The Laws of Science and the Rule of Law*

A Presentation in the Forum
"Science, Ethics and the Law"
for the Eighth Conference on Statistics, Science and Public Policy
Queen's University, Herstmonceux, UK
April 23-26, 2003

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Louise Robbins died in 1987. Though a distinguished anthropologist, the North Carolina professor's death was an event mainly unnoticed save from the community of expert witnesses and associated prosecuting and defense attorneys with whom she had collaborated in more than a score of United States and Canadian legal cases for better than a decade. And for a decade following her death, they continued to debate Louise Robbins's science. For, among other things, this field anthropologist boasted an exact knowledge of identifying indicia from footprints – and even boot prints. On one expedition to Tanzania she revealed the hidden text of a 3.5 million year-old fossilized print: a five-and-one-half months pregnant woman. Such forensic exactitude was not to be kept out of court, where countless suspects constantly await conviction or exoneration upon a definitive showing of relevant facts.

While we typically think of courts as law forums, they are far more dramatically triers of fact – for the application of law is utterly dependent upon an authoritative reading of the facts. The question is, who knows the facts. We scientists like to imagine that this is our exclusive domain, for indeed the laws of science were established precisely to determine knowledge of facts. Moreover, the courts have been all too willing to concede our claim – up to a point. That critical point – judgment point, deriving critical from its Greek source, *krinō* – is the determination of just who is a scientist. There for a very long time we have been stuck between the impracticality, if not impossibility, of defending the autonomy of the law if we insist that scientists alone may speak with authority about science, on the one hand, and the grave and enormous potential danger to human inquiry if it is left to law to determine authoritatively what constitutes science. Informed observers are aware of the postures this dilemma has assumed in debates about abortion and cloning. I do not address those issues, preferring instead to demonstrate from non-life and death issues just how imposing this dilemma has become.

The Louise Robbins case is particularly of interest precisely because her career took aim squarely at the 1923 U. S. "Frye Rule," which set forth legal steps for answering this question, founded upon the Court's accommodating itself to scientific authentication of science.[1] The central and most important of the "Frye Rules" was the bar against scientific eccentricity – i.e., evidence would be admissible only if it "is sufficiently established to have gained general acceptance in the particular field to which it belongs." This pre-Popperian notion of falsifiability was content to rely on consensus in the scientific community to reject a so-called "deception test" (pre-cursor to the lie detector) as what we would now call "junk science."

* Published in *Statistics, Science and Public Policy VIII: Science, Ethics and the Law.* Proceedings of the Conference on Statistics, Science and Public Policy, held at Herstmonceux Castle, Hailsham, U.K., April 23-26, 2003. Edited by A. M. Herzberg and R. W. Olford. Kingston, Ont.: Queen's University, 2004.

It would be appropriate for the skeptic to insist that I have overdrawn the dilemma, since a legal determination of what is *admissible* as science is not grammatically the same thing as determining what science is. I will show, however, that this slippery slope is perceivable only after one has slid down it.

Louise Robbins slipped through the "Frye Rule," sending at least a dozen people to prison and one to death row, despite the fact that no one ever replicated her findings and she could never articulate a systematic foundation of her putative knowledge. Indeed, she became a feet-reading celebrity in courtrooms, practicing a science where no one else knew one to exist. Did she, as one critic belatedly remarked, "make a mockery out of the criminal justice system?"[2] Some would say that the U. S. Congress, and not the Court, opened the door to a claim of science in a case where there was never a test, no peer reviewed publication, and no corroborative research. In 1978 Congress passed legislation, "Federal Rules of Evidence," that made no reference to *Frye's* standard of "general acceptance in the field." Robbins, however, did her work prior to a definitive 1993 Supreme Court ruling on the new legislation,[3] and in a context in which most courts still practiced "Frye" rules. The problem, ultimately, was not a changed rule but an inherent difficulty.

This difficulty shows up in many ways contemporaneous with Robbins's infamous work, but ultimately in one question contemporaneous both with *Frye* and Robbins.

