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Methods, Conclusions, and the Search for Scientific Validity in Economics and Other Social Sciences

SHUBHA GHOSH*

I. INTRODUCTION

Economic analysis pervades law within the academy and without.[1] While academic critics of economics as a tool to dissect and interpret the law abound, its application in the courtroom has rarely been questioned.[2] The tools and methods of economics are accepted and admitted as evidence in many disparate areas of the law, from the strictly commercial, such as antitrust and securities, to the more public and social, such as employment discrimination. Even when economics does not invade a substantive area of law, such as personal injury, it makes at least a peripheral, if not crucial, appearance in the context of remedies.[3] Despite economics' apparent security within the courtroom, the 1993 *Daubert*[4] decision threatens to erode the foundations that support the use of economics by lawyers and judges. As is well known, the Supreme Court in *Daubert* established standards which judges could use to distinguish real from "junk" science. As applied to the testimony of economic experts, *Daubert* requires that we ask the previously unasked (at least in the courtroom): is economics a science?

Ascertaining economics' status as science requires the exploration of what I call the "paradox of *Daubert*." The paradox can best be seen by looking at the

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1. This point is perhaps so obvious that it does need support. But for discussions of the pervasiveness of not only economics in law school curriculum but also in legal reasoning and thinking, *see* GARY MINDA, POSTMODERN LEGAL MOVEMENTS 83-105 (1995); ANTHONY KRONMAN, THE LOST LAWYER 225-240 (1993).

2. For an excellent discussion of how economics and economists have triumphed in a specific legal field, *see* MARC ALLEN EISNER, Antitrust and the Triumph of Economics (1991)(illustrating through close institutional analysis how economics has altered substantive Antitrust Law in contract to other jurisprudential and interpretive approaches). For discussions of economics as evidence, *see* David Crump, *Evidence, Economics, and Ethics: What Information Should Jurors Be Given to Determine the Amount of a Punitive-Damage Award*, 57 MD. L. REV. 174 (1998)(considering the role of economic evidence in the context of punitive damages).

3. For an overview of the applications of economics to law, see Judge Richard Posner, ECONOMIC ANALYSIS OF THE LAW (1996). Judge Posner's approach is to define law and economics as a jurisprudential school to understand legal doctrine. He does not separately consider the evidentiary uses of economics. As I discuss below, the two may be very difficult to separate in certain substantive areas such as Antitrust where economics serves as a basis for statutory interpretation as well as a source of knowledge for factual determination in a legal dispute.

4. Daubert v. Merrell Dow Pharmaceuticals, 509 U.S. 579 (1993).

relationship between the *Daubert* and the *Frye* standards.[5] *Daubert* overturned the prior *Frye* standard for the admissibility of expert scientific testimony in federal courts; several states have followed this lead and have adopted *Daubert* principles under state evidence law. Under *Frye*, expert scientific testimony was subjected to the "general acceptance test," which required the trial court judge to determine whether the proffered testimony was accepted by some scientific community. The difficulty in applying *Frye* was in determining first, the relevant scientific community and second, the extent of acceptance within the community. Critics of the *Frye* standard claimed that it gave judges too much leeway, that the standard put too much power in the hands of experts, and that the standard to a battle of experts whose terms were often lost on the trier of fact, especially when it was the jury.[6] In many peoples' eyes, *Daubert* alleviated these concerns by giving the trial judge guidelines by which to serve as a gatekeeper of improper or misleading experts and perhaps as a better-armed referee in ensuing battles.[7] Instead of looking to general acceptance as the standard, the trial judge post-*Daubert* would subject the proffered testimony to four guidelines: (1) whether the testimony was developed from a theory or technique that was subject to testing and falsification; (2) whether the testimony pertained to a theory or technique that had been subject to peer review and publication; (3) whether the testimony was developed from a technique with a known or potential rate of error; and (4) whether the testimony pertained to a theory or technique that was generally accepted.[8] *Daubert* incorporated the general acceptance test into a broad judicially orchestrated inquiry into the scientific validity of the methods used to produce the proffered testimony. By creating this four-element inquiry, the Court in *Daubert* expanded the relevant community standard by which to gauge the scientific validity of testimony.[9] While *Frye*

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5. The *Daubert* decision expressly ruled that *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923)(holding that admissibility of expert testimony should be determined by a general acceptance standard), had been superseded by Federal R. Evid. 702. *See Daubert, supra* note 4, at 594.

6. For an overview of the criticisms of *Frye*, *see* KENNETH R. FOSTER & PETER W. HUBER, JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS 16-22, 37-68, 163-206, 226 (1997) (this text is hereinafter referred to as "FOSTER & HUBER") (chronicling the growing dissatisfaction with *Frye* during the 1960s and 1970s as ceding too much authority to the scientific community). *See also* SHEILA JASANOFF, SCIENCE AT THE BAR; LAW, SCIENCE, AND TECHNOLOGY IN AMERICA 61-62 (Harvard U. Press 1995); John W. Strong, *Language and Logic in Expert Testimony: Limiting Expert Testimony by Restrictions of Function, Reliability, and Form*, 71 Or. L. Rev. 349, 367 n.81 (1992); PETER HUBER, GALILEO'S REVENGE 14-17 (1991)(lamenting the misuse of the *Frye* test by subsequent courts).

7. *See* Jassanoff, *supra* note 6, at 63-68 (expressing concerns with the workability of *Daubert*). *See also*, Note, *Improving Judicial Gatekeeping: Technical Advisors and Scientific Evidence*, 110 Harv. L. Rev. 941-42 (1997)(arguing that judicial gatekeeper function facilitated by use of court appointed experts); Laurens Walker and John Monahan, *Daubert and the Reference Manual: An Essay on the Future of Science in Law*, 82 Va. L. Rev. 837, 838-9 (1996)(expressing optimism towards the court's receptivity to and ability of use of scientific testimony and method).

8. *See Daubert, supra* note 4, at 592-4.

9. I make this point in Shubha Ghosh, Letter, "Should Social Scientists Be Allowed in Court?," THE CHRONICLE OF HIGHER EDUCATION B3 (July 25, 1997). *See also* FOSTER & HUBER, *supra* note 6, at 16-

required deference to scientific experts once the general acceptance within a relevant scientific community had been established, *Daubert* invites inquiry into scientific validity from within the community of legal practice and judging. No longer is deference required; the tools of legal method can be applied to appraise the basis of expert testimony in scientific method.[10] However, *Daubert* does require the judge to look to several enumerated elements of scientific method, such as error rates, peer review and falsificationism.[11] In contrast, the courts were not limited to these factors in determining general acceptance under *Frye*.[12] The *Daubert* standard not only broadens the evidentiary inquiry by expanding the relevant community but also narrows the inquiry by introducing a very specific notion of scientific method. This tension is what I call the paradox of *Daubert*.

The existence of this paradox clarifies the application of *Daubert* by the lower courts in assessing the admissibility of social science testimony such as economics. Under *Frye*, the testimony of an expert social scientist would be subject to the review of the peers in his/her relevant scientific community. The review might constitute formal replication and review of methods, or it might constitute acceptance of the conclusions as plausible.[13] There was no scrutiny

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22 (commenting on the *Daubert* majority's use of philosophy of science and other sources in interpreting the meaning of scientific under Fed. R. Evid. 702); Randolph N. Jonakait, *The Assessment of Expertise: Transcending Construction*, 37 Santa Clara L. Rev. 301 (1997) (exploring the problem of demarcating scientific and non-scientific communities under *Daubert*).

10. I underscore this point in Section III, infra, where I analyze the Court's reasoning in *Daubert* from the perspective of legal method. The exact form of legal method that analysis of scientific evidence requires is a difficult one to determine. As many courts emphasize, legal thinking and scientific thinking are distinct and not necessarily commensurable. *See* Kronman, *supra* note 1, at 209 ("[the Legal Realists] too uphold an ideal of legal science that is antithetical to the common lawyer's conception of his craft and find in it, as Langdell did, the meaning of the legal educator's special task"); Pierre Schlag, *Law and Phrenology*, 110 HARV. L. REV. 877, 920 (demonstrating that Langdell's characterization of law as science paralleled developments of phrenology in Nineteenth Century thought); M.H. Hoeflich, *Law and Geometry: Legal Science from Leibniz to Langdell*, 30 AM. J. LEGAL HIST. 95 (1986)(tracing roots of Langdellianism to Rationalist School of thought in philosophy).

11. *See* FOSTER & HUBER, *supra* note 6 at 37-68, 163-206 (for a discussion of the meaning of peer review and falsificationism).

12. The standards provided under *Frye* are quite vague and murky as evidenced by the following oft-cited passage: "Just when a scientific principle or discovery crosses the line between the experimental and the demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized and, while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs." *Frye*, 293 F. at 1014. The court's reference to scientific testimony as a "thing" and the recognition that scientific testimony may reside in a "twilight zone" contrasts quite sharply with the four part, rule-like inquiry of *Daubert*.

13. "Peer review of a manuscript by a journal is the first formal step in the 'knowledge filter' of science. . . .Papers are screened for obvious methodological problems with the study. . . This review filters out at least the most glaringly deficient contributions." FOSTER & HUBER, *supra* note 6 at 166. *But see* "Methodical Progress," *The Economist* 89 (Sept. 27, 1997)(reporting on dissent within the scientific community on the value of peer review).

necessarily applied to the standards of the scientific community. Under *Daubert*, however, the trial court judge is able to review the expert social scientist's testimony *de novo*. For example, consider testimony pertaining to a novel economic theory of market competition. Under *Frye*, the evidentiary debate would be over the definition of the relevant community: should it include all trained economists, only neoclassical economists, only game theorists, and so on.[14] Under *Daubert*, the inquiry can be broader than that of defining the right community. The trial judge can inquire into the methodology used, the techniques followed, and decide whether the testimony can be subject to test, has been peer reviewed, and has a known error rate. None of these last factors may even have been a necessary methodological element for the defined scientific community. Although many critics of *Daubert* have warned of the possibility that the decision would open the courts to all types of experts, *Daubert* is not inevitably more liberal or more conservative.[15] The standard has tendencies in either direction. As I document in my discussion of recent cases pertaining to economic experts, *Daubert* has been a largely conservative force, limiting the admissibility of expert economic testimony in a way that limits substantive legal claims. The narrowing tendencies of *Daubert* have trumped the expansive ones, at least where economics has been at issue.

This result should not be surprising. *Daubert* in its four-part standard for determining scientific validity adopts an experimental view of science.[16] Economics, to the extent that is attained the status of a science, is largely one that has developed very differently from "natural" or "hard" science.[17] The source

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14. For economists, each of these approaches are not distinct schools of economics. All graduate level textbooks in the field that are standard in the training of economists contain discussions of each of these methods. *See, e.g.* HAL VARIAN, MICROECONOMIC ANALYSIS (1994); DAVID KREPS, A COURSE IN ECONOMIC THEORY (1992). However, different schools vary in their emphasis. Legal scholars who have adopted economic theory for their work tend to treat game theory as separate from other types of economic theory. *See* DOUGLAS BAIRD ET AL., GAME THEORY AND THE LAW (1994).

15. This view is consistent with that expressed by Foster & Huber: "When all is said and done, a great number of judges applying the new terms will end up making calls very similar to those that would have been made under *Frye*." FOSTER & HUBER, *supra* note 6, at 226. FOSTER & HUBER are arguing that *Daubert* did not overrule *Frye* but simply incorporated it as a factor in the analysis. The final implications of *Daubert* will depend upon how courts weigh all the elements. *Daubert* mandates more scrutiny by the trial court judge of expert testimony, but on narrower terms than *Frye*. The net result can be either more deferential or more exclusionary to expert witness testimony.

16. I mean an approach based on falsificationism and experimentation, associated with philosophers of science Karl Popper and Carl Hempel. *See* FOSTER & HUBER, *supra* note 6, at 41-42.

17. Economic methodology has moved from a basis in verificationism and observation through a flirtation with falsificationism and to the current state which can best described as foundational heterogeneity. Professor Mark Blaug articulates the problem as follows: "Once we have accepted the basic idea that the presence of 'disturbing' influences surrounding economic events precludes absolute falsifiability of economc theorems, it is easy to see why economics contains so many nonfalsifiable concepts. Many economic phenomena have not lent themselves to systematic theorizing. . . .A 'theory' is not to be condemned merely because it is as yet untestable, not even if it is so framed as to preclude testing, provided it draws attention to a significant problem and provides a framework for its discussion from which testable implications may some day emerge." MARK BLAUG, ECONOMIC THEORY IN RET-

of the conflict between the *Daubert* standard and economic methodology is falsificationism. To the extent that trial court judges applying *Daubert* look to the falsifiability of proffered expert testimony, as they have in the past, they inevitably will find that economic testimony falls short of the standard. Most economic theories are not falsifiable or verifiable in the way that we imagine many propositions of science to be falsifiable or verifiable. If the hypothesis is that Drug X inhibits the spread of HIV, the test, albeit difficult, practically is one of applying the drug and observing the effects once other factors are controlled for.[18] If the hypothesis is that narrow fluctuations of price in a market means that there has been collusion among competitors, the test is difficult to imagine. Part of the problem is isolating all the factors that otherwise could explain price stability, and constructing functional definitions of market, competitors, and collusion.[19] The latter problem is in one dimension a problem of economic methodology; in another, it is a problem of the appropriate legal definition and standard to apply.[20] After all, collusion has both a legal meaning and an economic one. The value of *Daubert* as applied to economic testimony is that it broadens the inquiry; the trial court judge need not defer to the statements of the community of economic experts. The danger of *Daubert,* however, is that it narrows the standards by which the trial court judge can scrutinize the testimony by basing scientific validity on falsificationism. As the post-*Daubert* case law indicates, the immediate victim is the testimony of expert economists. The tensions within *Daubert* are illustrated in Figure One, below, which depicts the three policy parameters of *Daubert.* The use of expert testimony in litigation necessitates the balancing of three interests: the autonomy of clients in develop-

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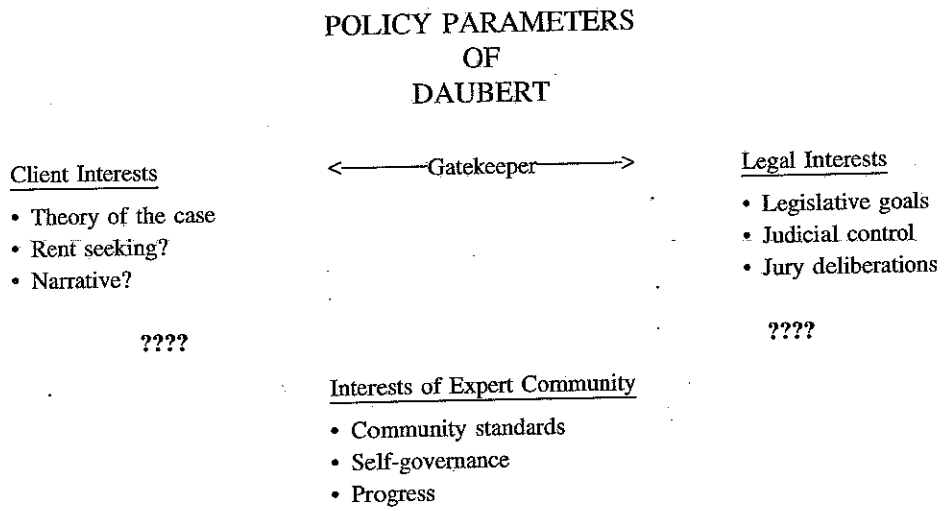
ROSPECT 703 (1985). For overviews of methodological debates in economics, *see* MARK BLAUG, THE METHODOLOGY OF ECONOMICS (1992); DEBORAH A. REDMAN, ECONOMICS AND THE PHILOSOPHY OF SCIENCE (1991); DANIEL HAUSMAN, THE INEXACT AND SEPARATE SCIENCE OF ECONOMICS (1992); ALEXANDER ROSENBERG, ECONOMICS-MATHEMATICAL POLITICS OR SCIENCE OF DIMINISHING RETURNS (1992) and DONALD MCCLOSKEY, THE RHETORIC OF ECONOMICS (1986).

