: the National Cancer Institute Surveillance Epidemiology and End Results Program Rates (SEER, a national cancer registry), the State of Illinois, demographically similar zip codes without manufactured gas plant sites, and demographically similar zip codes with manufactured gas sites. At the conclusion of her study, Dr. Kramer testified that there was a one in 10,000 probability that chance caused the nueroblastomas in this case. Further, Dr. Kramer discussed fetal nervous system cancers and the increased sensitivity of expectant mothers and young children to carcinogens. Based upon medical research animal studies, she testified that the fetal nervous system is 50 times more sensitive to carcinogens. Dr. Kramer also testified that there is no safe level of exposure to known sensitive populations, and argued that this was a "known scientific fact" cited in the literature.

Plaintiffs also presented Dr. Strauss, a molecular biologist and toxicologist. Dr. Strauss received her Ph.D. in molecular biology from the University of Wisconsin, completed a post-doctoral fellowship on the study of toxic interactions at the cellular level from the National Institute of Environmental Health Sciences, participated in graduate training at MIT in organic chemistry, and received her bachelor's degree in chemistry from Smith College. Her field of study, toxicology, examines the adverse effects of chemicals on living organisms, and is otherwise called the "science of poisons." Dr. Strauss explained that toxicological studies, by themselves, rarely offer direct evidence that a disease in any one individual was caused by a chemical exposure. However, toxicology can rule out other risk factors known to cause a disease and provide scientific information regarding the increased risk of contracting a disease at any given dose.

Dr. Strauss testified that coal tar and its general chemical constituents were the cause of plaintiffs' neuroblastomas. Dr. Strauss based her conclusions upon animal studies and medical research in the area of nervous system tumors, soil samples from the Site, health and safety diaries from the Site, and air-monitoring logs from the Site. Additionally, Dr. Strauss discussed the volatile potential of coal tar compounds, using studies that discussed manufactured gas plant sites with similar site histories and VOC contamination profiles. From this data, she compiled the potential toxicity of the Site and the cancer potency of the coal tar. Further, Dr. Strauss discussed the complex chemical compounds contained in coal tar, and the "synergistic" effect that occurs when these compounds interact to form more potent compounds. She stated that these same compounds are multipotential, affecting several organ sites, and transplacental, meaning that the carcinogen may pass from the placenta to a developing fetus.

This case presents the classic "battle of the experts" frequently seen in toxic tort litigation. Plaintiffs' experts testified that the Site was a substantial factor in bringing about plaintiffs' neuroblastomas, while defendants' experts testified that medical science does not associate coal tar with neuroblastoma. When viewing this evidence in the light most favorable to the plaintiffs, we do not find that the evidence so overwhelmingly favors CIPS that no contrary verdict based on that evidence could ever stand. Clearly, there was sufficient evidence from which a jury could conclude that CIPS's conduct was a material element and substantial factor in bringing about the alleged injury.

C. *Duty*

CIPS next claims that plaintiffs failed to satisfy its burden to show CIPS violated any duty. CIPS does not deny the existence of a duty; it argues that the evidence was insufficient to establish that it breached its duty. We find sufficient evidence of a breach.

In their complaint, plaintiffs alleged a breach of duty beginning in 1939 and ending in 1989. Jury instructions incorporated specific acts and omissions alleged in plaintiffs' complaint: (1) the abandonment of coal tar in the underground tanks in 1938; (2) failure to monitor the Site before contaminants migrated off-site and were discovered by local authorities; (3) failure to warn local authorities or residents after CIPS discovered contamination in 1985; (4) failure to control airborne pathways before beginning its immediate removal action in 1987; (5) increasing volatile air and dust emissions during the immediate removal action in 1987; (6) failure to control the volatile air and dust emissions after the immediate removal action between 1987 and 1989; (7) failure to warn residents of any risk to human health resulting from exposure to the Site while it remained open between 1987 and 1989; and (8) failure to provide reliable air monitoring of emissions while the Site remained open between 1987 and 1989.

