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Environment in the Courtroom

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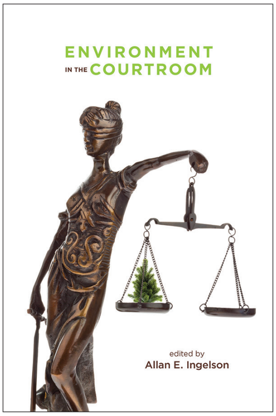

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Science and Advocacy

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What does an environmental advocate need to know about science? What does she need to help judges to understand about science? Analysis of the interrelationship between science and law has been extensive and is still evolving.[1] The focus of this chapter is on a much narrower aspect of this debate, namely the role of science in advocacy in environmental prosecutions.

The first obvious but important point is that the majority of lawyers and the judges they appear before are not scientists themselves. It is therefore crucial for them to know when, what kind, and how much science is necessary, whether to prove the environmental offence or to substantiate the defence of due diligence. It is important to be clear on the different goals of, and standards of proof in, law and in science. Finally, in environmental cases, the issue of scientific uncertainty is relevant and must be dealt with by advocates.

Purposes and Standards in Science and Environmental Prosecutions

Deciding when, what kind, and how much science is necessary in a legal case depends on the purpose of the litigation in question. What is the purpose of science and what is its role in law? It is sometimes argued that both science and law seek "the truth," but the US Supreme Court in *Daubert* noted some of the differences in these quests:

> Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and quickly. The scientific project is advanced by broad and wide-ranging consideration of a multitude of hypotheses, for those that are incorrect will eventually be shown to be so, and that in itself is an advance. Conjectures that

> are probably wrong are of little use, however, in the project of reaching a quick, final, and binding legal judgment—often of great consequence—about a particular set of events in the past.[2]

While the purposes of science and law may be seen to vary from each other, the purposes of law also vary across legal fields. In tort law, the primary purpose is corrective justice between the parties, and therefore the balance of probability is the test. In administrative law, the purpose is to determine whether executive actions were fair, efficient, and legitimate, and therefore the standard is usually reasonableness.[3] In criminal cases, the goals are different again, and they are even more specific in environmental prosecutions. What is required to be proved in these cases?

Some harms to the environment might be caught by the *Criminal Code*[4] itself,[5] in which case the full criminal law standard of proof beyond a reasonable doubt would apply to proof of both the crime and any defences to it. The penalty for *Code* offences is often incarceration. Further, a significant social stigma is attached to being charged with a crime, even if the ultimate verdict is not guilty. The courts, therefore, tend to be heavily influenced by the need to avoid wrongful convictions.

Yet the majority of environmental harms are caught by specific environmental legislation that creates prohibitions or offences punishable primarily by fines (though very rarely incarceration is ordered, particularly for repeat offences or failure to comply with court orders). Benidickson provides several examples of such provisions, including section 30 of the *Ontario Water Resources Act*[6] and subsection 36(3) of the federal *Fisheries Act*,[7] noting that "[o]ffences in the environmental context are generally described as *regulatory* or *public welfare offences*" that "may be further subdivided into three classifications—*mens rea*, strict liability, and absolute liability offences," and that environmental offences … fall overwhelmingly within the strict liability category."[8]

The goals of these three types of offences differ in important ways. Full *mens rea* means the full criminal code burden of proof, with the rationale that severe penalties such as incarceration require higher standards of proof and greater intention on the part of the defendant. Absolute liability offences represent a drastically different social decision—that the prevention and penalization of particular kinds of conduct are more important than fairness to the accused.

Strict liability offences, which most environmental offences are, provide a kind of middle ground. They require the prosecutor to prove the *actus reus* to the criminal standard of beyond a reasonable doubt, but then the burden shifts to the defendant to prove that he or she showed due diligence, to be proved on the civil standard of a balance of probabilities.

This is because, as stated in *Wholesale Travel*,[9] "[t]he objective of regulatory legislation is to protect the public … from the potentially adverse effects of otherwise lawful activity.… The concept of fault in regulatory offences is based upon a reasonable care standard and, as such, does not imply moral blameworthiness in the same manner as criminal fault." That case also stated that "[w]hile criminal offences are usually designed to condemn and punish past, inherently wrongful conduct, regulatory measures are generally directed to the prevention of future harm through the enforcement of minimum standards of conduct and care."[10]

This underlines several important aspects of strict liability offences. They are intended to "protect the public … from … *potentially* adverse risks," which suggests that there is greater emphasis on risk prevention in these cases than in criminal law, as well as a focus on prevention of future harm, rather than punishment of past wrong, a very different goal from *Criminal Code* offences and therefore requiring a different standard of proof. This is important in selecting the types of science to be used, the approach to interpreting it in court, and the degree of certainty required.