18. *See* FOSTER & HUBER, *supra* note 6, at 58-62.

19. This is an example of what Foster & Huber call the flexibility of scientific theory and experimenter's regress. FOSTER & HUBER, *supra* note 6 at 46-7. The flexibility of scientific theory reflects the ability of theorists to transform the theory to fit the facts by incorporating unstated assumptions. Experimenter's regress is the ability to explain away experimental evidence that contradicts theory by reference to experimental error. These phenomena as arising in economics are discussed by Blaug: "By the standards of accuracy applied to predictions in the natural sciences, economics makes a poor showing and hence economists are frequently forced to resort to indirect methods of testing hypotheses, such as examining the realism of assumptions or test the implications of theories for phenomena other than those regarded ar directly relevant to a particular hypotheses." *See* Blaug, *supra* note 17, at 703.

20. For a hint of this problem, *see* Judge Posner's discussion of the use of economic evidence to prove price fixing under Section One of the Sherman Act: "If the economic evidence introduced in a case warrants an inference of collusive pricing, there is neither legal nor practical justification for requiring evidence that will support the further inference that the collusion was explicit rather than tacit." Therefore, the legal distinction between express and tacit collusion is irrelevant once economic proof of price fixing exists. RICHARD A. POSNER, ANTITRUST LAW: AN ECONOMIC PERSPECTIVE 71 – Ed. (1976).

ing a legal theory, the autonomy of the legal system in administering the law, and the autonomy of the expert community in developing standards for the scientific community. Courts following *Daubert* have focused on the tension between client autonomy and legal autonomy. This tension is resolved through the judge's gatekeeper function to limit "junk" science entering the courtroom. The trial court judge fulfills this gate-keeping role by adopting a definition of science that excludes "junk" testimony. However, this view ignores the relationships between client and expert autonomy and between legal and expert autonomy. The court's definition of science may not be amenable to the development of scientific standards, especially if the definition is permissive to junk science. The definition also may not be amenable to the filtering of scientific knowledge to clients who can use scientific finding to substantiate or rebut claims. The hard question posed by *Daubert* is the development of a definition of science that will balance all these interests. The definition used by courts is that of falsificationism.



To the extent that *Daubert* adopts falsificationism as the keystone of scientific methodology, the standard comports with popular notions of science. Galileo dropping cannonballs from the Leaning Tower of Pisa comes to mind first. Then there are the cases of Edward Jenner finding a cure for small pox from observing milkmaids and Jonas Salk's cure for polio. Each of these stories, in part apocryphal, exemplifies commonly accepted notions of what science is: observation, experimentation, analysis, and conclusion. In this way *Daubert* incorporates a view of science that is generally accepted by the population in its four-part standard. However, there are several scientific breakthroughs that do not conform to this conventional view. Consider, for example, Charles Darwin's theory of natural selection to explain the origins and evolu-

tion of species.[21] Despite the controversies surrounding the teaching of Darwin's theories, it would not be controversial to state that his theories have wide acceptance. But what is the proof that the theory is true? In many ways the theory cannot be falsified. If the theory states that traits are adoptions necessary for a species to survive in a given environment, then the theory would be falsified by discovering a trait that provides no particular advantage or may even harm the species. But one can posit many alternative explanations for why the suspect trait has survived by consideration of the environment and the role the trait plays for the species' survival. The strength of Darwin's theory comes from its amazing explanatory power through simple, unencumbered arguments.[22]

Economic analysis as a science is closer to Darwin's method than Galileo's. This analogy is misleading if one interprets my characterization of Darwinian methodology as a constructivist one.[23] My point is not that Darwinian theory's

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21. CHARLES A. DARWIN, ON THE ORIGIN OF SPECIES 425-6 (Harvard U. Press 1964). In his introduction, Professor Ernest Mayr states: "The truth of the matter is that Darwin was one of the first practitioners of a method novel then but now perhaps the prevailing method of science. Expressed in modern terms, it is the testing of a model developed on the basis of prior observations." Id. at xxii.

22. It was the lack of these characteristics as well as other flaws that lead Judge Overton to strike down an equal time for creation science law in *McClean v. Arkansas Board of Education*, 529 F. Supp. 1255 (E.D. Ark. 1982), as discussed in FOSTER & HUBER, *supra* note 6 at 54. However, Darwin's theory has been criticized for not being falsifiable by natural scientists: "The crucial phase of natural selection means no more than 'the survival of those who survive'—a vacuous tautology. . . .Tautologies are fine as definitions, but not as testable scientific statements. . ." STEPHEN JAY GOULD, EVER SINCE DARWIN 40 (1977)(summarizing criticisms of Darwin's work by Tom Bethell in 1975). Gould argues that Darwin's theory is not completely a tautology because there are independent criteria of fitness which can be determined from the local environment in which the trait develops. *Id.* at 45. Darwin's theory can also be saved by elaborating its description of how evolution occurs; as Daniel C. Dennett puts it: "Darwin himself described *Origin of Species* as one long argument. That is because it consists of two sorts of demonstrations: the logical demonstration that a certain sort of process would necessarily have a certain sort of outcome and the empirical demonstration that the requisite conditions for that of process had in fact been met in nature." DANIEL C. DENNETT, DARWIN'S DANGEROUS IDEA 48-9 (1995). As Dennett concludes, Darwin's theory of natural selection is not so much a theory, but an algorithm, a description of the process by which evolution occurs. The potential danger is to somehow accept the theory or algorithm as the truth applicable beyond its domain. As Professor Gould emphasizes, the success of Darwin's theory is due in part to its vision of progress, consistent with the industrial growth and colonialist expansion of the Nineteenth Century. *See* Gould. Certainly Darwin's theory if accepted had starking implications for all of society. "It was precisely the necessity of showing as best he could how man's distinctively human traits might have originated without a special act of creation that forced Darwin to become a social scientist and social philosopher." John C. Greene, DARWIN AND THE MODERN WORLD VIEW 96 (1961). But the social uses of Darwin have often not followed the rigorous scientific scrutiny of the originator, as described by Professor Mayr, *supra* note 21. *See* STEPHEN JAY GOULD, THE MISMEASURE OF MAN (1981)(detailing the misue of Darwin's theory to justify regressive social policies).

23. My use of the word constructivist here is closer to the notion of methodological nihilism associated with PAUL FEYERABEND, AGAINST METHOD (1975). I am not of course denying that social factors affect scientific discovery. Needless to say scientific programs are shaped by budget constraints and social attitudes as well as objective, empirical inquiry. *See* Ernan McMullin, "Introduction:The Social Dimensions of Science," in THE SOCIAL DIMENSIONS OF SCIENCE (Ernan McMulin,

strength is based on social attitudes towards religion and competition which support the acceptance of natural selection as a scientific theory. This view would vitiate any meaning in the term "methodology." But a close reading of Darwin's work, as well as the work of many economic theorists, will indicate that there is an approach, a method of analysis, that leads to certain conclusions.[24] If one interprets my view as a constructivist one, then the inevitable conclusion is that *Daubert* would collapse into a *Frye* standard. If scientific validity rests on cultural and social mores alone, then a trial court could do no better than a general acceptance standard to gauge scientific validity. I am not calling for such a reductionist view. Instead, I advocate that courts in using *Daubert* should show greater awareness of (and dare I say be more sensitive to?) developments in scientific methodology after falsificationism.[25]

The approach to social science that I develop here is in the spirit of Dennis Patterson's question raised in LAW AND TRUTH: "what does it mean to say that a proposition of law is true?"[26] His answer is, in part, that "[t]ruth in law is neither a property nor a relation. . . .Once cannot say something meaningful in law without using the grammar of legal argument."[27] A statement is true in law, according to Patterson, "if a competent legal actor could justify its assertion. Doing this requires the speaker to employ the forms of legal argument. In short, 'true' is a term of commendation or endorsement."[28] Analogously, validity in economics is founded on what philosophers of science who study economics call "appraisal," a term taken from Imre Lakatos, a philosopher of science who has written on mathematics and social science.[29] According to Lakatos, "methodology as such does not provide scientists with a book of rules for solving scientific problems; it is concerned with the logic of appraisal, a set of non-mechanical rules for appraising fully articulated theories."[30] Scientific validity within economics is bedded within the "grammar of economics."[31] The

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ed.)(1992)(discussing the work of Robert K. Merton applying sociological techniques to the study of how scientists actually discovered). Social factors play a role in the acceptance of scientific findings. Should they play a role in the admissibility of expert testimony? To the extent that the *Frye* test is one of general deference, social factors will play a role in the admissibility equation. If *Daubert* requires judicial scrutiny, the social factors may play less of a role in determining admissibility especially if the factors for methodological validity are easily applicable. The difficult question explored in this paper is the determination of methodological factors for scientific validity that are independent of social factors of acceptance.

24. Mayr, *supra* note 21; *see also* Gould, *supra* note 22.

25. For a discussion of these approaches, *see* Blaug, *supra* note 17; Redman, *supra* note 17; and Hausman, *supra* note 17.

26. Dennis Patterson, LAW AND TRUTH 3 (1996).

27. *Id.* at 21.

28. *Id.* at 152.

29. IMRE LAKATOS, PROOFS AND REFUTATIONS: THE LOGIC OF MATHEMATICAL DISCOVERY (1976).

30. Blaug, *supra* note 17, at 32.

31. Laurence Tribe and Michael Dorf criticize the application of Lakatos to legal method because legal method often centers around the truth or falsity of initial postulates. LAURENCE TRIBE & MICHAEL

purpose of this Article is to define this grammar within the terms of the *Daubert* standard. Truth within economic methodology comports to the goals of truth within law as articulated by Patterson.

To illustrate the confusion of the court in interpreting and applying *Daubert* to economic testimony, I discuss the major post-*Daubert* cases dealing with hedonic damages. I will show how *Daubert* has been used in a way that undermines substantive legal claims. If *Daubert* was designed to aid in the search for truth within the legal process, its success has been mixed, and in many cases it has been harmful. In Section III of the Article, I turn to the question of how economic testimony in particular and social science testimony in general should be treated under *Daubert*. I critique the narrow falsificationism of the *Daubert* standard and develop the method of appraisal drawing from Lakatos. In Section IV, I report the Supreme Court's most recent pronouncement on *Daubert:* the case of *Joiner* v. *General Electric*. In Section V, I conclude by demonstrating that the debate over what evidence counts as scientific is best understood in terms of the search for the proper method in fixing and ascertaining belief.

II. *DAUBERT* AND EXPERT TESTIMONY ON HEDONIC DAMAGES

Proof in law is guided by the requirements of the statutory, common law, or constitutional basis for the claim being adjudicated. Proof is also guided by strategic concerns of exonerating or vindicating one's client. In contrast proof within a scientific discipline is more open ended, guided by the longstanding and current passions of the profession. The goal within a scientific discipline is ostensibly truth, more modestly an expansion of the knowledge base, more realistically the attainment of professional and financial rewards in terms of grants, consultancies and professional accolades. Under the *Frye* standard, the legal system could stand independently of the scientific profession, deferring to the findings that had attained general acceptance within the profession. Under *Daubert*, the wall between the legal system and the scientific professions is broken, or at least severely weakened. Trial court judges are given the power to second guess the findings of scientists for their validity in a legal forum. The varied responses to this additional power is best demonstrated by the court's treatment of expert economic testimony concerning hedonic damages.

Hedonic damages are compensation for loss of value of life independent of the market or productive value of the individual.[32] They are an attempt to mea-

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DORF, ON READING THE CONSTITUTION 96 (1991). This statement however does not contradict my proposition that we should view economic methdology as a matter of appraisal rather than falsification. My approach only applies to the narrow question of interpreting the meaning of scientific under Fed. R. Evid. 702 not to the broader question of legal interpretation, as discussed by Tribe and Dorf.

32. *See* Joseph A. Kuiper, *The Courts, Daubert, and Willingness to Pay: The Doubtful Future of Hedonic Damages Testimony Under the Federal Rules of Evidence*, 1996 ILL. L. REV. 1197, 1204-6 (1996).

sure the value of the pleasure of being alive which supplements often under compensatory economic losses. Suppose an automobile accident results in the death of two individuals, each the same age and educational characteristics, one a successful electrician, the other a struggling artist. If a purely market-based measure of damages were used, each would receive the value of lost market wages, resulting in the artist's estate receiving almost nothing. Hedonic damages are designed to compensate each victim for the loss of life itself, a value that would not necessarily be captured in the market-based losses.