CIPS contends that there is no breach because it was the industry standard to leave underground storage tanks and coal tar in 1939. Plaintiffs, however, offered evidence that coal tar was a concern as early as 1906. CIPS also argues that its failure to backfill the Site for a period of two years does not establish a breach of its duty because, according to CIPS, this act was at the direction of the IEPA. Evidence in the record was also sufficient for a jury to find otherwise. Plaintiffs offered an internal CIPS memorandum, dated February 18, 1987, to show that CIPS was not prohibited from backfilling the Site. This memorandum described meetings between CIPS and the IEPA in 1987. The topic of these meetings included further soil excavation. The document discusses CIPS's objection to further soil excavation due to the costs of additional remediation efforts, the lack of IEPA input, and the impossible deadlines imposed by the IEPA. This same document indicates that CIPS was advised that it could proceed with backfilling "at its own risk," suggesting that further excavation may be required at a later date that would necessitate reopening the hole. Therefore, the jury was presented evidence that the Site remained open, not as a result of the IEPA's direction, but because CIPS refused to temporarily backfill to avoid additional costs. We find that this evidence, although contradicted by defendants' own witnesses, was sufficient for a jury to conclude that CIPS breached its duty of care. We do not find that the evidence so overwhelmingly favors CIPS that no contrary verdict based on that evidence could ever stand.

As a final matter, CIPS also argues that the acquittal of the contractors who performed the excavation, and the verdict against it, are inconsistent, and that this inconsistency warrants judgment notwithstanding the verdict.

CIPS was sued for its own independent negligent acts or omissions. Clearly, where the same set of facts shows one party liable and the other not liable, they are not legally inconsistent verdicts. For example, in this case the jury was offered evidence that CIPS's contractors disagreed with the remediation procedures. In one instance, contractors expressed "great concern *** about air emissions. *** [and] [w]

anted to be 'on record' as pushing for shutdown and resident relocation," while CIPS refused to order resident relocation, even temporarily. Thus, we find that the verdicts are not inconsistent and are supported by evidence in the record. We conclude, therefore, that the trial court did not err by denying CIPS's motion for judgment notwithstanding the verdict.

III. Public Nuisance

Last, CIPS claims that plaintiffs' nuisance claims were defective. First, CIPS argues that the public nuisance statute is criminal in nature (see 720 ILCS 5/47-5 (West 2000)) and does not authorize a private cause of action. Alternatively, CIPS argues that the mere existence of government oversight precludes nuisance liability. These issues raise questions of law, which we review *de novo*. *Miller*, 173 Ill. 2d 167.

At the time plaintiffs' filed their complaint, their cause of action was authorized by section 221 of "An Act to revise the law in relation to criminal jurisprudence" (the Public Nuisance Act) (Ill. Rev. Stat. 1989, ch. 100½, par. 26)-a declaration of common law. See *Gilmore v. Stanmar, Inc.*, 261 Ill. App. 3d 651, 661 (1994); see also *Village of Wilsonville v. SCA Services, Inc.*, 86 Ill. 2d 1, 21-22 (1981). However, the Public Nuisance Act did not displace common law rights: plaintiffs were free to plead and prove either common law nuisance or statutory nuisance. *People ex rel. Burris v. C.J.R. Processing, Inc.*, 269 Ill. App. 3d 1013, 1019 (1995) (plaintiffs were free to plead either common law nuisance or statutory nuisance); *Gilmore*, 261 Ill. App. 3d at 661 ("while the nuisance alleged by the plaintiffs is recognized by statute in Illinois, they were free to plead common law public nuisance without mention of the statute"); *Village of Bensenville v. Botu, Inc.*, 39 Ill. App. 3d 634, 636 (1976) ("there exists a common law right of action to abate public nuisance independent of any statutory right").