In 1995, summary judgment was granted in favor of GTE Mobilnet in a lawsuit that claimed a cell phone caused the growth of a brain tumor, the court having declared the plaintiff's argument "a kind of….junk science."[4] In 1996 the U. S. District Court for the District of Columbia, forcing the hands of the Food and Drug Administration and the Federal Trade Commission, required restaurants to justify health and nutrition claims in food/menu labeling just as food packagers do under the "Nutrition Labeling and Education Act."[5] And only last year (2002) one Todd Brown defended his master's thesis, entitled "The Morphology of Calcium Carbonate: Factors Affecting Crystal Shape," against a University of California decision refusing to award the degree because the thesis contained a "Dis-acknowledgements" section in which Brown wrote "F...k you" to university administrators and California's Governor Davis.[6] Because his case was rejected at every judicial level prior to the U. S. Supreme Court, Mr. Brown announced a reconsideration of his career choice, abandoning science for the law! As recently as 1999 a New Jersey school board had to decide, subject to court review, whether a high school physics teacher could be removed because of searching pornography sites on the Internet *while* conducting physics instruction.[7]

The foregoing cases may seem quirky and unproblematic, compared with Louise Robbins. But consider one further case, formally similar to the New Jersey case. Roger De Hart is a science teacher in the State of Washington. In 1999 De Hart was ordered to stop including instruction in "intelligent design" in his high school biology class. He and his school district were challenged by the American Civil Liberties Union, because De Hart had for ten or twelve years consistently paired the teaching of evolution with the teaching of "intelligent design."[8] Although he religiously avoided mention of God, Creation, or religion, his effort was viewed as part of a large, national movement to bring creationism into the school curriculum. Opponents (often scientists) saw it as pushing anti-science, and worse, religion, in the face of a definitive 1987 Supreme Court ruling.[9]

It is surpassingly ironic that debates about the role of science in the courts – in the United States at least – continue to revolve around issues once settled in the 1923-24 era, and matters no less non-controversial than controversial. The "Frye Rule" of 1923 never generated the dramas sustained by the so-called "Scopes Monkey Trial,"[10] yet each addressed the issue of science in the courts. At the same time as one court – the *Frye* court – appealed to scientific consensus as deci-

sive, the other court – the *Scopes* court – arrogated the right and power to declare what was and what was not science. I submit that the *Scopes* result was a necessary consequence of the *Frye* orientation. This does not occur merely because scientists, like all others, organize around perceived opportunities to exploit their interests. Some proposed reforms of the past twenty years would have addressed these dilemmas by establishing science courts, independent of law courts, naively imagining that official scientists who had decided a question one way, would not have exerted every possible influence, licit and illicit, ethical and unethical, to assure that a subsequent legal decision would have agreed with them. But the tendency of scientists, like everyone else, to be politicians first, is not responsible for the dynamic between *Frye* and *Scopes* – that is, from scientific laissez-faire to "somebody's got to judge."

The easy way to explain this phenomenon would be to point out the notorious instabilities of the laws of science (e.g., Kuhn), which can never be completely compatible with legal thinking that must presume stable order even when it knowingly does not favor it. The truer account, though, has to do with the direct relationship of science and law. Science is a necessary tool of law. Without science the law could not perpetuate the myth of sufficiency of judgment. Science is nothing less than the legal community's defense against the jury – which is to say, uninstructed opinion. Once that relationship became clear to legal minds – despite *Frye's* attempt at "live and let live" accommodation – there was no choice but for law to begin to set the boundaries of science, or to avoid creating new Galilean martyrs by making would-be Galileo's their own policemen. The formula in *Frye*, rendered practically, is "you scientists get together and keep the crackpots out of our hair, and we, in turn, will assure that you are not disturbed by idle tomfoolery." That is the sense in which *Scopes* is naturally paired with *Frye*.

One sees this dynamic at work not immediately in *Scopes* but in the pair of 1980s cases that revisited *Scopes* (It is useful to remember that *Scopes* did not reach the U. S. Supreme Court). It is only necessary to bear in mind that these decisions were being rendered shortly after the "Federal Rules of Evidence" were revised (and before the Supreme Court interpreted them to open the door to novel science claims), and while truly difficult scientific questions in the life sciences and in the computer software industry were bubbling to the forefront. In short, courts were asked to police science in the life sciences and computer software areas, at the same time as it had elected anew to defend science against fundamentalism in the form of creationism. The relationship was perfectly reciprocal – and ideal pairing. And the result defines for us now, and doubtless for a long time to come, the role of science in the courts.