The difficulty, of course, arises in measuring the value of life that any one individual has lost. Relying on the testimony of the surviving heirs would undoubtedly overestimate the value of the victim's life as the heirs would assuredly testify to how much the victim enjoyed the various pleasures of life. Even if such testimony were considered, the obvious problem of placing a dollar value on the pleasure from a walk in the park, scuba diving, painting, writing, reading, etc. is seemingly insurmountable. Economists overcome some of these difficulties by undertaking willingness to pay studies.[33] Actual market choices provide a basis for economists to construct measures of how much consumers are willing to pay for such life-saving benefits as seatbelts, airbags, and other life-saving devices. By comparing the dollars spent with the accompanying reduction in probability of death and increase in life expectancy, economists can place a dollar value on how much individuals are willing to spend on increased life expectancy.[34] Other empirical bases for determining the value of life include studies of "compensating wage differentials," which compare how much more certain high risk occupations pay in comparison with the resulting reduction in life expectancy.[35] Studies that look at consumer choices of life-saving devices measure an average consumer's willingness to pay for additional life expectancy. Studies that look at compensating wage differentials measure an average consumer's willingness to be compensated for loss in life expectancy.

Prior to *Daubert*, there was a split among the courts, as to their willingness to admit expert economic testimony on hedonic damages. The split is best exemplified within the Seventh Circuit in the mid-Eighties and early Nineties. In *Sherrod*, a 1985 case involving damages in a 1983 action brought against an Illinois police officer accused of shooting an African-American, a United States district court permitted testimony on hedonic damages by Stan Smith, an economist with a master's degree from the University of Chicago whose name ap-

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33. *See* Kuiper, *supra* note 32, at 1206-13; see also W. Kip Viscusi, FATAL TRADEOFFS: PUBLIC & PRIVATE RESPONSIBILITIES FOR RISK 34-74 (1992)(discussing the various economic techniques used to measure value of life from labor market and consumer studies).

34. *See* Viscusi, *supra* note 33, at 67-70 (discussing survey evidence on amount actually paid for life saving technology).

35. *Id.* at 34 (stating that "jobs that carry with them certain disadvantages must have other offsetting advantages such as higher wages that make them as attractive overall as jobs without those disadvantages").

pears with some frequency in litigation over hedonic damages.[36] The court's reasoning, however, is unclear, as indicated by the following excerpt:

> "Life," Blackstone has reminded us, "is the immediate gift of God, a right inherent by nature in every individual. . . .The deprivation of life that is prohibited by the Fourteenth Amendment includes "not only life [itself], but of whatever God has given to everyone with life for its growth and enjoyment." In other words, loss of life means more than being deprived of the right to exist, or of the ability to earn a living; it includes deprivation of the pleasures of life.
>
> This is the point that Smith discussed with the jury when he told them about "the hedonic value of life.". . .Smith's expert testimony enabled the jury to considerthe important aspect of injury which the estate of Ronald Sherrod suffered. . . All competent evidence tending to establish a legitimate item of damage is, under proper pleadings, relevant and admissible. [internal cites omitted[37]]

There was no discussion of possible prejudicial effects under Rule 403; there was discussion about Smith's credentials, and about the number of corroborative studies, but it is not clear whether the court was looking to general acceptance or some other standard in judging admissibility. The import of the *Sherrod* decision is further confounded by the Seventh Circuit's reversal and remand of the case on grounds relating to the substantive 1983 claim.[38] Nonetheless, the district court opinion is sometimes still cited for admitting expert economic evidence on hedonic damages.

An opposite and arguably more rigorous approach was adopted by the court in *Mercado*, a 1991 case involving damages resulting from an automobile accident[39]. The district court in *Mercado*, after engaging in a fairly stimulating discussion of science, law and truth, excluded Mr. Smith's testimony on hedonic damages because "there is no basic agreement among economists as to what elements ought to go into life valuation. There is no unanimity on which studies ought to be considered. There is lack of reliability."[40] The ruling rested in part on relevance, in part on reliability, and in part on general acceptance. As far as general acceptance, the court's unanimity standard is obviously burdensome and inconsistent with *Frye* and its varied applications. After all, *Frye* does not require general acceptance among natural scientists, so why should general acceptance be applied to a field whose status as science is doubtful? What perhaps underlay the court's reasoning was a concern that the testimony

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36. Sherrod v. Berry, 629 F. Supp. 159 (N.D. Ill. 1985).
37. *Id.* at 163-4.
38. 856 F.2d 802 (7th Cir. 1988).
39. Mercado v. Ahmed, 756 F. Supp. 1097 (N.D. Ill. 1991).
40. *Id.* at 1103.

on loss of life did not require an expert because at its heart measurement of the value of life is not a meaningful scientific inquiry.

> What is wrong here is not that the evidence is founded on consensus or agreement, it is that the consensus is that of persons who are no more expert than are the jurors on the value of the lost pleasure of life. Even if reliable and valid, the evidence may fail to "assist the trier of fact to understand the evidence or determine a fact in issue" in a way more meaningful than would occur if the jury asked a group of wise courtroom bystanders for their opinions.[41]

The general helpfulness standard was cited by the Seventh Circuit in its affirmance of the district court's evidentiary ruling in *Mercado*.

The tension between *Sherrod* and *Mercado* has yet to be resolved. Even *Daubert* cannot resolve the conflict. In *Estate of Sinthasomphone*, a United States district court in Wisconsin acknowledged the tension between *Sherrod* and *Mercado* in the light of *Daubert*[42]. The court concluded that

> The problem with Mr. Smith's testimony is that he is attempting to quantify something which cannot truly be determined: what is the value of a human life? He rests his determination on a number of studies which are in themselves grounded in the science of economics-which, in the first place, is not quite like physics. Does this mean that his testimony will not assist the jury or will mislead them? I am not, at this point, convinced of that. His testimony may conceivably be useful for the jury to have some starting point in their attempt to place a value on life.[43]

A United States district court in Illinois was more certain about the admissibility of expert testimony on hedonic damages. In *Ayers*, the court held that expert testimony on hedonic damages did not survive the four-pronged *Daubert* standard[44].

> Even if this Court were to find that the methodology underlying those studies constituted "science" as that term is properly understood, it would still have to exclude them under the helpfulness standard of Rule 702. It would really be no use to a jury to hear that others had placed the statistical value of life at greater than $500 thousand and less than $9 million. . . And it is frankly bogus to massage those numbers, as both Hedonic Damages and Plausible Result have done, to create a deceptive appearance of precision rather than the true picture of an enormous spread in "value."[45]

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41. 974 F.2d 863, 870 (7th Cir. 1992).

42. Estate of Konerak Sinthasomphone v. City of Milwaukee, 878 F. Supp. 147 (E.D. Wisc. 1995).

43. *Id.* at 152.

44. Ayers v. Robinson, 887 F. Supp. 1049 (N.D. Ill. 1995).

45. *Id.* at 1063.

Several lower courts have rejected the use of experts on hedonic damages, applying an analysis similar to that in *Ayers*.[46] Most of the courts have based their decisions on the persuasive authority of *Mercado*; those who have also cited *Daubert* have done so in a cursory manner.

Several economists, especially those working in the area of forensic economics, agree with the *Ayers* decision. Dr. Thomas Ireland is the most prominent.[47] The criticism rests on the work of Thomas Schelling who has cautioned against extrapolating from statistical lives to actual lives.[48] Such an extrapolation would be subject to the error of assuming that choices of individuals who may be heterogeneous in their attitude towards risk can be representative of an average or typical individual. However, this criticism addresses only how numbers are aggregated, not the relevance that individuals are willing to pay for additional risks in their lives. If one of the purposes of tort damages is to compensate, then failure to completely compensate for loss of life by denying hedonic damages or evidence for hedonic damages would undermine one of the chief purposes of making individuals whole through a monetary remedy. Current testimony on hedonic damages errs in aggregating market choices that determine the value of a statistical life and applying this aggregation to actual lives. The value of a statistical life is certainly not relevant to the value of an actual life, but information about the value of risks may be relevant to determining the value of an actual life. Therefore, evidence on the value of risks should not be excluded, even though as Dr. Ireland and Professor Schelling correctly conclude evidence on the value of statistical lives is irrelevant and should be excluded.

To understand how testimony on hedonic damages can be helpful, it would be useful to compare and contrast how courts have treated hedonic damages with how courts have treated contingent valuation or willingness to pay mea-

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46. The cases that have followed Ayers/Mercado include: Pick v. American Medical Services, Inc., 1997 WL 162061 (E.D. La. 1997); Kurncz v. Honda, 166 F.R.D. 386 (W.D. Mich. 1996); Anderson v. Nebraska Dept. Of Social Services, 538 N.W. 732 (Sup. Ct. Neb. 1995); Chustz v. J.B. Hunt Transport, Inc., 659 So. 2d 784 (La. 1995); Hein v. Merck & Co. Inc., 868 F. Supp. 230 (D. Ct. Tenn. 1994); Montalvo v. Lapez, 884 P.2d 345 (Sup. Ct. Ha. 1994); Sullivan v. U.S. Gypsum Co., 862 F. Supp. 317 (D. Ct. Ks. 1994); Longman v. Allstate Ins. Co., 635 So. 2d 343 (La. 1994); Wilt v. Buracker, 443 S.E.2d 196 (Sup. Ct. App. W. Va. 1993); Laing v. Honda, 628 So.2d 196 (La. 1993); Livingston v. U.S., 817 F. Supp. 601 (E.D.N.C. 1993).

The treatment of hedonic damages in New Mexico presents a nice tension between state and federal law. Hedonic damages are recognized statutorily in New Mexico and state courts will allow experts to testify on the size of hedonic damages. *See* Sena v. New Mexico State Police, 119 N.M. 471 (N. Mex. 1995) (citing Romero v. Byers, 117 N.M. 422 (N. Mex. 1994).) However, a federal court in New Mexico has excluded testimony on hedonic damages under *Daubert*, following Ayers/Mercado. *See* McGuire v. City of Santa Fe, 954 F. Supp. 230 (D.Ct. N. Mex. 1996).

47. *See* Dr. Walter D. Johnson & Dr. Thomas R. Ireland, "Qualifications and Admissibility: Applying the Daubert Mandate to Economic Testimony," (March 26, 1997)(unpublished manuscript on file with the author); Thomas R. Ireland *et. al.*, "Economic Science and Hedonic Damages in Light of Daubert v. Merrell Dow," (February 2, 1997)(unpublished manuscript on file with the author).

48. Thomas Schelling, "The Value of Life" in The New Palsgrave Dictionary of Economics (Social Economics)(1990).

sures in environmental cases. The most important case on point is *State of Ohio v. Department of Interior*, in which the D.C. Circuit ordered the Department of Interior to consider both use and nonuse values in calculating damages for environmental disasters and to specifically consider the contingent valuation method in measuring nonuse values.[49] Just as measures of hedonic damages attempt to measure the value of being alive, independent of pecuniary earnings, consumption, and other purely "economic" values, nonuse values of damages attempt to measure the value placed on the mere existence of environmental amenities. Use value is the value placed on using national parks and the attendant enjoyment from use; nonuse value measures the pleasure obtained from the pure existence of the parks independent of any use. Often use values can be measured by market equivalents such as looking to the drop in price of a particular commodity (such as a recreational facility) after a natural or environmental disaster. However, when no market exists for the environmental amenities, economists have looked to surveys to measure the value placed on both the use and nonuse of the amenities. This latter method is the contingent valuation method and involves the use of surveys which typically ask how much a particular individual is willing to accept in exchange for the loss of an amenity. Many industry participants and economists were critical of the contingent valuation method because it tended to overstate value.[50] However, the D.C. Circuit endorsed the method, finding it consistent with the Superfund provisions.

The State of Ohio case was a pre-*Daubert* opinion. Even more importantly, it was a case in which the Federal Rules of Evidence would not apply since the Department of Interior, like all agencies, are not limited by the Federal Rules. But the case contrasts interestingly with the court's treatment of similar evidence in civil cases. Could contingent valuation methods be used in nuisance cases as evidence of damages? If the reasoning of the hedonic damage cases were held to apply, then the answer would most likely be no. Even if contingent valuation were scientific, it would not necessarily be helpful, since a jury does not need an expert to determine the value of resources absent a market. Jurors can form their own sense of the value of recreational areas in much the same way as they can form their sense of the value of life. However, there is adequate support for the use of contingent valuation to value natural resources. Although some of the survey methods underlying contingent valuation have been criticized, a panel of economists including several Nobel Laureates concluded that "contingent valuation studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values."[51] Under a general acceptance standard, contingent

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49. 880 F.2d 432 (D.C. Cir. 1989).

50. Paul R. Portney, *The Contingent Valuation Debate: Why Economists Should Care*, 8 J. Econ. Persp. 3, 6-7 (1994).

51. Portney, *supra* note 50, at 8.

valuation studies will very likely be admissible. Under *Daubert*, they should be as well, since there is general acceptance for the methodology underlying the studies. However, under the rationale of the hedonic damage cases, they should almost certainly be excluded. The proper treatment of testimony pertaining to hedonic damages and contingent valuation remains uncertain and confusing. Improper attention has been paid to the scientific bases for each testimony.[52]

It should, of course, be noted that the court in *State of Ohio* endorsed contingent valuation largely on grounds of statutory interpretation and due process grounds. Hedonic damages have no federal statutory basis. However, the one state that has permitted testimony on hedonic damages post-*Daubert* has done so statutorily.[53] The different treatment of economic testimony under the Federal Rules of Evidence, common law remedies, and pertinent statutes both Federal and state raises difficult questions on how scientific knowledge is used differently in legislative and judicial contexts. The *Daubert* standard applies, of course, only to the latter.

The treatment of testimony on hedonic damages post-*Daubert* is rooted in a pre-*Daubert* reading of Rule 702 and poses a particularly large obstacle to those who need or advocate the use of hedonic damage measures. Courts have ignored the question of the scientific validity of hedonic damage measures; instead, they have concluded that even if there were a scientific foundation for the measure, testimony on hedonic damages simply would not be helpful to the trier of fact. Proponents of hedonic damages need to establish not only that there is a scientific basis for such measures, but also that such measures would in fact be helpful to the jury.