Uncertainty, Standards of Proof, and Fields of Science

Environmental cases often involve not only science but scientific uncertainty. Just as with standards of proof, there are various kinds of uncertainty, with differing causes. There are, for example, "preventable scientific uncertainties"[11] that result from a lack of research, but there are also uncertainties even in cases where the highest degree of scientific investigation has been undertaken, because the current state of science simply cannot answer with certainty the question of whether this particular contaminant caused this particular environmental or health effect. There is also an important difference between awareness of uncertainty, where we can predict and articulate with some degree of accuracy at least the level of potential risk, and situations where "we don't know that we don't know" and therefore proceed as if we have certainty when in fact we do not.

Scientific uncertainty is more likely to arise in prosecutions for violations of qualitative, rather than quantitative, standards. Consider, for example, subsection 36(3) of the *Fisheries Act*, which has been the subject of many environmental prosecutions, as we will see below:

> **36**(3) … no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

"Deleterious substance" is defined in section 34 of the Act as "any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water." Whether a substance is deleterious is a qualitative question. These kinds of offence provisions are more subject to interpretation than quantitative standards, which are based on numerical and measurable limits on substances or emissions. However, the kinds of cases that do raise scientific uncertainty may involve significant environmental or health risks, and it is therefore essential to have an effective approach to deal with scientific uncertainty fairly and effectively.

Various tools have been proposed to deal with the different kinds and degrees of scientific uncertainty at the interface between law and science. Charles Weiss has developed a "subjective scale of scientific uncertainty," which is "a tool to help increase the precision and rationality of discourse in controversies in which generalists untrained in natural science must judge the merits of opposing arguments in dispute among scientific experts" to clarify the risk probabilities.[12] He states that this is similar to the quantitative scale of scientific uncertainty used by the Intergovernmental Panel on Climate Change to provide clarity on the numerical probability of their conclusions about the science of climate change being accurate.[13] However, Weiss's scale is subjective in that it is intended to allow scientific experts to express their subjective degree of uncertainty about their opinion. He states that this table may help to avoid the problem that "issues of scientific uncertainty become inextricably intertwined with differences in policy and philosophy."[14]

Weiss tries to help lawyers and scientists to talk to one another by lining up scientific uncertainty with legal standards of proof. For example, Weiss equates "beyond a reasonable doubt" with the scientific level of certainty of "rigorously proven; Critical experiment(s) give(s) a clear an unambiguous result, excluding alternative explanations," and gives the example of "AIDS is caused by HIV." The lower civil standard of a balance of probability is similar to the scientific approach of "more likely than not. If I have to choose, this seems more likely to be true than untrue," and the corresponding example is "there has been liquid water on the surface of Mars at some time within the past 100 million years."[15]

Effective environmental advocacy in prosecutions will ensure that the uncertainty in expert testimony is addressed and clarified. In regulatory offences, it could be argued that since the goals are somewhat different from those involved in "true" crimes and the goal is to protect the environment and human health and prevent risk of harm, the precautionary approach should apply, and uncertainty should be resolved in favour of penalizing risk creation and preventing risk.

In addition to uncertainty, another issue in relation to science and advocacy arises from the many different branches of science that can be involved in environmental prosecutions. Jurists require awareness of the different approaches in these branches of science, and of the advantages and disadvantages of relying on them in environmental cases. For example, scientific evidence in environmental situations can include scientific fields as varied as medicine, epidemiology, public health, environmental health, hydrogeology, geology, environmental engineering, environmental chemical engineering, toxicology, hematology, and oncology, among many others.

It is also important to understand that some of these fields of science have different goals, time frames, and standards than others, just as the various branches of law do. For example, epidemiologists can wait generations to reach a result, and tend to prefer Type I over Type II errors.[16] They wait until they reach almost complete certainty before providing opinions. By contrast, clinical doctors have to treat a patient now, based on the evidence they have, however limited it may be. They proceed on what is more like a balance of probabilities because they have a short time frame and a need for an immediate decision to solve a current problem. As a result, this field of medicine is much closer to the role and realities of litigators and judges.[17] This understanding may also inform the types of scientific evidence advocates may wish to put before the court in a given environmental case.