To understand this requires but a brief summary of the 1980s cases and related materials.

In 1981 the State of Arkansas established Public Act 590, commanding that "public schools within this State shall give balanced treatment to creation-science and to evolution-science." This Act was challenged as unconstitutional in Federal District Court by Rev. Bill McLean and others, on the grounds, among others, that it violated the First Amendment protection against an establishment of religion, that it violated a right to academic freedom, and that it suffered from vagueness incompatible with due process protections in the U. S. Constitution.[11] The District Court ruled against the State and for McLean on the basis of an "evaluation" of the "scientific merit" of creation-science. The Court held that the methods, practices, and premises of this so-called science fell squarely outside the methods, practices, and premises of "the scientific community" and, moreover, could only be understood as a religious claim based on the *Bible*. The Act "lacks legitimate educational value because 'creation science' as defined in [the Act] is simply not science. . . Science is what is accepted by the scientific community and is "what scientists do'." And what is science?

> (1) It is guided by natural law; (2) It has to be explanatory by reference to natural law; (3) It is testable against the empirical world; (4) Its conclusions are tentative, i.e., are not necessarily the final word; and (5) It is falsifiable. [IV (C)]

We could greatly expatiate on the confusion of "laws of nature" with "natural law" and the notion of a world "empirical," but the present task forces us to treat such claims as unproblematic. Thus, while it is evident that the Court relied upon orthodox opinions concerning the nature of science, what is of moment is the use of those opinions to construct an authoritative, legally binding definition of science, which may be applied to exclude or include specific scientific claims or practices based on enforceable legal determination.

In such light, the contemporary debates on issues such as stem cell research or cloning take on an entirely different hue. To insist upon the independence or autonomy of science at the same time as relying upon the authority of the state to give force to scientific consensus may represent mutually exclusive, contradictory alternatives. This prospect loomed large in the Court's discussion of the "comet seeding theory" of the origins of life on earth by "Dr. Wickramasinghe." While this eccentric, outlying theory "has not received general acceptance within the scientific community, he has, at least, used scientific methodology to produce a theory of origins which meets the *essential characteristics* of science." ([IV, (D)]. Emphasis added.) In other words, however the Court derives its notion of science, it is free to apply the notion based on its own interpretation of any particular scientific claim.

We question appropriately the discussion of the role of legal authority in defining science, when the activity clearly arises as a result of legislative enactments. To remove the courts from such roles does not imply removing the state from attempts to infringe upon the autonomy of science. And many observers would prefer the deliberative forum of a court to the potential rule of general public opinion, likely to influence a legislature. To pose the question that way, however, fails to enlarge the option for courts to embrace a self-denying ordinance – "it is not our job to say what science is" – upon which basis it may still restrain legislative excesses – "the meaning of science may not be legislated." On the latter path political restraints upon science will extend no farther than public funding or non-funding of specific scientific practices would necessarily imply. That there might be danger in the nexus between politics and science all but the hopelessly naïve must concede. But the withdrawal of a grant does not produce a Galilean martyr.

The fullest implication of *McLean* was made manifest in a 1987 case decided by the U. S. Supreme Court, *Edwards v. Aguillard Et Al.* Where the decision in *McLean* was unappealed, leaving the state of the law unsettled nationally, this subsequent case from Louisiana produced a national rule.

Edwards likewise derived from a State Public Act seeking "Balanced Treatment for Creation-Science and Evolution-Science in Public School Instruction." Deviating from the challenged Arkansas statute, however, Louisiana chose not to mandate instruction in either subject. Rather, it insisted that when either is taught, so too must the other be taught. The ground stated for this provision was to defend the pupils' right to be free from indoctrination. While the lower courts treated this case on the model of the *McLean* Court's decision and focused largely on the scope of the State's authority to direct public schools curricula, the Supreme Court dwelt exclusively on the "religious purpose" test in order to arrive at its overturning decision. In that sense, the Court's opinion did not delve into definitions of science.