Surmounting these two hurdles is not a simple task. Court opinions betray a view that hedonic damage experts are the epitome of junk scientists. However, courts should consider what jurors may consider without the use of an expert. Of course, no one is an expert on the value of life. The question of value of life is obviously a philosophical, moral, and religious one in addition to (or perhaps instead of) being economic and statistical. But in dismissing testimony on hedonic damages on this ground, the courts make a mistake analogous to the economist's confusion of value with price. For legal purposes, for the purposes of measuring compensatory damages, the value of life is the price of life. Once the decision has been made to compensate for loss of life (a decision that can be either legislative or judicial), the decision maker has already reduced value to price. The decision maker would not have justification, having done so, in tak-

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52. *See* the discussions in W. Michael Hanemann, *Valuing the Environment Through Contingent Valuation*, 8 J. Econ. Persp. 19, 32-37 (1994)(advocating narrow use of contingent valuation studies); and Peter A. Diamond & Jerry A. Hausman, *Contingent Valuation: Is Some Number Better than No Number?*, 8 J. Econ. Persp. 45, 47-58 (1994)(concluding that contingent valuation is deeply flawed from a methodological perspective).

53. *See Sena, supra* note 46.

ing the high moral ground and stating that of course value is not price. Any decision to limit hedonic damages should not and cannot be based on the helpfulness of economists in measuring price, unless of course the economist's method was without scientific foundation. Once the remedy has been permitted, economic testimony is almost necessarily helpful for its measure.

Absent such testimony, the question becomes one of discerning what basis jurors would look to in determining value of life. Would a poor person's life be valued less than a rich person's? An African-American's less than a Caucasian's? A woman's less than a man's? Research in the area of tort damages has demonstrated such biases, usually supported by lawyer's testimony and in some cases by expert testimony on valuation.[54] There is no doubt expert testimony on hedonic damages may also introduce such biases. But reliance on untethered jury discretion in measuring value of life would exacerbate their prevalence. More importantly, such untethered discretion would for the most part be unreviewable. Expert testimony on the other hand can be reviewed both at the trial and the appellate levels for prejudicial effects, including effects that would lead to discriminatory results. Although the question of value of life may arguably not be a question suitable for experts, it is incorrect to say that we can all price life equally well or in a consistent and reasonable manner. Expert testimony would provide guidance as to the price of life that is both consistent and logical even if the metaphysical question of value remains forever a mystery.

Expert testimony on hedonic damages for all these reasons is in fact helpful, contra Mercado and its progeny. But the first hurdle still remains: is it scientific under *Daubert*? The answer to the latter question is no, to the extent that *Daubert* requires falsifiability. If an economist computes that his measure of the value of life, based on risk analysis, is $ 2 million, how can this testimony be falsified or even tested? The court could review the statistical validity of the finding, could check whether the economist used proper survey method and statistical analysis, but there is something about the conclusion that reeks of non-science. If another economist testified to $ 1 million, which one, if either, is to be believed? Is the inquiry for the court simply one of reviewing statistical method? Or should the court somehow not allow any testimony because of the problem of testing it for validity?

As I have argued throughout this paper, falsifiability is not a requirement that is consistent with the social science method. Social scientists of course want to test the validity of their findings by holding them up to data, but many social science conclusions, like many natural science conclusions, are generalizations made from observations. Even if an observation is obtained which is contrary

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54. Martha Chamallas, *Questioning the Use of Race-Specific and Gender-Specific Economic Data in Tort Litigation: A Constitutional Argument,* 63 FORD. L. REV. 73 (1994) (documenting the awarding of lower tort damages to women and minorities based on statistical disparities in life expectancy and earnings across gender and race).

to the conclusion, the conclusion can be saved through careful and clever rethinking of the background assumptions supporting it. To put it in more familiar terms, social science is not testable because all relevant variables cannot be controlled for in a systematic manner, and, even if they could, the underlying model will always have assumptions that can never be tested.

Such is the case with economic studies of the value of life. Economists can analyze data and determine a number. The number is interpreted within the context of a theory and used as a measure of the price individuals are willing to pay for various risks. This price implicitly measures how much individuals are willing to pay to forsake life itself. The number and the price cannot be proved or disproved; it is a question of interpretation; one helpful to the trier of fact and shaped by the logic of the economic enterprise. It is within this enterprise that courts should assess the scientific validity of hedonic damage testimony. The current approach, to rule that hedonic testimony is unhelpful because any individual can assess the value of life, implicitly overrules the right to certain tort damages. Such an overruling should be done expressly rather than through questionable glosses on the meanings of "science" and "scientific."

III. SOCIAL SCIENCE TESTIMONY

Neither the *Daubert* court nor the various *amici* in the case addressed the issue of the applicability of *Daubert*'s scientific validity standard to social science.[55] At issue in *Daubert*, and in the *amici* briefs submitted, was the narrow question of whether publication was a necessary prerequisite for admissibility under Rule 702.[56] The answer given by the Supreme Court to this narrow question was no. Publication was not necessary for admissibility nor was failure to publish sufficient for exclusion.[57] Instead the trial court judge should look to the methodological validity underlying the testimony. In order to understand the question of how *Daubert* should be applied to social science, we should address a more basic question: who won in *Daubert*? In a narrow technical sense Merrell Dow won because upon remand of the Ninth Circuit, applying *Daubert* principles, still held that the expert testimony should be excluded.[58] In

55. The phrase social science does not appear in the *Daubert* opinion and there is no Supreme Court opinion directly on point regarding the applicability of *Daubert* to social science. Many lower courts have held that *Daubert* does apply to the testimony of economists and other expert social scientists. *See* Shubha Ghosh, *Federal and State Responses to the Problem of Daubert and Technical and Other Specialized Knowledge* (unpublished manuscript on file with the author). The most recent (as of this writing) case to hold that *Daubert* applies to social scientist testimony is *United States v. Hall*, 974 F.Supp. 1198, (C.D. Ill. 1997) (holding that *Daubert* is applicable to the testimony of a social psychologist).

56. *Daubert*, *supra* note 4, at 588.

57. "The fact of publication (or lack thereof) in a peer reviewed journal thus will be relevant, though not dispositive, consideration in assessing the scientific validity of a particular technique or methodology on which an opinion is premised." *Id.* at 594.

58. Daubert v. Merrell Dow Pharmaceuticals, 43 F.3d 1311 (9th Cir. 1995).

a broader sense, however, it is unclear whose view of science really was the victor. On the one hand, the Court did reject the Ninth Circuit's holding that the publication was necessary for admissibility, the position adopted by many of the *amici* for *Daubert*; but on the other hand, of all the *amici*, the Court cited the brief from the National Academy of Science, writing on behalf of Merrell Dow.[59] The NAS' brief urged the Court to defer to the scientific community much as the Ninth Circuit had done.[60] However, the Court adopted the NAS' brief only to the extent that it provided a view of scientific method and validity that was generally accepted by the scientific community. The *Daubert* decision, as delineated in the previous sections, did not adopt a standard requiring deference to the scientific community by the trial court judge. With respect to the findings of the scientific community, *Daubert*'s standard is essentially de novo, whereby the Court reviews the testimony for scientific validity using the guideposts of the scientific community, such as publication and peer review, as factors to be considered in the review.

The *Daubert* court's treatment of natural science has strong implications for social science, depending upon the level of generality at which the *Daubert* opinion is read. At one level, the opinion is holding that scientific validity should be gauged by general acceptance within the scientific community.[61] The holding differs from that of *Frye* only in focus. While *Frye* required the judge to inquire whether a particular expert testimony was generally accepted, *Daubert* would require the judge to ask whether the particular expert utilized generally accepted scientific methods.[62] The distinction is elusive. As applied to social science, the implication would be that the court should look to the accepted methodology of the particular social science to determine admissibility. *Daubert*, so interpreted and applied, would result in the same problems of how to define the relevant scientific community as *Frye*.

Since the *Daubert* court clearly overruled *Frye*, this result cannot be correct. Therefore we are left with two choices in applying *Daubert* to social science testimony. The first is to place social science testimony outside the scope of scientific testimony and to analyze it as "technical or other scientific testimony."[63] For reasons articulated in the previous section, this treatment is misguided and untenable under *Daubert*'s language and policy. The second is to interpret *Daubert* as providing standards for all "scientific, technical, or specialized knowledge" and apply these standards to social science evidence. The latter, I believe, is the only tenable position; the difficulty is in determining how *Daubert* in fact defines science. The opinion spells out four factors but does not

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59. *Daubert*, *supra* note 4.
60. *Id.*
61. *Id.*
62. *Id.*
63. *Id.* at 588.

state how the factors are to be aggregated. Therefore, as I have shown in my discussion of the case law in Section Two, courts have picked and chosen the list, perhaps to reach a particular result, and perhaps more generously to derive operational principles from *Daubert*. The final result is that some courts have looked to credentialism, some to publication and peer review, and others still to a sense of valid scientific methodology, sometimes poorly defined, in making the threshold determination of admissibility. Although only one court has expressly held that *Daubert* applies to social science, a synthesis of judicial opinion as to how *Daubert* applies is remote and elusive.

Preliminary guidance can be found from some *amici* in the *Daubert* case, *amici* not cited in the opinion. The *amici* brief of the Carnegie Commission on Science, Technology, and Government (signed by, among others, economist and Nobel laureate Robert Solow) urged rejection of the Ninth Circuit's overreliance on publication and the *Frye* test in general.[64] The Commission's proposed test involved an inquiry into three questions combined with a threshold inquiry into competence of the expert based on qualifications and relevance of the testimony. The three proposed questions are: (1) Is the claim being put forth testable?; (2) Has the claim been empirically tested?; and (3) Has the testing been carried out according to scientific methodology?[65] If the answer to any of these questions is no, then the Commission concludes the expert opinion must be rejected. As the Commission succinctly stated in its brief: "[O]pinions based on claims that are not capable of being tested should not be admitted into evidence. Claims that are supported by data that cannot be replicated should likewise be rejected."[66]

The Carnegie Commission's proposal is the same as the first part of *Daubert*'s four factors. The emphasis is on falsifiability and actual falsification. By contrast, the *amici* of Physicians, Scientists, and Historians of Science proffered a very different set of guidelines for assessing scientific validity.[67] The Historians of Science, like the Carnegie Commission, rejected the *Frye* test for very similar reasons. As characterized by the Historians of Science, *Frye* "assumes that science always progresses by the continuous accumulation of objective, irrefutable truths, which are gradually incorporated into a consensus reflected in the scientific literature" and that "scientific truths once discovered are complete, universal, immutable, and eternal."[68] The language is identical to the Carnegie Commission's assertion that *Frye* "assumes much more definiteness in science than actually exists, and that this precision takes the form of

64. Brief for Amicus Curiae Carnegie Commission Submitted in Support of Petitioner, Jan. 2, 1992.

65. *Id.*

66. *Id.*

67. Brief of Amicus Curiae Historians of Science Submitted in Support of Petitioners, Jan. 2, 1992.

68. *Id.*

widely held beliefs about reality that can be readily found."[69] The Historians of Science, however, do not suggest a rule-based inquiry such as the one proffered by the Carnegie Commission. Instead, the *amici* offers a series of admonishments over the application of *Frye* to exclude novel claims that may be scientific even if not generally accepted. If the Historians of Science offer any guidance to judges and lawyers, it is that admissibility decisions should be based not on a rigid, formulaic notion of general acceptability but rather on the quality of testimony where "[t]he quality of scientific approach or opinion depends on the strength of its factual premises and on the depth and consistency of its reasoning, not on its appearance in a particular journal or on its popularity among scientists."[70] If the Carnegie Commission's proposal is developed around principles of falsifiability, then the Historians of Science ask the court to look to the factual premises and the consistency of reasoning underlying the expert's testimony.

Are these two approaches different? In a qualitative sense, no; both are empiricist in outlook, both focus on the method underlying the opinion rather than the substance of the opinion. But as applied to social science, the approaches have very distinct implications. The Carnegie Commission's proposal requires that the expert testimony be subject to testability. The classic problem (or critique, depending upon one's perspective) of much social science and especially economic research is that it cannot be falsified. For example, the economic assumption that consumers are rational utility maximizers or that firms are profit maximizers is clearly false. Any theory based on such assumptions would logically also be false. If an economic expert were to testify on the negative market effects of price fixing or the benefits of competition in a particular industry, the expert would almost surely be excluded under the Carnegie Commission's test. This result would not be undesirable from the more basic question of relevance. If the expert's testimony was too general with regards to either anti-competitive or pro-competitive effects, the testimony would be of questionable relevance as applied to the details of, for example, the health care industry. The Carnegie Commission's test would shift economic experts from those who are purely theoretical to those who have experience with the industry. But the pivotal question then becomes what experience would be sufficient for exclusion? Suppose the expert has studied the health care industry statistically; that is, he has never spoken to actual participants in the industry nor worked in the industry, but has spent a career studying statistics pertinent to the industry. Such an expert would be competent; his testimony would be relevant. But would it survive a *Daubert* inquiry, at least as proposed by the Carnegie Commission? The answer should hinge on how the expert analyzed the data, the assumptions of his statistical model, and the statistical techniques used to

69. *Id.*
70. *Id.*

develop and analyze the model. The Carnegie Commission would have the trial judge focus on falsifiability. If the expert's statistical model was built on assumptions that were not falsifiable, then the entire testimony must be excluded. The falsifiability test is arguably too narrow as applied to social science testimony, for the simple reason that social scientists cannot conduct natural experiments and instead must always filter empirical data through a theoretical lens that will often contain hidden assumptions that are untestable.

Because of the problem with the falsification criterion, the *amici* of the Historians of Science contains a better approach. To the extent that they developed a test, it would consist of two parts: an inquiry into the factual premises of the expert's reasoning and one into its consistency. There is no requirement that the testimony be tested or even testable. Instead, there must be an empirical basis and a structural basis for the testimony, foundations in fact and in logic. The inability to test for failure to construct pure natural experiments, unadulterated by theoretical assumptions, would not hinder the admissibility of social science testimony. The problem is whether there is any basis in law to apply this approach to gauge admissibility. The *Daubert* Court arguably did not adopt it; the opinion is more consistent with the Carnegie Commission's proposal even though the Court clearly did not make falsification a necessary or sufficient condition for admissibility. Although the Court in its third enumerated factor did discuss known error rates and technical flaws, this factor is distinct from consistency of the expert's testimony and from factual basis. Furthermore, the spirit of the *Daubert* opinion suggests a more structured and rigorous analysis of scientific method than that proposed in the Historians of Science's *amici*. *Daubert* arguably requires more than simply factual basis and logical consistency for admissibility.