Expert Evidence, Novel Science, and Admissibility

Advocates must choose the appropriate type of scientific evidence and meet the appropriate standard of proof, but they also have to pass the admissibility threshold. This has been the subject of much debate in the United States since the 1993 US Supreme Court decision in *Daubert*, a toxic tort case about an allegedly defective drug, which dealt with "novel science" and established a greater "gatekeeping" role for judges. The court set out the "standard for determining the admissibility of novel scientific evidence at trial,"[18] developing a four-part test that more strongly emphasized peer review and "general acceptance" by the scientific community than the prior test. The court emphasized that the methodology, not the results, are the focus. It is interesting that the court admitted that "there are no certainties in science" and required that "the known or potential rate of error … and the existence and maintenance of standards controlling the technique's operation" be clarified. In *Daubert*, the court recognized the risks in this stricter approach to admissibility:

> We recognize that, in practice, a gatekeeping role for the judge, no matter how flexible, inevitably on occasion will prevent the jury from learning of authentic insights and innovations. That, nevertheless, is the balance that is struck by Rules of Evidence designed not for the exhaustive search for cosmic understanding but for the particularized resolution of legal disputes.[19]

Canadian courts tend to be more generous with admissibility. The Supreme Court of Canada, in the criminal case of *R. v. Mohan*,[20] provided the four Canadian criteria for admissibility of expert evidence:

(a) relevance;
(b) necessity in assisting the trier of fact;
(c) the absence of any exclusionary rule; and
(d) a properly qualified expert.[21]

Relevant means logically relevant and also entails an assessment of whether "its probative value is overborne by its prejudicial effect, if it involves an inordinate amount of time which is not commensurate with its value or if it is misleading in the sense that its effect on the trier of fact, particularly a jury, is out of proportion to its reliability" which they call the "reliability versus effect factor."[22] Another element of relevance is to ask whether "the jury is likely to be overwhelmed by the 'mystic infallibility' of the evidence" because of its complexity and the status of the experts.[23] The court added that "a novel scientific theory or technique is subjected to special scrutiny to determine whether it meets a basic threshold of reliability and whether it is essential in the sense that the trier of fact will be unable to come to a satisfactory conclusion without [it]."[24]

In a medical device liability case, the court also addressed weight, stating that "the underlying message of *J.-L. J.*, echoed in *The Goudge Report*, is that in assigning weight to individual pieces of scientific evidence, the court must pay attention to its purpose and underlying methodology and be guided by the methods and principles generally accepted and applied in the relevant scientific communities."

It is noteworthy that the leading cases in Canada on the issue of admissibility—*Mohan, Trochym*, and *J.-L.J.*—are criminal cases. In *Trochym*, the court emphasized "the need to carefully scrutinize evidence presented against an accused for reliability and prejudicial effect, and to ensure the basic fairness of the criminal process"[25] to avoid wrongful convictions, "particularly … where, as here, an accused person's liberty is at stake."[26] Canadian courts tend to be fairly generous with admissibility, but advocates must still turn their minds to this potential barrier for scientific evidence. It is also once again important to emphasize that in the context of environmental regulatory offences, there is an even greater argument for generous approaches to admissibility.

Examples

A brief review of some examples of environmental prosecutions will provide some illustration of how science arises, and the types of science presented, in environmental prosecutions.

Several cases have dealt with subsection 36(3) of the *Fisheries Act* and the issue of deleterious substances. In *R. v. Williams*,[27] the Ministry of Fisheries and Oceans prosecuted the defendant mining company for discharging deleterious substances, including arsenic, cyanide, and copper, into Moose Lake. This resulted from an overflow of "3,000 gallons of mine and storm water" from a sedimentation pond into the lake, due to a plugged intake screen in a pump in the sedimentation pond. The issue was whether "deleterious" under the Act refers to the nature of the substance itself or its effect on the receiving waters. This issue has been repeatedly litigated, and in *R. v. Kingston*[28] and *R. v. MacMillan Bloedel (Alberni) Ltd.*[29] both the Ontario and BC Courts of Appeal held that "[w]hat is being defined is the substance that is added to the water, rather than the water after the addition of the substance."[30] The court in *Williams* agreed.[31]

R. v. Kingston, in fact, was a leading example of a case started as a private prosecution, and was begun when Janet Fletcher launched a private suit against the City (the Ontario Ministry of the Environment (MOE) then began its own prosecution). It involved the escape of leachate from a municipal landfill.