In fact, though, an argument about the meaning of science lay barely beneath the surface of the opinion. The discredited "religious purpose" constituted in fact only a non-scientific basis for a policy purporting to direct scientific education, which result appeared from the Court's heavy reliance upon *McLean*: "The Court found that there can be no legitimate state interest in

protecting particular religions from scientific views 'distasteful to them'." [III, (B)] In short, the Court's idea of religious purpose was wholly informed by its tacit judgment of what constitutes science, which is wholly compatible with the *McLean* definition:

> We do not imply that a legislature could never require that scientific critiques of prevailing scientific theories be taught. . . teaching a variety of scientific theories about the origins of humankind to schoolchildren might be validly done with the clear secular intent of enhancing the effectiveness of science instruction. [III, (B)]

The national rule that obtains in the United States, therefore, may be formulated as follows: The public or political determination of the methods, practices, and premises of science can be limited by a juridical definition of science – at least insofar as any particular science's methods, practices, or premises implicate fundamental guarantees under the Constitution of the United States. Given that present rule, it is important to inquire just how far science enjoys autonomy and to what end.

Let us note again, therefore, that in the unappealed *McLean* case the lower court made very clear that it could defend science only if it *defined* science. Moreover, at the similar lower court level in the *Aguillard* case[12] the same result was averted only by a ruse: the appeals court decided that state authorities *could* define science, and remanded the case for such a determination. While that district court opinion avoided the need to define science, it was reversed on appeal, preparing the way for a State Supreme Court to affirm the authority of the Board of Elementary and Secondary Education.[13] The appeal of that decision (recognizing legislative authority) eventually ripened into the case decided by the U. S. Supreme Court. This dynamic made it unnecessary for the Supreme Court directly to review the case on that level. However, it was patent that either court could review – and correct – a state definition of science.

Thus, we learn that the important question is not whether the theory of evolution is science and the theory of creationism is no science. That is *a* question but not the pertinent question. The great question is, who *must* decide what science is. The answer is: the court must do so. It may – nay, will – invoke scientific expertise to answer that question. But the court will *decide* – not the expert.

Now, that brings us back to Louise Robbins. Her science was eventually exposed as the merest charlatanry. In its pursuit, she even defeated the presentations of FBI experts, whose results emerged from some of the best-funded and most disciplined laboratories.

Nevertheless, in 1993's *Daubert vs. Merrell Dow*, the Supreme Court vindicated Robbins – not her judgments (which remain embarrassing) but her role in the process. For the Court defended the judge's authority to determine who was an expert or a scientist independently of third party criteria ("What is falsifiability," one asked). Moreover, we may say even the facts vindicated Robbins, for we learned following *Daubert* of the scandalous investigative abuses that penetrated the FBI (not to mention many a coroner's and prosecutor's office since) – that is, we learned there and elsewhere that consensus procedures assure neither reliability nor ethics. As a result, the only claim science has is no match for a court, that promises justice.

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[1] *Frye v. United States*, 293 F. 1013 (D. C. Cir. 1923).
[2] Mark Hansen, "Believe It or Not," *ABA Journal*, June, 1993, 79A.B.A.J.64.
[3] *Daubert v. Merrell Dow*, 509 U. S. 579.
[4] *ABA Journal*, August, 1995, 81 A.B.A.J.38.
[5] "Legal Backgrounder," Washington Legal Foundation, September 6, 1996.
[6] Dee McAree, *National Law Journal*, November 4, 2002 (24:59), p. A4.

[7] *National Law Journal*, Feb. 8, 1999, p. A23, AP story.
[8] John Gibeaut, "Evaluation of A Controversy," *ABA Journal*, November 1999, 85 A.B.A.J.50.
[9] *Edwards v. Aguillard,* 482 U. S.578.
[10] *Scopes v. State of Tennessee*, 154 Tenn. 105, 289 S.W. 363 (1927).
[11] *McLean v. Arkansas Board of Education,* 529 F. Supp. 1255; 1982 U.S. Dist. LEXIS 10361
[12] *Edwards v. Aguillard,* 482 U. S.578.
[13] *Aguillard v. Treen,* 440 So. 2d 704 (La. 1983); *Aguillard v. Treen*, 720 F. 2d. 676 (5th Cir. 1983); *Aguillard v. Edwards*, 765 F. 2d 1251; and *Aguillard v. Edwards*, 778 F. 2d 225.