More importantly, adopting the more flexible standard would, according to some, vitiate any tendency *Daubert* has to limit junk science in the courtroom. To see this argument, consider how the testimony of a social psychologist on battered woman's syndrome would be treated under either approach. Under the more flexible approach, admissibility of the social psychologist's testimony would depend upon whether there was a factual and logical foundation for the testimony. If the psychologist's conclusions pertaining to battered woman's syndrome derived from studies of actual battered women and their responses to a history of abuse, there would be a factual basis for the testimony. If the expert's conclusion that a history of abuse leads to a phenomenon of learned helplessness, then there would be a logical consistency to the testimony presuming that such consistency was established through legitimate psychological principles. The more flexible approach would admit the expert. The *Daubert* four-factor approach would arguably exclude the expert. Since battered woman's syndrome has been tested with minimal corroboration in the scientific community and because the error rates for the connection between abuse and helpless-

ness are high, testimony on battered woman's syndrome should be excluded under *Daubert*.[71] The result seemingly is that the *Daubert* approach is a better filter for the exclusion of junk science.

I believe that all of these arguments are ungrounded. The more flexible approach proffered in the *amici* of the Historians of Science is completely consistent with the *Daubert* opinion, even though this *amici* was not cited. The *Daubert* court's last factor, "general acceptance," mandates that the judge look to the relevant scientific community for standards to define scientific validity when falsification, peer review, and error rates are not helpful factors.[72] As I have argued above, because of the problem of falsificationism in social science, the first three *Daubert* factors are not helpful in determining the admissibility of social science testimony. Therefore, the judge should consider the practices and methodological guidelines of the relevant social science community to develop standards for admissibility. Furthermore, even if the *Daubert* court had not expressly stated general acceptance as one of the factors to consider, the Court did adopt a general acceptance standard for the determination of valid scientific methodology. Therefore, it would not be inconsistent with *Daubert* to consider the approach of the Historians of Science in determining appropriate scientific methodology for the purposes of admissibility.

More troubling may be the assertion that the more flexible approach of looking to factual and logical foundations would result in the increase of junk science in the courtroom. As I have argued above, it is not clear that the *Daubert* opinion is refined enough to exclude junk science. The Court itself betrayed confusion over the admissibility of testimony on phases of the moon affecting human behavior. The Court stated that such testimony would not admissible under Rule 702, "absent creditable grounds supporting" a connection between the two.[73] The Court was probably simply making the point that there could never be creditable grounds for such testimony. But the use of the hypothetical leaves open the question whether *Daubert* would permit such testimony to be admitted. Such testimony would almost definitely be excluded under the more flexible approach of requiring both a factual and a logical foundation for the testimony. Although an expert could in theory establish a factual foundation for the testimony by pointing to such statistical evidence (if it were to exist) that erratic and inexplicable behavior is correlated with the phases of the moon, it would be difficult to establish a logical foundation for such a claim for precisely the reasons raised in my prior discussion. If in fact "moon madness syndrome" exists, how can anyone including the observer of such a syndrome escape its effects? And even if the observer is immune to "moon madness syndrome,"

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71. *See* David L. Faigman, *The Evidentiary Status of Social Science Under Daubert: Is it Scientific, Technical, or Other Knowledge?*, 1 PSYCH. PUB. POL. AND L. 960 (1995).

72. *Daubert*, *supra* note 4 at 593.

73. *Id.* at 591.

how can we be certain about the definition of madness to be applied in diagnosing this syndrome since a correlation between phases of the moon and irrational behavior suggests a logical, rational relationship to begin with? The more flexible approach dispenses with the phases of the moon expert in a way that the *Daubert* court and the *Daubert* four-factor approach cannot.

As for more realistic experts, such as the social psychologist, the requirements of factual and logical foundation are more apt to exclude battered woman's syndrome, should one advocate such a result. Testimony on battered woman's syndrome can be excluded either by questioning the factual foundation for the syndrome or by attacking the logical foundation. In determining logical foundation, attention can and should be paid to scientific methodology. The consistency of an expert's testimony will almost inevitably have to be determined by reference to scientific practice and standards. The more flexible standard, as articulated in the *amici* of the Historians of Science, would be less tolerant of junk science than the *Daubert* standard.

I would argue further that even though the *Daubert* court did not cite the *amici* of the Historians of Science, the Court did in effect adopt its more flexible standard. The *Daubert* four factor inquiry is essentially a test of factual foundation (as gauged by peer review and error rates) and logical foundation (as gauged by falsificationism and general acceptance). The problem is that in applying these factors to social science testimony, many courts and commentators have ignored the natural science roots of *Daubert* and the practical problems of applying a natural science standard to the social sciences. As a result, commentators have been draconian on the question of admissibility of social science testimony and courts have been confused and inconsistent in their treatment of social scientists and economists in the courtroom. The requirements of factual and logical foundations are consistent with *Daubert*'s treatment of natural science testimony and with extending *Daubert* to social science testimony, which almost always cannot strictly be falsified.

Further support for the flexible approach is provided by a recent shift in the standards for approving grants for biomedical research, as recently announced by Dr. Harold Varmus, the director of the National Institute of Health.[74] The new standards were a response to Dr. Keith Yamamoto, a researcher at the University of California, San Francisco, and a chair of the advisory panel for the NIH's Division of Research Grants, who criticized the NIH grant reviewers for being too cautious in funding research (largely as a response to tightened budgets) that was too novel. According to Dr. Yamamoto, grant reviewers have been favoring "grants with the best pedigrees rather than those taking on the biggest challenges."[75] Dr. Varmus' proposed criteria include the following five

74. Eliot Marshall, *NIH Plans Peer Review,* SCIENCE 888 (May 9, 1997), at http://www.sciencemag.org/cgi/content/full/276/5314/888?.

75. *Id.*

factors: (1) Significance: Does this address an important problem?; (2) Approach: Are the conceptual framework, design, methods, and analyses adequately developed, well integrated and appropriate to the aims of the project?; (3) Innovation: Does the project employ novel concepts, approaches or methods?; (4) Investigator: Is the investigator appropriately trained and well suited to carry out this work"; and (5) Environment: Does the scientific environment in which the work will be done contribute to the probability of success?[76] The purpose of these guidelines is to force reviewers to consider innovativeness as one criterion to limit an overly cautious review process.

The shift in the NIH guidelines casts light on the *Daubert* decision by illustrating how accepted scientific methodology is shaped and can be transformed as a response to budgets and changes in values as well as the needs of a particular field of inquiry. Arguably, courts in applying *Daubert* and the *Daubert* court itself have been overly cautious in defining science. Less charitably, courts have not been well attuned to the realities of knowledge production by people trained in a natural science or social science background.

IV. *G.E. Co. v. Joiner*: Confounding the Errors

If there is one thing that is clear in the *Daubert* opinion, it is that judicial review of the admissibility of expert testimony rests largely on consideration of the expert's methodology as opposed to the acceptability of his conclusions by the relevant scientific community. Justice Blackmun's opinion reflects in large part a suspicion of the scientific community's ability to govern itself and maintain standards for truth production. Because of this failure, judges post-*Daubert* must provide the necessary governance. This governance role requires the trial court judge to gauge the validity of the expert's methodology in reaching the conclusions which are the subject of the testimony. *Daubert* does not so much discard *Frye*'s general acceptance standard as it reformulates it: an expert's testimony should be excluded if it involves conclusions that were not derived from generally accepted methodology.

Of course the trial court judge also needs to be policed to ensure that she applies not only the correct legal standard but also the correct analysis of the facts. The issue of what standard applies to the trial court's finding of admissibility under *Daubert* was recently addressed by the U.S. Supreme Court in *General Electric v. Joiner*.[77] The specific question in the case was whether the trial court's *Daubert* findings should be treated as findings of fact, to which the appellate court would defer, or findings of law, which the appellate court would scrutinize. The Court held that the trial court's finding of inadmissibility under *Daubert* was subject to the abuse of discretion standard, the standard usually

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76. *Id.*
77. *See* General Elec. Co. v. Joiner, 522 U.S. 136 (1997).

applied to trial court's factual findings. Based on this holding, the Court overruled the Eleventh Circuit's finding that the trial court had erred in excluding expert testimony on the carcinogenic properties of PCB's to which the plaintiff had been exposed, and in its consequent granting of summary judgment to the defendants.

It is without a doubt that *Joiner* will lead to trial court's having more power in the admissibility of expert witnesses. More importantly, the decision makes the admissibility question the most crucial part of much litigation. Whether in toxic torts (the subject of *Daubert* and *Joiner*) or antitrust or civil rights, the plaintiff's case will often hinge on expert testimony. Once this testimony is barred, the case essentially has no foundation. Questions of admissibility of expert testimony are closely linked to substantiality of the claim; as the *Joiner* case and the other cases discussed in Section II indicate, motions to exclude expert testimony are a prelude to summary judgment motions. This connection between admissibility and sufficiency of the evidence indicates the central problem with the Court's analysis in *Joiner*. While the expert's testimony is a factual predicate for a legal conclusion (such as causation or unreasonable restraint of trade or discrimination), the question of whether the expert's testimony is valid science is a legal conclusion not a factual one. In making a *Daubert* ruling, the trial court is answering the question of whether an expert's testimony is valid science under Rule 702 of the Federal Rules, not whether an expert's testimony is scientific as a factual matter. Therefore, an abuse of discretion standard is not appropriate for a *Daubert* finding and the Eleventh Circuit was correct is imposing a higher (though admittedly amorphous) standard to the trial court's findings.[78]

Even if one views the court's determination of the scientific validity of an expert's testimony as a pure question of fact, the Supreme Court's understanding of the how the court is to make this determination as articulated in *Joiner* is in conflict with *Daubert*. As stated above, the *Daubert* determination is one of determining whether the expert has used valid methodology in reaching his conclusions. Therefore, if the expert is testifying that full moons induce madness, the decision to admit the expert's testimony should not be based on the acceptability of his conclusions but on how the expert arrived at his conclusions. If the expert's methods are not generally accepted, then the expert's testimony should be excluded because it cannot be helpful under Rule 702. Notice that this rule applies regardless of the expert's conclusions. Suppose, for example, the expert were to testify as to a scientific conclusion that was generally accepted (such as the law of gravity). If the expert reached his conclusions through a method that

78. *See* Andrew I. Gavil, *After Daubert: Discerning the Increasingly Fine Line Between the Admissibility and Sufficiency of Expert Testimony in Antitrust Litigation*, 65 ABA ANTITRUST L.J. 663 (1997)(suggesting procedural ways for the trial court to deal with the admissibility/sufficiency confusion).

was not accepted (suppose he based it on pure introspection rather than experimentation and observation), then the expert should be excluded under *Daubert* even if the conclusion had scientific validity. This result seems odd only because we cannot imagine the situation of an expert arriving at a well known result through unconventional means; the very reason that certain scientific conclusions are valid is because they have been subjected to standard methods. Therefore, even if an expert were to testify that he reached result X through an odd method, another expert could be found that would testify to result X as reached through the correct method. As long as there is a basis for the conclusion through some valid method, the *Daubert* rule does no harm to those scientific conclusions that are truly generally accepted. Furthermore, the *Daubert* rule does no harm to those conclusions that have not gained acceptance because the court must subject these conclusions to the requirement that they were derived through adequate method.

The problem arises in the context of testimony regarding novel conclusions reached through novel methods. It is in these penumbral areas that *Daubert* has posed the most difficulty. In *Joiner*, the issue arose with laboratory experiments and epidemiological studies of the links between exposure to PCB's and cancer which were introduced by the plaintiff.[79] The district court excluded this evidence because it found that the laboratory studies of exposure to mice of chemicals were not relevant to extrapolating the effects on humans. The court determined that the exposure rates were much higher in the experiments and the resulting cancers were different from the ones suffered by the plaintiff. The district court also excluded the epidemiological studies for inadequate controls and the statistical insignificance of the correlation between exposure and incidence of cancer. The Eleventh Circuit overruled this finding on the grounds that the district court erred in substituting its judgment for that of the expert scientists by drawing "different conclusions from the research than did each of the experts."[80] According to the Eleventh Circuit, the district court had failed to limit its role "to determining 'the legal reliability of proffered expert testimony, leaving the jury to decide the correctness of competing expert opinions."[81] The Supreme Court, after holding that scientific validity is a question of fact subject to the abuse of discretion standard, concluded that "it was within the District

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79. *See generally Joiner*, supra note 77. The district court had ruled that there was no genuine issue of fact that Joiner had been exposed to furans and dioxins, and therefore did not rule on the admissibility of expert testimony on whether furans and dioxins were carcinogenic. The Eleventh Circuit reversed the district court on the exposure issue, holding under the standard for review of summary judgment that there was a genuine issue as to Joiner's exposure since G.E. had not met its burden of proof on this issue. The Supreme Court affirmed the Eleventh Circuit on this issue and remanded for consideration of the factual issue of Joiner's exposure and the admissibility of his expert's testimony on the relationship between exposure to furans and dioxins and cancer.

80. *See id.* at 141.

81. *Id.*

Court's discretion to conclude that the studies upon which the experts relied *were not sufficient*, whether individually or in combination, to support their conclusions that Joiner's exposure to PCBs contributed to his cancer"[82] (emphasis added).