Thus, in this case, in the same count of their complaint, plaintiffs sought damages under both statutory law (see Ill. Rev. Stat. 1989, ch. 100½, par. 26) and common law. However, after plaintiffs filed their complaint, the legislature repealed section 221 (the Public Nuisance Act) and recodified its provisions as section 47-5 of the Criminal Code of 1961 (740 ILCS 5/221 (West 1996)). Pub. Act 89-234, eff. January 1, 1996.

Importantly, however, the effect of this repeal is not necessary to resolve this issue. Simply stated, whether or not plaintiffs' statutory claim is defective is irrelevant: plaintiffs' claim is proper under common law. At the time plaintiffs' filed their complaint, plaintiffs had a common law right to claim damages for public nuisance. *People ex rel. Burris*, 269 Ill. App. 3d at 1019; *Gilmore*, 261 Ill. App. 3d at 661-62; *Village of Bensenville*, 39 Ill. App. 3d at 636.

At common law, a public nuisance included:

"an unreasonable interference with a right common to the general public. Earlier cases recognized that the public had a right to clean, unpolluted air and that any deprivation of that right was actionable as a private injury and indictable as a public wrong. [Citation.] However, the notion of pure air has come to mean clean air consistent with the character of the locality and the attending circumstances. Whether smoke, odors, dust or gaseous fumes constitute a nuisance depends on the peculiar facts presented by each case." *City of Chicago v. Commonwealth Edison Co.*, 24 Ill. App. 3d 624, 631-32 (1974).

See also *Village of Wilsonville*, 86 Ill. 2d at 21-22 (a " ' "public nuisance is the doing of or the failure to do something that injuriously affects the safety, health or morals of the public, or works some substantial annoyance, inconvenience or injury to the public" ' "), quoting W. Prosser, Torts §88, at 583 n.29 (4th ed. 1971), quoting *Commonwealth v. South Covington & Cincinnati Street Ry. Co.*, 181 Ky.

459, 463, 205 S.W. 581, 583 (1918). CIPS does not argue that plaintiffs failed to plead and prove the elements of common law nuisance. We find, therefore, that plaintiffs' nuisance claim was proper.

The second issue presented for our review is whether IEPA direction and supervision bar nuisance liability. CIPS maintains that the extension of nuisance liability in this context will damage State interests by discouraging the private sector from cooperating with the IEPA. At the heart of CIPS albeit brief argument, is the contention that it is "unfair" to reward cooperation with exposure to liability. CIPS warns that if this court permits liability here, it will slow down or reduce future clean-up efforts.

First, we reject CIPS's argument based upon the language of the Illinois Environmental Protection Act. Section 45(a) of the Illinois Environmental Protection Act (415 ILCS 5/45(a) (West 2000)) states that "[n]o existing civil or criminal remedy for any wrongful action shall be excluded or impaired by this Act." See also *City of Monmouth v. Pollution Control Board*, 57 Ill. 2d 482 (1974) (The Environmental Protection Act provides remedies to prevent or diminish pollution which are in addition to remedies recognized by common law). This clear unequivocal language demonstrates that state law does not prevent nuisance claims.

We are, however, compelled to respond further. CIPS was not held liable for the mere release of toxins into the ambient air during remediation. In an industrial society odors, film, dust, and smoke may exist. See *City of Chicago*, 24 Ill. App. 3d at 632 (noting that "[t]hese conditions in an industrial area have generally not been considered to be public nuisances"). This logic is equally true in the case of an environmental remediation. In this instance, however, plaintiffs' allege a substantial injury different from the general public, and claim that this injury is not based solely on ordinary clean-up efforts, but rather negligent remedial conduct. See *Gilmore*, 261 Ill. App. 3d at 661-62 (a law "making a nuisance legal does not automatically destroy a common law nuisance action where the defendant's conduct was not in compliance with the law, [or] where the defendant was otherwise negligent ***"). We need only look to plaintiffs' allegations: CIPS is liable for, the "release of 'coal tar' into the soil, groundwater and air *in violation of the IEPA*; [c]ontamination of public water supplies *in violation of the IEPA*; [r]elease of airborne carcinogens, clastogens, and mutagens from the Site before its 'Immediate Removal Action;' [r] elease of airborne carcinogens, clastogens, and mutagens from the Site during its 'Immediate Removal Action;' [r]elease of airborne carcinogens, clastogens, and mutagens after its 'Immediate Removal Action;' [m]aintaining an open pit resulting in erosion of soil and collection of surface water which allowed the further release of volatile air and fugitive dust emissions for two years after its 'Immediate Removal Action." (Emphasis added.) We do not find that liability in this case will frustrate future remedial efforts or deter cooperation. To the contrary, it may encourage cooperation with government agencies, and heighten care and concern for public safety during remedial actions.