Scientifically, Ms. Fletcher had had samples taken for her on four occasions, and the MOE later obtained its own samples. All of these samples and the results of their testing served to provide the evidence on which the City was convicted, and the municipality provided no adequate evidence of due diligence. The trial lasted for 25 days and again involved significant scientific evidence on the tests of deleteriousness and acute lethality, among other things. The trial judge stated that this was a difficult case, indicating that "many witnesses were necessary to establish the legality of a chain of evidence for the samples, the analysis, the charts and exhibits—two hundred and twenty-seven exhibits in all."[32]

While the core issue in all of these cases ultimately turned on the statutory interpretation of subsection 36(3), the science played a significant role. Indeed, on appeal in *Kingston*, one of the issues raised was whether the trial judge had ignored relevant evidence. The Court of Appeal upheld the decision, stating that "[a]lthough the trial judge's reasons are not exhaustive, his reasons nevertheless demonstrate a full understanding of the complex issues of scientific evidence that were before him. I therefore conclude that the record does not disclose a lack of appreciation of relevant evidence."[33]

Another high-profile prosecution was *R. v. Syncrude Canada Ltd.*, in which the defendant corporation was charged with "failing to store a hazardous substance in a manner that ensured that it did not come into contact with any animals, contrary to section 155 of Alberta's *Environmental Protection and Enhancement Act*, and with depositing a substance harmful to migratory birds in an area frequented by migratory birds, contrary to subsection 5.1(1) of Canada's *Migratory Birds Convention Act*."[34] Over one thousand birds died when they became trapped in bitumen in the tailings pond. The evidence involved several experts, including an "expert in conservation behaviour and specialized research dealing with avian deterrence," who explained to the court the qualities of a "minimum reasonable deterrent system" for birds. Much of the scientific information presented was to substantiate the due diligence defence. The court had to assess the scientific issues of the working of tailings ponds and the composition of the substances within them, the technology of bird deterrent systems, and the flight patterns and migratory habits of birds, among other things. These were presented by expert witnesses as well as experienced employees of the defendants. The diversity and complexity of the science was remarkable.

Finally, another successful private prosecution was *Podolsky v. Cadillac Fairview Corp.*, about offences resulting in fatalities, once again to birds, but in this case from hitting office buildings, under the Ontario *Environmental Protection Act* (*EPA*) and the federal *Species at Risk Act*.[35] The private prosecutor, which was the environmental advocacy group Ecojustice and not a private individual, was able to prove the offences, but the due diligence defence was accepted. Scientific evidence was presented, including expert evidence related to ornithology, "the physics of light and radiation," and growing social awareness of "bird strikes." Once again, much of the evidence related to the due diligence analysis, yet expert opinion about the physics of light was instrumental in having the court accept the prosecution's novel argument that discharging a contaminant in section 14 of the *EPA* could include emitting light radiation.[36]

Conclusion

Science is an essential element of environmental prosecutions. Advocates and judges need to understand what kinds of scientific evidence are necessary, as well as the purposes, methodologies, and standards in each of those fields of science, and they need to apply them appropriately to the applicable legal standards of proof. They also need to be aware of scientific uncertainties of various kinds, and to become familiar with tools such as the Weiss scale of uncertainty, to ensure that advocates and scientists can talk to each other, if not in the same language, at least in a way that enables them to understand each other.

NOTES

1 Sidney N Lederman, "Judges as Gatekeepers: The Admissibility of Scientific Evidence Based on Novel Theories" in Joost Blom & Hélène Dumont, eds, *Science, Truth and Justice* (Canadian Institute for the Administration of Justice, Themis, 2000) 218–242; Justice Ian Binnie, "Science in the Courtroom: The Mouse that Roared" (2007) 56 UNBLJ 307; Susan Haack, "Of Truth, in Science and in Law" (2008) 73:3 Brook L Rev 985–1008; John M Eisenberg, "What Does Evidence Mean? Can the Law and Medicine be Reconciled?" (2001) 26:2 J Health Pol 369–381 [Eisenberg]; Michelle M Mello & Troyen A Brennan, "Demystifying the Law/Science Disconnect" (2001) 26:2 J Health Pol 429–438.