The key phrase in the *Joiner* opinion quoted above is "sufficient." The district court's task, under *Daubert*, is to determine the admissibility of the evidence, not its sufficiency. At the least, the Court's holding is badly worded. At the worst, the Court has created more confusion on how a district court is to fulfill its gatekeeper function under *Daubert*. This confusion is aggravated by the Court's interpretation of *Daubert* in *Joiner*:

> Respondents point to *Daubert*'s language that the "focus, of course, must be solely on principles and methodology, not on the conclusions that they generate." 509 U.S. at 595. He claims that because the District Court's disagreement was with the conclusion that the experts drew from the studies, the District Court committed legal error and was properly reversed. . . .But conclusions and methodology are not entirely distinct from one another. Trained experts commonly extrapolate from existing data. But nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence which is connected to existing data only by the *ipse dixit* of the expert.[83]

While Justice Stevens agrees that abuse of discretion is the correct standard of review, he dissents from the majority's application of the standard to the district court's findings. The district court's finding as to scientific validity of the expert's testimony was, according to Justice Stevens, "not faithful to the statement in *Daubert* that the 'focus of course must solely be on principles and methodology, not on the conclusions that they generate.'"[84] as Justice Stevens continued:

> Joiner's experts used a "weight of the evidence" methodology to assess whether Joiner's exposure to transformer fluids promoted his lung cancer. They did not suggest that any one study provided adequate support for their conclusions, but instead relied on all the studies taken together (along with their interviews of Joiner and their review of his medical records). The District Court, however, examined the studies one by one and concluded that none was sufficient to show a link between PCB's and lung cancer. The focus of the opinion was on the separate studies and the conclusions of the experts, not on the experts' methodology.[85]

Justice Stevens would, therefore, conclude that a district court's *Daubert* finding is subject to the abuse of discretion standard and that the district court

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82. *Id.* at 146-147.
83. *Id.*
84. *Id.* at 152.
85. *Id.* at 152-53.

abuses its discretion when it bases its decision on a consideration of the expert's conclusions rather than solely on her methodology.

The debate between Justices Rehnquist and Stevens illustrates the central problem in understanding the methodology conclusion distinction in *Daubert* and *Frye*. On the surface, it seems absurd to allow absurd conclusions into evidence as long as the methodology is not flawed. The absurdity is the same as that which arises in syllogistic statements drawn from absurd conclusions: Socrates is a duck; All ducks have feathers; Therefore, Socrates has feathers. The methodology is flawless in this example, but the conclusion is wrong. Contrast this example with the following: Socrates is a person; Some persons are men; Therefore, Socrates is a man. Here, the conclusion is valid even though the methodology is flawed. Under *Daubert*, the first testimony, as to Socrates having feathers, would be admitted, although the second testimony would not. Under *Frye*, the first would not be admitted while the second would, because of the general acceptance of the conclusions, be admitted. The complete separation of methodology and conclusions (an approach that Justice Stevens is suggesting) cannot be fully satisfactory. But neither can the blurring between methodology and conclusions suggested by Justice Rehnquist. Scientific conclusions, as I have said before, are gauged by methodological validity. If methods and conclusions could not be distinguished, then conclusions can never be validated scientifically. Justice Breyer conveys the dilemma well, without offering a resolution, when he states in his concurrence in *Joiner* that the district court's gatekeeping requirement under *Daubert* "will sometimes ask judges to make subtle and sophisticated determinations about scientific methodology and its relation to the conclusions an expert seeks to offer."[86] How a judge is to make the distinction remains unresolved, as evinced by the multiple and often inconsistent applications of *Daubert*.

The tension between Justice Stevens and Justice Rehnquist can be readily resolved in the *Joiner* case. Justice Stevens is correct to point out that, under *Daubert*, the district court is to look at methodology and not simply the conclusions. In other words, the *Daubert* determination is intended to be an issue of admissibility and not the sufficiency of the evidence. I repeat my warning that methodology and conclusions cannot be completely separated, though they are different. Justice Stevens erred, however, in his analysis of the district court's finding. As he described it, the proffered expert's methodology was a "weight of the evidence" methodology. In other words, the expert read a variety of published scientific findings and from these published works extrapolated to the plaintiff's case. The key question is not whether the expert's conclusions was warranted by these findings, but whether the "weight of the evidence" methodology is a valid one. I would contend that it is not. The proper method in this

86. *Id.* at 147.

situation would be to perform laboratory experiments or to undertake a statistical epidemiological study. The expert in *Joiner*, however, did no independent study. Instead he attempted to synthesize both animal studies and epidemiological studies, resulting in the fatal error of comparing incommensurables. The expert, therefore, was properly excluded in *Joiner* - not for the obtuse reasons that the majority provides, but because the expert reached his conclusions through a bizarre "weight of the evidence" methodology. While Justice Rehnquist reached the right result for the wrong reason, Justice Stevens is guilty of the obverse. Ironically, the *Joiner* opinions illustrate quite neatly the tension between methodology and conclusions.[87]

V. CONCLUSION

What constitutes science for the purpose of law? The answer seems to be: knowledge derived through the proper method. The cases discussed in this paper demonstrate judicial struggles to ascertain valid methodology. Guided by the Supreme Court's citation of Popper and Hempel, courts have attempted to ground proper methodology in experimentation, falsificationism, and credentialism. The result has been a mixed set of holdings and analyses that fail to cohere or to illustrate the proper legal method to apply to ascertaining the scientific method.

I would like to end this paper with an alternative model by which to understand the judicial quest for scientific validity. This alternative model is motivated by the insight that the Supreme Court erred in framing the problem of determining scientific validity in terms of the work of Karl Popper and Carl Hempel. Instead, Charles Sanders Peirce provides a more cogent method of framing the quest for scientific validity. In an article entitled *The Fixation of Belief*, Peirce proposes four methods describing how individuals validate their beliefs: the method of authority, the method of reason, the method of tenacity, and the method of science.[88] The method of authority rests on appeal to an authoritative source for support of the knowledge; credentialism would be an example of this method. The method of reason rests on ascertaining certainty through deduction; formalism in legal method is an example. The method of tenacity rests on psychological notions of certainty based on appeal to what has been believed in the past. Precedent illustrates this method in the context of

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87. The relationship between methodology and conclusion in the philosophy of science is interesting enough, much like the relationship between process and substance in law. How do we know that Person X is guilty of murder? We know that Person X is guilty because he has been subjected to proper procedure, and in the end, the trier of fact reached the conclusion that Person X is guilty. If there is an error in the procedure, the appeals process will ferret it out. Admittedly, this picture is a naive one of the trial and appellate process. But it is exactly such a model that informs how the judicial process views (and reviews) the scientific process.

88. Charles S. Peirce, *First Paper- The Fixation of Belief*, 12 POP. SCI. MONTHLY 1-15 (1877).

judicial reasoning. Finally, the method of science is the method of empiricism and induction, drawing generalizations from data. It is this method that courts following *Daubert* seek to identify and promote.

Peirce's four methods are categories that describe methodology at a meta-level. They were developed to understand how society accepts certain ideas and beliefs. Peirce was not concerned with the legal system or judicial reasoning. Peirce's categories, however, are useful in understanding how courts have dealt with experts under both *Frye* and *Daubert*. Sometimes by appealing to credentialism, applying formal definitions of science, and appealing to generally accepted truths, judges have ascertained the admissibility of expert testimony while couching their review in terms of the method of science. The open question is whether the method of science will prevail in judicial review under *Daubert*. Judging from the most recent Supreme Court pronouncement in *Joiner*, I would have to conclude that it will not.

The "Soft Science" of Discretion: A Reply to Ghosh's "Search for Scientific Validity"

STEVEN ALAN CHILDRESS*

These Replies are traditionally a place where my role is to lord it over Shubha Ghosh that he is not so smart after all. That may be true, but I do not see it in his paper. So I get to do the harder job: construct rather than deconstruct, add something rather than criticize. Maybe even reassure him that many reviewing judges are smarter than he thinks, that his analysis may not fall on deaf ears.

Where can I add the most? That appears to be to the later portion of his analysis: the problem of judicial discretion and review raised in *General Electric Co. v. Joiner*[1] and Ghosh's Parts IV and V. Ghosh is convincing, throughout his paper, that *Daubert* gives the trial judge a *de novo* power over the scientific community, by relocating the "acceptance" inquiry into the court itself, rather than deferring to the scientific community. *Joiner* certainly confirms that the initial inquiry belongs particularly to the trial judge, who now explicitly receives an "abuse of discretion" deference on appeal. Yet, I will suggest that within that second-level review lies the seeds for more hope than Ghosh believes, and a recurring chance for his larger point to be made.

I therefore have replied to the most pessimistic part of Ghosh's paper, in order to suggest a bit more promise and light for his own views than even he finds there. The effort is, as it turns out, not peripheral at all; if his dour reading of *Joiner* is wholly correct, the Court has already killed any chance that Ghosh's views matter. The question of appeal may seem off-central to his main thoughts about rocket science versus social science. But it has the potential to render "academic" anything he may achieve analytically when convincing us of the proper place for falsification in the multivariate *Daubert* inquiry. If he is right, trial courts which screw up that inquiry will go wholly unchecked.

To be sure, fair questions can also be raised about whether Ghosh accurately reads *Daubert* as relatively hostile to, or more narrowly filtering of, expert testi-

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1. General Electric Co. v. Joiner, 522 U.S. 136 (1997).

mony in courtrooms (his Part I). It seems equally likely to me that within the analytic mush that is *Daubert*, and its apparent coronation of the initial trial judge as king gatekeeper, will be found the excuse to do what Peter Huber and others fear most (and what we all thought the Court in *Daubert* granted *certiorari* to foreclose): expand the admissibility and uses in adjudication of neo-scientific claims. Many trial judges will, I'd say, read the rejection of *Frye* as a license to admit fringe (generally unaccepted) testimony, simply because their own *de novo* review of the methodology declares it adequate, or because they read *Daubert* as placing primary, if not initial filtering, judgment in the hands of common-sense jurors.

Ghosh makes a good case as to why these judges would be wrong. He is especially convincing that in the social sciences,[2] *Daubert* simply must work out to have narrowing tendencies that trump the expansive ones. The new emphasis on falsification, at the least, invites a restrictive admissibility of a whole genre of evidence, like economics, that never did live and breathe falsification in the way that the test-tube jocks do. Finally, the shut-out of hedonics in courtrooms is a good illustration of that reading (though previous courts were not too inviting either). In any event, Ghosh is either right that courts will read *Daubert* as narrowing admissibility, or he is right that they would be correct in doing so.[3] I find that there is little room left for strident criticism of his central reading of *Daubert*.

Nevertheless, whichever way trial courts eventually will go with *Daubert*, there remains the problem of the reviewing court's own role and its place in the vital gatekeeping function of courts generally. This is a problem pregnant in *Daubert* itself and delivered screaming in *Joiner*. Ghosh seems to fear that *Joiner* disables appellate courts from making sure that the initial *de novo* function is done well and true.

The fear is understandable in light of the harsh language of "abuse of discretion" used now to describe that review. Furthermore, Ghosh is right to imply that the fear is worth fighting, that it would be a bad thing if *Joiner* removed the law-and-policy-rich appellate courts from this legitimate adjudicative and oversight process. No doubt that is the easiest way to read *Joiner* in isolation, as a

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2. Particularly economics, he says, though his point is well taken as applied to such "soft sciences" and hotbed issues as eyewitness-identification testimony, child sexual abuse accommodation syndrome, parental alienation syndrome, and repressed memory experts. Responding to Shubha Ghosh, Methods, Conclusions, and the Search for Scientific Validity in Economics and Other Social Sciences, n.17, published in this volume. *See, e.g.*, United States v. Rouse, 100 F.3d 560, 568 (8th Cir. 1996) (noting then-open issue as to how Daubert applies to "soft" sciences, though still using abuse of discretion standard to reverse exclusion of expert testimony about suggestibility of child witnesses). These questions remain largely open after *Kumho Tire*, discussed below, because that opinion allows such flexibility in applying *Daubert* to soft science.

3. Ghosh may further be right, in Part III, that the Historians of Science approach could be an even finer "junk" filter than *Daubert*. If so, the irony has been lost on most commentators.

straightforward statement that trial judges apply *Daubert* while appellate courts only rubberstamp.

What a mess it would be if that is what happens. *Daubert* will have realized worse fears in the legal arena than even Huber and others popularly expressed (in shuddering at the open floodgates of junk science). It will have endorsed *uneven* floodgates that provide no coherent guidance for any later case. This would, in turn, obviate the power of common law decision-making and lose the accretion of wisdom that could result if appellate courts remained truly "in play," *i.e.*, able to step back, observe the larger river, and then create binding norms that stretch and teach beyond the case at hand.

Ghosh obviously and correctly wants appellate judges to have the power to apply *Daubert* in an unfragmented way, in order to provide a healthy amount of consistency and predictability to such rulings, so that we can all know that at least in the Eleventh Circuit, polygraphs are as a rule admissible even in criminal cases for impeachment or if the parties have so stipulated before the test.[4] At least, he apparently wants reviewing judges to feel empowered to correct misreadings and misapplications of *Daubert* found in the *de novo* reviews made below. If the scientific or economics community is no longer the forum for admission decisions, appellate courts should be involved too. But, he fears, *Joiner* stops that salutary function in its tracks.

I would suggest a bit more hope than that, even if *Joiner* itself reads about as flexible as Al Gore's likeness in Madame Toussaint's. Other Supreme Court cases express a more robust role for reviewing courts even under the "abuse of discretion" banner. In those subtleties exist the opportunity for reviewing courts to provide much of the healthy oversight and broad-policymaking that, Ghosh correctly implies, is the point and strength of appellate courts.

It is true that the Supreme Court has, in the past two decades, increasingly held an "abuse of discretion" standard of review to apply to a variety of procedural, evidentiary, and court management decisions.[5] The Court now tends to make sweeping statements such as "[t]he standard of review applicable to the evidentiary rulings of the district court is abuse of discretion."[6] In isolation, such a direction appears to mean most trial decisions are reviewed for "abuse," and that this review standard uniformly admits of little "play" in the appellate court joints.

At the same time, however, the Court have elsewhere invigorated the now-widespread "abuse" inquiry by increasingly noting that procedural and evidentiary decisions made under a mistaken view of the law receive *no* deference:

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4. *See* the pre-*Daubert* case of United States v. Piccinonna, 885 F.2d 1529 (11th Cir. 1989) (en banc).

5. *See* Pierce v. Underwood, 487 U.S. 552, 558 n.1 (1988); STEVEN A. CHILDRESS & MARTHA S. DAVIS, FEDERAL STANDARDS OF REVIEW chs. 4, 11 (3d ed. 1999) [hereinafter, CHILDRESS & DAVIS].