As a final matter, we reject CIPS's argument that it should not be liable because the release of emissions was solely the result of IEPA oversight. The record demonstrates otherwise. Plaintiffs offered evidence that CIPS did not act solely at the direction of the IEPA. For example, CIPS tested soil and evaluated the extent of contamination before it contacted the IEPA; CIPS drafted the remediation and monitoring plans, which although subject to IEPA review, were based upon CIPS's own data and risk assessments; and CIPS continually resisted and modified IEPA remedial suggestions, and on some occasions did not notify the IEPA of shutdowns or air emission problems until after the IEPA discovered the problem. Moreover, CIPS's own admissions rebut the argument that CIPS was a forced participant in the remediation. The record is replete with CIPS's own reference to its "voluntary" participation. In fact, the record shows that CIPS sought voluntarily status to avoid strict federal superfund guidelines and to maintain greater authority and control over the remediation. Accordingly, we reject CIPS's claim that IEPA oversight was a defense to liability.

CONCLUSION

For the foregoing reasons, we affirm the judgment of the appellate court affirming the trial court's judgment in favor of plaintiffs.

Affirmed.

JUSTICE FREEMAN took no part in the consideration or decision of this case.

JUSTICE McMORROW, specially concurring:

Although I agree that the appellate court judgment should be affirmed, I write separately to reiterate the position I took in *People v. Miller*, 173 Ill. 2d 167 (1996), that "the all-encompassing abuse of discretion standard" is inappropriate when reviewing "the legal issues raised by trial court applications of the *Frye* standard." *Miller*, 173 Ill. 2d at 204 (McMorrow, J., specially concurring). I maintain, as I did in *Miller*, that the more appropriate standard for reviewing *Frye* "general acceptance" issues is *de novo*.

Whenever a trial court is called upon to decide whether to admit expert testimony, the court must decide whether the expert is qualified to testify in the subject area and whether the proffered testimony will assist the jury in resolving the issues before it. These determinations, like most evidentiary matters, are traditionally left to the discretion of the trial court and its decision should not be reversed unless it is found that the trial court abused its discretion. *People v. Gilliam*, 172 Ill. 2d 484 (1996); *People v. Jordan*, 103 Ill. 2d 192 (1984).

Frye evidence is a particular form of expert testimony. As the majority correctly acknowledges, when an expert's opinion is derived from a scientific method or technique which is alleged to be unconventional or novel, the admission of the expert's testimony depends on whether the trial court finds that the scientific method employed by the expert meets the *Frye* "general acceptance" test. In my view, the "general acceptance" question should not be subject to an abuse of discretion standard. As stated in the specially concurring opinion in *Miller*:

"There are good reasons why the determination of general acceptance in the scientific community should not be left to the discretion of the trial court. Foremost is the fact that the general acceptance issue transcends any particular dispute. As one court has put it, '[t]he question of general acceptance of a scientific technique, while referring to only one of the criteria for admissibility of expert testimony, in another sense transcends that particular inquiry, for, in attempting to establish such general acceptance for purposes of the case at hand, the proponent will also be asking the court to establish the law of the jurisdiction for future cases.' *Jones v. United States*, 548 A.2d 35, 40 (D.C. App. 1988). Application of less than a *de novo* standard of review to an issue which transcends individual cases invariably leads to inconsistent treatment of similarly situated claims." *People v. Miller*, 173 Ill. 2d at 204 (McMorrow, J., specially concurring).