2 *Daubert v Merrell Dow Pharmaceuticals, Inc*, 509 United States Reports 579 (US SC, 1993) at 596–597 [*Daubert*].

3 H McLeod-Kilmurray "Placing and Displacing Science: Science and the Gates of Judicial Power in Environmental Cases" (2009) 6 U Ott Law & Tech J 25.

4 RSC 1985, c C-46.

5 For example, criminal negligence, common nuisance, dangerous (explosive) and offensive volatile substances—see "Bringing a Private Prosecution" (East Coast Environmental Law Summary, Vol III, Summer 2009) at 1, online: <https://www.ecelaw.ca/images/PDFs/EnviroLaw_SS_2009_Bringing_a_Private_Prosecution.pdf>.

6 RSO 1990, c O.40.

7 RSC 1985, c F-14.

8 Jamie Benidickson *Environmental Law*, 3d ed (Toronto: Irwin, 2009) at 159–160.
9 *R v Wholesale Travel*, [1991] 3 SCR 154 at 219 (as cited in Benidickson, *ibid*).
10 *Ibid* at paras 25–26.
11 W Wagner, "Choosing Ignorance in the Manufacture of Toxic Products" (1997) 82 Cornell L Rev 733 at 780–782.
12 Charles Weiss, "Expressing Scientific Uncertainty" (2003) 2 Law, Probability and Risk 25 at 25.
13 The IPCC 2001 report provides: "The following words have been used throughout the text of the Synthesis Report …: *virtually certain* (greater than 99% chance that a result is true); *very likely* (90–99% chance); *likely* (66–90% chance); *medium likelihood* (33–66% chance); *unlikely* (10–33% chance); *very unlikely* (1–10% chance); and *exceptionally unlikely* (less than 1% chance). An explicit uncertainty range (±) is a *likely* range." *Climate Change 2001 Synthesis Report: Summary for Policymakers* (Box SPM-1), online: <http://www.ipcc.ch/pdf/climate-changes-2001/synthesis-spm/synthesis-spm-en.pdf>.
14 Weiss, *supra* note 12 at 26.
15 *Ibid*, table 2.
16 Type I errors are. e.g., saying that a substance is safe, when it is later revealed to be dangerous. Type II errors assert that a substance is dangerous when in fact it was safe. See US, *Reference Manual on Scientific Evidence*, 3d ed (Federal Judicial Centre, National Research Council: 2011) at 176.
17 See Eisenberg, *supra* note 1, as summarized in Mello & Brennan, *supra* note 1 at 430.
18 *Ibid*.
19 *Daubert*, *supra* note 2 at 596–597.
20 [1994] 2 SCR 9. The case was about when "expert evidence is admissible to show that character traits of an accused person do not fit the psychological profile of the putative perpetrator of the offences charged" (para 1).
21 *Ibid* at para 17.
22 *Ibid* at para 18.
23 *Ibid* at para 19.
24 *Ibid* at para 28.
25 *R v Trochym*, 2007 SCC 6, [2007] 1 SCR 239 at para 1.
26 *Ibid* at para 33.
27 2007 ONCJ 163.
28 (2004), 70 OR (3d) 577 (ONCA) [*Kingston*].
29 (1979), 47 CCC (2d) 118 (BCCA).
30 *R v McMillan Bloedel (Alberni) Ltd*, 1979 BCCA 693 at para 10.
31 *R v Williams Operating Corp*, 2008 ONSC 5646 at paras 85 and 87.
32 *Kingston*, *supra* note 28 at para 93.
33 *Ibid* at para 95.
34 *R v Syncrude Canada Ltd*, 2010 ABPC 229 at para 1.
35 *Podolsky v Cadillac Fairview Corp*, 2013 ONCJ 65 at para 3: "causing or permitting the discharge of a contaminant, namely radiation (light), from reflective glass, including windows, that caused or was likely to cause an adverse effect, namely death or injury to birds, contrary to subs. 14(1) of the *Environmental Protection Act*, RSO 1990, c E.19" and "killing, harming, or taking individuals of a wildlife species, namely Canada Warblers or Olive-sided flycatchers, that are listed as a 'threatened' species, by having or using highly reflective glass, including windows, contrary to the *Species at Risk Act*, s 32(1)."
36 *Ibid* at paras 15–18, 68–71.