6. Old Chief v. United States, 519 U.S. 172, 174 n.1 (1997).

they *are* an abuse of discretion.[7] The 1996 case involving Stacey Koon emphasized that review of legal matters *within* the general abuse of discretion test empowers the appeals court to do its lawmaking function, yet reaffirms that the term "*de novo*" need not be used because the "discretion" concept itself encompasses such a varying review:

> Little turns, however, on whether we label review of this particular question abuse of discretion or *de novo*, for an abuse of discretion standard does not mean a mistake of law is beyond appellate correction. A district court by definition abuses its discretion when it makes an error of law. That a [sentencing guideline] departure decision, in an occasional case, may call for a legal determination does not mean, as a consequence, that parts of the review must be labeled *de novo* while other parts are labeled an abuse of discretion. The abuse of discretion standard includes review to determine that the discretion was not guided by erroneous legal conclusions.[8]

Apparently this review is done without deference and might as well be called *de novo*.

This residual appellate power survives expansion of the *applicability* of the abuse test as an accompanying expansion of its *application*. More recently: "It is true that the trial court has discretion [to order reconsideration under civil Rule 60(b)], but the exercise of discretion cannot be permitted to stand if we find it rests upon a legal principle that can no longer be sustained."[9] The standard of review "we employ in this litigation [*i.e.*, "abuse of discretion"] does not therefore require us to depart from our general practice" of overruling bad law.[10]

Thus, it would be a gross overstatement to pronounce that every aspect of every procedural or evidentiary call receives uniform deference. The Court simply cannot mean it in a blanket way that evidentiary decisions are subject to review for abuse of discretion,[11] unless it is concurrently understood that the appellate application of that test recognizes the flexibility and review-power built into it. "Discretion" implies the power to choose within a range of acceptable options.[12] Still, the decision as to what are acceptable options, and thus the valid parameters within which a judge may exercise his or her choice, *must* remain the province of lawmaking appellate courts. We have simply evolved to perform that function under an umbrella of "abuse of discretion" rather than

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7. *See* Cooter & Gell v. Hartmarx Corp., 496 U.S. 384 (1990).

8. Koon v. United States, 518 U.S. 81, 100 (1996) (citations omitted).

9. Agostini v. Felton, 521 U.S. 203, 238 (1997).

10. *Id.*

11. *See also* David P. Leonard, *Appellate Review of Evidentiary Rulings*, 70 N.C. L. REV. 1155 (1992) (much evidentiary decision-making is not really "discretion").

12. *See* Wheat v. United States, 486 U.S. 153, 164 (1988); United States v. Wallace, 964 F.2d 1214, 1217 n.3 (D.C. Cir. 1992); Kern v. TXO Prod. Corp., 738 F.2d 968, 970 (8th Cir. 1984).

nakedly apart from it.[13] Ironically, the more the Supreme Court demands wider applicability of the "abuse" test, the more that standard inevitably requires a deeper and contextually-driven application within the reviewing court.

Looked at another way, even hierarchical courts are actors within a broad market of litigation processes. They make exchanges all the time, talk all the time — and appellate reviews are not the next, separate level of process, but part of an ongoing exchange with and dialog about lower courts (really, "exchanges" in both senses of the word). The abuse of discretion inquiry has now become the uniform language of that exchange, but the exchange itself is heavily dependent on context and readily reflects the continuing legitimate power of appellate actors within the exchange. If aware appellate judges feel the need to declare or apply law in the process of reciting abuse review, they will continue to do so, rightly, under that umbrella term. The Supreme Court's more flexible cases on the *application* of abuse review seem to recognize this reality.

Many lower appellate courts likely understand this too. Judges who write about discretion on appeal know its fluidity and the importance of context.[14] One court said it best: "There is discretion and then there is discretion."[15] Even as the abuse of discretion test becomes the required language of review (the currency of exchange), its application increasingly recognizes a powerful appellate role within that review. "Abuses" are found more readily and more often.[16]

More to the point, a pre-*Joiner* appellate panel in the Sixth Circuit, which grasped its own need for a viable oversight process, did so by declaring some aspects of the *Daubert* inquiry, especially whether the opinion offered is properly regarded as "scientific knowledge," to be "legal" and thus reviewed *de novo*.[17] The panel recognized that the gatekeeping function should also occur in the appellate courts. Today, that rationale remains persuasive, though it cannot be operationalized by terming the finding one of "law" and thus overtly rejecting the abuse of discretion test. Yet surely, this court was correct that any aspect of the *Daubert* inquiry which triggers broad lawmaking, or invites the application of norms which control beyond the case at hand, should be done

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13. *See* Robert C. Post, *The Management of Speech: Discretion and Rights*, 1984 SUP. CT. REV. 169, and CHILDRESS & DAVIS, *supra* note 5, §§ 4.01 and 4.21.

14. *See* Henry J. Friendly, *Indiscretion About Discretion*, 31 EMORY L.J. 747 (1982).

15. Metlyn Realty Corp. v. Esmark, Inc., 763 F.2d 826, 831 (7th Cir. 1985).

16. This is especially so to the extent "discretion" is not the same as fact-finding, which may be less fluid as it searches to establish a real truth. Thus, Ghosh's statement that *Joiner* applies abuse of discretion as the usual test for "trial court's factual findings" may gloss over the essential differences between fact-declaration and the exercise of discretion, missing the chance to stress that the latter has more inherent leeway.

17. Cook v. American S.S. Co., 53 F.3d 733, 738 (6th Cir. 1995). A later panel was strongly critical of this decision, *see* United States v. Jones, 107 F.3d 1147, 1151 (6th Cir. 1997), *cert. denied*, 521 U.S. 1127 (1997). Perhaps they can be reconciled as I suggest above, by locating that legitimate appellate function *within* abuse review.

without strong deference in any appellate court that keeps its day job, *i.e.*, law declaration.

Ghosh's fear of inconsistent application of *Daubert* across the United States is more immediately supported by the Court's recent language in *Kumho Tire Co. v. Carmichael*.[18] As he notes, the Court gives trial courts "discretion" yet again, now even on the decision as to which *Daubert* factors control and how they apply to a particular technical inquiry. This is, I am sure he would agree, loose and dangerous language if it is read to mean that nearly automatic affirmance follows in the appellate court. Yet, even under *Kumho Tire*, it is not clear that the appellate court is taken out of its legitimate review process, and its important dialog with the trial judge, as long as that review is done within an "abuse of discretion" inquiry. Instead, such an inquiry should be properly understood to require thoughtful and involved input from the appellate judges and not the kind of blind deference that the language of "abuse" may at first blush require.

In concrete terms, it should still be clear that a trial judge who has applied *Daubert* inappropriately, in a way that would affect a larger grouping of like cases, should be found to have abused his or her discretion. In the process, the appellate court may not say it is declaring law broadly, but the consistent finding of abuse of discretion in like cases will have that effect. This is apparently how rules of law are increasingly declared within the broad world of "discretion."

Using the larger body of Supreme Court jurisprudence on discretion, and not just its thin infusion into the issue of experts found in *Joiner* and *Kumho Tire*, Ghosh's hope that courts as a whole can implement *Daubert*, with some understanding and consistency in its application, may yet be realized. At the least I hold more optimism about that than he expresses. As limited as *Joiner* is as an opinion, I do not believe that courts generally will find themselves so limited in its application.

In any event, Ghosh makes a good case as to why *Joiner* is wrong, if it means such hard-and-fast deference. I would simply add that there is no such thing as hard-and-fast deference in the flexible and contextual world of judicial discretion, such that it is possible within that world to do the appellate good that Ghosh suggests.

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18. Kumho Tire Co. v. Carmichael, 119 S. Ct. 1167 (1999).

Book Review: Reviewing Dau-Schmidt & Ulen, Law and Economics Anthology, and Mercuro & Medema, Economics and the Law: From Posner to Post-Modernism.

ROBIN PAUL MALLOY*

INTRODUCTION

The use of economic reasoning in law has been growing steadily for more than twenty-five years. In the beginning, the use of economics was limited to legal questions related to antitrust and regulated industries, but now economic reasoning has invaded every area of law. It has found its way into First Amendment law, criminal law, takings law, family law, contracts, property, torts, corporations, intellectual property, commercial law, bankruptcy, statutory interpretation and other areas. Today, no one can really consider himself to be a well-educated lawyer if he is unfamiliar with such concepts as the Coase Theorem, Public Choice Theory, Arrow's Theorem, the theory of the efficient breach, the endowment effect, wealth maximization, externalities, and cost and benefit analysis. Certainly, all major appellate work opens itself up to the vast and influential forces of economic analysis, and most government legislation now undergoes cost and benefit analysis. Likewise, every law school in the country offers a course in law and economics, and many of the leading casebooks for main line law school classes include discussions of, and cases that illustrate, the use of economic reasoning in the law.[1] There are more than one half-dozen journals, hundreds of law books, and thousands of law review articles devoted specifically to the subject matter of law and economics.

Increasingly, federal and state courts make explicit references to law and economic sources and ideas in their opinions. A good example of the central role of economics in law is the case of *BMW v. Gore* argued before the U.S. Supreme Court on October 11, 1995[2]. During this case, each side to the dispute had their own team of law and economics scholars file extensive briefs in support of shaping the law in a particular economic fashion. This practice of using

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1. ROBIN PAUL MALLOY and JAMES C. SMITH, REAL ESTATE TRANSACTIONS (1998).
2. BMW of N. Am. v. Gore, 517 U.S. 559 (1996).

law and economics experts is becoming more and more frequent, and I have given advice in several situations. In *BMW v. Gore,* I was on the brief in support of Dr. Gore who sued BMW for failure to disclose the fact that his *new* BMW had been repainted prior to sale. In support of Dr. Gore, we argued about the need for disclosure and access to information for a market to operate effectively. We also used economic analysis to diminish fears of uncontrollable global damages in certain types of tort cases. In contrast to our approach, the experts for BMW presented arguments against the need for disclosure and in support of a need to control the potential for costly global damages and tort awards. The fact that extensive economic arguments were made for both sides indicates the importance that economic reasoning plays in the legal decision making process. It also confirms the fact that economic analysis can be used to support competing views as each team offered support for alternative legal outcomes. Beyond the *BMW v. Gore* example, it is evident that many judges, particularly on the Federal Bench, regularly apply economic analysis in making legal decisions. Therefore, being ill-equipped to make or respond to such arguments can be fatal to a lawyer's success in promoting a client's cause.

To better understand the nature of economic concepts applied to legal reasoning, one should be familiar with some basic texts on the subject matter. These include: Malloy's *Law and Economics: A Comparative Approach to Theory and Practice*;[3] Cooter and Ulen's *Law and Economics*[4] and Posner's *Economic Analysis of Law*.[5] To these basic sources we can now add two new books. Both books should prove useful for students, judges and practitioners, as well as for academics. The first book is by Kenneth G. Dau-Schmidt and Thomas S. Ulen and entitled *Law and Economics Anthology* ("Anthology").[6] The second book is by Nicholas Mercuro and Steven G. Medema and is entitled *Economics and the Law: From Posner to Post-Modernism* ("Economics").[7] Both books offer thoughtful overviews of the field. *Anthology* is organized by subject matter (property, contracts, torts, criminal law, etc.) whereas *Economics* is arranged with reference to particular approaches or schools of thought within economics (Chicago School, Institutional and Neo-Institutional economics, etc.). Each work is primarily descriptive and informative without passing judgment on any particular school of thought or "leading figure" within law and economics.

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3. ROBIN PAUL MALLOY, LAW AND ECONOMICS: A COMPARATIVE APPROACH TO THEORY AND PRACTICE (1990) [hereinafter MALLOY, LAW AND ECONOMICS].

4. ROBERT COOTER & THOMAS S. ULEN, LAW AND ECONOMICS (2d. ed. 1997) [hereinafter COOTER & ULEN, LAW AND ECONOMICS].

5. RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW (5th ed. 1998).

6. KENNETH G. DAU-SCHMIDT & THOMAS S. ULEN, LAW AND ECONOMICS ANTHOLOGY (Anderson Publ'g. Co., Cincinnati, Ohio) (1998) [hereinafter ANTHOLOGY].

7. NICHOLAS MERCURO & STEVEN G. MEDEMA, ECONOMICS AND THE LAW: FROM POSNER TO POST-MODERNISM (Princeton Univ. Press) (1998) [hereinafter ECONOMICS].

In this brief review I will comment first on the *Anthology* and then on *Economics*. I will then address a common omission from each book and make some suggestions for additional readings that can help to complete the picture drawn by these two useful texts.

LAW AND ECONOMICS ANTHOLOGY

Anthology is an edited selection of articles that figure into the general discourse of law and economics. There are seven chapters in the book ranging from an introduction that provides the basic contour of the field, with selected pieces on the benefits and the detriments of using economic analysis in law, to chapters on specific subjects and topics. Other chapters include readings on the Coase Theorem, the economics of property, the economics of contract law, the economics of tort liability, the economics of criminal law, and the efficiency of the common law. Subtopics within the chapters provide exposure to arguments covering a broad spectrum of issues such as enforcement problems, damages, remedies, defenses, and hot topics like intellectual property. In essence, the book provides excellent coverage of debates in law and economics as they concern most of the concepts covered in the first year courses of law school.

Dau-Schmidt and Ulen do an excellent job of editing the selected pieces so that they fit together well and so that the main points come across clearly and quickly to the reader. This is exactly what needs to be done for such a book to be useful as a resource text. The first chapter of the book provides the best reading, in my opinion, as it presents one of the best outlines of the nature of the law and economics mission and of the critiques thereof. In a carefully edited chapter of eighty pages, the authors convey a simple and clear statement of how basic economic concepts can be applied to law. They also give the reader a nice flavor for the debate concerning the advantages and disadvantages of legal economic analysis. This chapter is followed by one on Coase that I think is also nicely presented, even if a bit too long. The readings here provide a good package of materials for a full and thoughtful discussion of the Coase Theorem and its uses in legal analysis. These first two chapters are the best parts of the book because they gather together a lot of information and points of view and make it possible to read a breadth of materials in a way that would otherwise be very difficult. If one is thinking about learning such ideas, *Anthology* does a nice job of simplifying the task.