In addition, *de novo* review of the "general acceptance" issue allows the reviewing court to look beyond the expert evidence presented in the trial court. It allows consideration of other judicial opinions, including those from other jurisdictions, as well as pertinent legal and scientific commentaries. See *Miller*, 173 Ill. 2d at 205 (McMorrow, J., specially concurring).

The appropriateness of employing a *de novo* standard when reviewing decisions regarding "general acceptance" under *Frye* has been recognized by courts in other jurisdictions. In fact, the supreme courts in three states, citing to my special concurrence in *Miller*, have adopted a *de novo* standard for reviewing the "general acceptance" issue. See *Commonwealth v. Vao Sok*, 425 Mass. 787, 796, 683 N.E.2d 671, 677 (1997); *State v. Harvey*, 151 N.J. 117, 167, 699 A.2d 596, 619 (1997); *Brim v. State*, 695 So. 2d 268, 274 (Fla. 1997).

On a whole, then, there is no single standard of review appropriate when considering the admissibility of *Frye* evidence. Traditional evidentiary matters, such as the expert's qualification to testify and the relevancy of the testimony, should be left to the discretion of the trial court. "General acceptance," however, is more appropriately a matter subject to a *de novo* standard of review.

Adopting this dual standard of review is not unusual. This court has recognized that the measure of deference to be afforded any trial court determination depends on "the substantive and procedural backdrop against which the appealed order or ruling arose." *People v. Coleman*, 183 Ill. 2d 366, 378 (1998). Further, it has been acknowledged that, at times, evidentiary issues can present both questions of law and fact, requiring application of different standards of review at different junctures in the inquiry. See *In re G.O.*, 191 Ill. 2d 37, 47-48 (2000) (whether trial court erred in denying defendant's motion to suppress his statements based on a claim that they were involuntarily made is subject to *de novo* review, although any factual findings will be accorded great deference).

In the present case, the majority, without discussion or analysis, states: "We review *Frye* issues under an abuse of discretion standard." Slip op. at 10. In so doing, the majority appears to hold that the deferential "abuse of discretion" standard should be applied to a trial court's determination that a novel scientific technique has gained general acceptance in the relevant scientific community and that the trial court's determination will not be reversed absent an abuse of discretion. At the same time, however, the majority states, "[o]nce a principle, technique, or test has gained general acceptance in the particular scientific community, its general acceptance is presumed in subsequent litigation; the principle, technique, or test is established as a matter of law." Slip op. at 12. Later, citing to my special concurrence in *Miller*, the majority states:

"Where the question of general acceptance of a scientific technique is raised for the first time a court is generally asked to establish the law for future cases." Slip op. at 15.

These statements are inconsistent. On the one hand, the majority professes to be applying an abuse of discretion standard when analyzing whether the trial court properly admitted expert testimony under the *Frye* standard. On the other hand, the majority expressly acknowledges that "general acceptance" is a legal issue-and legal issues are normally subject to *de novo* review. In my view, the bar and bench would be better served if the majority took this opportunity to acknowledge that a *de novo* standard of review is appropriate when reviewing issues of "general acceptance" under *Frye*.

JUSTICE GARMAN joins in this special concurrence.

1. [1]The parties have not argued, and we have not considered, the adoption of a new standard consistent with the United States Supreme Court decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 125 L. Ed. 2d 469,113 S. Ct. 2786 (1993). We will not raise this issue *sua sponte*.

2. [2]The parties, and Illinois case law, do not define "extrapolation." However, generally, "extrapolation" is the "process of estimating an unknown value or quantity on the basis of the known range of variables." Black's Law Dictionary 607 (7th ed. 1999). In the case of scientific study, extrapolation involves establishing a cause and effect relationship based upon similar, yet not identical, scientific studies and theories.