The remaining chapters in the book present a sound and thoughtful presentation of the debates related to each of the relevant subject matters in law. The materials are well edited and organized, and serve as a useful complement to a number of other textbooks already on the market. Ulen's book with Cooter, for example, is a textbook that does a good job of explaining economic analysis applied to a number of areas of law, including: property, contract, criminal, and

tort law.[8] All in all, the first two chapters in *Anthology* stand out as contributions that really cover the ideas better than in other available texts.

One problem with *Anthology* is the limitation of its format. Perhaps it is only because each of the authors has published such fine work in the field that the reader wishes the book contained more analysis and thoughtful commentary by Dau-Schmidt and Ulen. As it is, they provide a minimal introduction for various reading materials and follow up with some brief questions for consideration. As an instructive text, I would have enjoyed seeing a little more input from these authors.

In approaching their work by selecting and editing law review articles, the authors tap into competing legal theories and to the structure of legal discourse as it relates to law and economics. This provides a nice summary and introduction to leading articles and resources in the field.

ECONOMICS AND THE LAW: FROM POSNER TO POST-MODERNISM

Economics is a text that presents a description and discussion of some competing approaches to the economic analysis of law. It does this by looking at debates in law and economics through the lens of an economist, electing to compartmentalize alternative approaches with reference to particular schools of thought defined in the field of economics. There are seven chapters, including an introduction; Chicago School law and economics (basically classical/neoclassical economics); public choice theory; Institutional law and economics; Neo-Institutional law and economics; Critical Legal Studies (presented as Neo-Marxist economics); and finishing with some thoughts on future issues to be addressed. The book does an excellent job of explaining basic differences between schools of thought in economics and showing how these differences create diversity in the economic analysis of law.

Economics is an outgrowth of a contribution that Mercuro and Medema did for a book I edited with Chris Braun for Peter Lang Publishers titled *Law and Economics: New and Critical Perspectives*.[9] The book presented contributions by a number of authors including both Dau-Schmidt and Ulen. My book actually came out as a volume in a series on law and semiotics so my own contribution and that of Braun sought to place some of these issues into a semiotic interpretive framework.[10] Simply put, we were interested in considering the

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8. *See* COOTER & ULEN, LAW AND ECONOMICS, *supra* note 4.

9. ROBIN PAUL MALLOY & CHRISTOPHER K. BRAUN, LAW AND ECONOMICS: NEW AND CRITICAL PERSPECTIVES (eds. 1995). I should note that Mercuro and I overlapped at Tulane Law School for two years. I taught a number of courses including one on *Law and Economics* (which has evolved into *Law and Market Economy*), and he, while on the faculty at the University of New Orleans, was teaching a course at Tulane called *Economics of Legal Relationships*. These courses did not duplicate each other as he focused on economic calculation and analysis, and I concentrated on developing a new jurisprudence of exchange.

10. Semiotics is a branch of philosophy that looks at language, linguistics, and meaning.

meanings and consequences of using economic reasoning to decide legal questions.

In *Economics*, Mercuro and Medema expand on their earlier work and produce an excellent and thoughtful book containing many helpful references. I found that the chapters were well written and easy to follow but I thought that Chapter One included an appendix that compressed too much economics into too small a space for the typical lawyer or student to fully comprehend. Other than that, I think that the book should be readily accessible to just about any reasonably informed reader.

The idea of dividing the book by schools of thought rather than subject matter is a good one. I first did this in my book *Law and Economics: A Comparative Approach to Theory and Practice* published in 1990.[11] In fact, division by approach allows one to work through some of the traditional subject matter categories and more readily explore unifying features or themes between them. Mercuro and Medema do this well and provide a useful feature when they give examples and applications in each chapter.

Personally, I found the chapters on Institutional and Neo-institutional Economics to be the most interesting and enlightening. Some variation of these two schools is likely to be appealing to a number of people interested in economics and law who are still not sold on the Posner and Chicago School approach. Institutionalism lends itself to a broad range of social science investigation and has a nice fit with a lawyer's interest in institutions and social processes. The authors even mention Charles S. Peirce in this section of the book.[12] They cite Peirce as a leader in American Pragmatism that influenced law in the early 1900's.[13] It is Peirces' theory that shapes and informs my own work in law and market economy and I think it would be advantageous for the authors to more carefully explore Peirce's work as it bears upon an understanding of the relationship between law and market theory.[14]

The central importance of this book is its ability to clarify and define different schools of thought in economics while relating them to law. It also makes a valuable contribution to our understanding of the broader picture of law and economics. Too often the discussion of law and economics centers on the work of Judge Richard Posner and members of the Chicago School. The narrowness

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11. MALLOY, LAW AND ECONOMICS, *supra* note 3. My book is arranged by reference to alternative legal theories rather than those of economics. The book is offered as a primer and is a simple and easy read for getting started in law and economics. To the best of my knowledge, it was also the first book to seriously define and include Critical Legal Theory as within the gambit of law and economics. (It has been translated into Japanese and Chinese).

12. ECONOMICS, *supra* note 7, at 103.

13. RICHARD A. POSNER, THE PROBLEMS OF JURISPRUDENCE 454 – 69 (1990) (also giving favorable discussion to Peirce).

14. ROBIN PAUL MALLOY, LAW AND MARKET ECONOMY: REINTERPRETING THE VALUES OF LAW AND ECONOMICS (forthcoming 2000).

of this approach often turns off many lawyers and legal academics who find Posner's work to be lacking in values and social ethics. Mercuro and Medema make other economic approaches accessible and reveal the richness of economics. Like law, economics is not a monolith and many variations exist. In this respect *Economics* provides a valuable glimpse into generally unexplored territory.

A weakness of *Economics*, however, is its desire to remain neutral in describing each of the approaches included in the book. While this is useful as a device for providing definitional information, it seems to get in the way of explaining why or how one would effectively chose between one approach or another in any given situation. In other words, how should one strategically select a framework in order to promote a particular agenda? Lawyers are advocates after all, and each of the approaches leads to the consideration of different facts, variables, and options. Each approach favors a different decision maker and a different decision making process. Thus, I found myself wanting to read more from the authors about the normative and strategic consequences of the approaches being discussed.

OMISSIONS FROM EACH BOOK

I think both books are valuable to people interested in learning more about the relationship between law and economics. Having said this, however, I think that both books suffer from the same omission. Neither book deals with work being done in the area of interpretive law and market theory. Nor do these books give any real coverage to related concepts addressed by Austrian economics.[15]

As to interpretive theory, nothing is included by McCloskey, whose classic work on rhetoric and economics dates back to 1985,[16] and has been followed by law review articles and additional books.[17] Likewise, my work, and that of Denis Brion of Washington and Lee Law School, have focused on these issues for a number of years. I also find that some of the work being done from a feminist perspective in economics relates heavily to interpretation theory at the

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15. *See, e.g.*, FREDERICK A. HAYEK, THE CONSTITUTION OF LIBERTY (1960); 1 FREDERICK A. HAYEK, LAW, LEGISLATION AND LIBERTY 22 (1973); ISRAEL M. KIRZNER, THE MEANING OF MARKET PROCESS (1996); ISRAEL M. KIRZNER, DISCOVERY AND THE CAPITALIST PROCESS, 26, 126, 129, 164, 178 (1985).

16. DONALD N. MCCLOSKEY, THE RHETORIC OF ECONOMICS (1985).

17. *See, e.g.*, DONALD N. MCCLOSKEY, IF YOU'RE SO SMART: THE NARRATIVE OF ECONOMIC EXPERTISE (1990); DONALD N. MCCLOSKEY, KNOWLEDGE AND PERSUASION IN ECONOMICS (1994); Donald N. McCloskey, *The Rhetoric of Law and Economics*, 86 MICH. L. REV. 752 (1988); Donald N. McCloskey, *The Lawyerly Rhetoric of Coase's the Nature of the Firm*, 18 J. CORP. L. 425 (1993); Donald N. McCloskey, *Some Consequences of a Conjective Economics*, *cited by* MARIANNA A. FERBER & JULIE A. NELSON, BEYOND ECONOMIC MAN: FEMINIST THEORY AND ECONOMICS (eds. 1993) [hereinafter FERBER & NELSON, BEYOND ECONOMIC MAN].

core of our understanding of economic relationships.[18] An excellent paperback book to look at in this respect is *Beyond Economic Man*, by Ferber and Nelson.[19] I have used this in my basic law and market economy course for several years and find it very valuable. The point is that law and economics involves language, meaning and choice. We need to consider law and economics from the point of view of its interpretive functions and influences. We need to consider how alternative conceptual frame works shape our *understanding* of society and reshape social relationships. To ignore interpretation theory is to ignore the very process by which law and economic discourse is understood. Likewise, it prevents us from appreciating the subjective bias present in various economic assumptions.

In other words, we need to think about what we are doing when we say that the law should have economic efficiency as one of its primary, if not highest, goals. We need to be able to understand and to question people like Judge Posner. This is especially so when he says that we can use economic thinking to compare the presence of Jews and Blacks in a neighborhood, to the market problems of dealing with a common law nuisance;[20] or that rape can be understood as a circumvention of the marketplace for voluntary sexual exchanges;[21] or that the adoption of children would proceed more efficiently if the law allowed the market to allocate babies to the highest bidder rather than using the ambiguous criteria applied by most adoption agencies.[22]

In fairness to the authors of both books, works in traditional law and economics typically fail to address these fundamental issues of meaning and interpretation. Linguistics, rhetoric, narrative, and semiotics seem too removed from the science of economics for most people working in the field of law and economics. I suggest, however, that we should include these fields of study in law and economics if we want to more fully understand the relationship between law and market theory. We should also include them if we want to more carefully link this work to legal practice. This is because lawyers create meaning and shape values when they practice law. Therefore, they need to understand how the use of economic concepts will impact on the process of shaping law and the legal system.

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18. *See, e.g.*, works by Marleen O'Connor of Stetson University Law School (on corporate governance), Gillian K. Hadfield at the University of Toronto (on contract theory), and Terry O'Neill at Tulane Law School (on corporate governance).

19. FERBER & NELSON, BEYOND ECONOMIC MAN, *supra* note 17.

20. RICHARD A. POSNER, THE ECONOMICS OF JUSTICE 84-5 (1983).

21. RICHARD A. POSNER, SEX AND REASON 70-82, 212, 384-395 (1992).

22. Elisabeth M. Landes & Richard A. Posner, *The Economics of the Baby Shortage*, 7 J. LEGAL STUD. 323 (1978).

CONCLUSION

In *Anthology* and in *Economics* we have two new and valuable books. In their own way each makes a valuable contribution to our understanding of law and economics.

Proprietary Rights and the Human Genome Project: A Legal and Economic Perspective

JAMES J. MUCHMORE*

INTRODUCTION

Genetics is the fundamental biological science, for without genes there is no life. Thus, a full understanding of any biological process can only be achieved when there has been a detailed analysis of gene structure and function.[1] This is a central concern of the human genome project, and the implications of this project raise a number of important legal issues.

In the last twenty years, the development and understanding of the human genome has grown rapidly, and with the growth in understanding has come the question of property rights. Ownership in human genomes has become a hotly contested legal issue, and the main legal question that arises concerns the extent to which an individual or corporation possesses an enforceable property right to a human genome for its exclusive use. This article discusses the arguments supporting and criticizing the extension of property rights to the human genome and analyzes what the most effective policy for the treatment of the human genome should be in the future.

It is important to be aware of the controversy surrounding the sequencing of the human genome because of the tremendous economic and social impact of this project. Economically, research and development of the human genome contributes millions of dollars to the United States economy.[2] For example, during a fifteen-year period ending in 1997, the United States government had contributed over three billion dollars to the Human Genome Project (HGP).[3]

The HGP is also a significant issue because of its social ramifications. The HGP will have a tremendous effect on all individuals on earth. Scientists believe that the HGP will provide innumerable medical breakthroughs.[4] The HGP will enable scientists to treat patients with genetically caused disorders more efficiently and effectively.[5] Mapping and sequencing the genome will also en-

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1. *See* Courtney J. Miller, *Patent Law and Human Genomics*, 26 CAP. U. L. REV. 893 (1997).

2. *See* Melissa L. Sturges, *Who Should Hold Property Rights to the Human Genome? An Application of the Common Heritage of Humankind*, 13 AM. U. INT'L L. REV. 219 (1997).

3. *Id.* at 229.

4. *Id.* at 224.

5. *Id.*

able pharmaceutical companies to create drugs that are more effective.[6] Scientists expect the results of the HGP to be the "source book for biomedical science in the Twenty-First century."[7] Because of this tremendous impact, in the future the HGP will influence major social issues such as healthcare, medical availability, eugenics, and the potential for genetic-based discrimination.

This article discusses the legal and economic issues surrounding the HGP. The article examines the application of property rights to the HGP and analyzes the legal and economic theories applicable to the patentability of the human genome. The first section of the piece addresses the history and development of the HGP. The second section discusses the patent system and the property assignment history of the human genome. The third section discusses major United States case law addressing patent rights and body parts. The fourth section discusses the application of the Common Heritage of Humankind to the HGP. Finally, the last section of the article discusses the international attitude toward patentability and argues that property rights must continue to be granted to HGP developments.

I. THE HISTORY AND DEVELOPMENT OF THE HGP

Before discussing different perspectives on the HGP, an adequate understanding of its development and history is necessary. Therefore, this section of the article provides a brief history of the understanding of the human gene and of the development of the HGP. In doing this, I first explain the scientific definitions of genes and the discovery of deoxyribonucleic acid ("DNA"). Then, I discuss the emergence of an interest in the development of the HGP by the United States and the international community.

Gene patenting is the granting of patents for identified sequences of human DNA.[8] A gene is a segment of the nucleotide sequence comprising the DNA molecule, and the biological information that is carried by a gene is contained within the nucleotide sequence.[9] Genes are the functional units of heredity, and contained within the nucleotide sequences of genes is the information required for synthesizing proteins.[10] The estimated three billion nucleotide base pairs in the human genome are organized into distinct, physically discrete units called chromosomes, and each contains a single DNA molecule.[11] The nucleus of most human cells contains twenty-three pairs of somatic chromosomes, and one

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6. *Id.* at 225.

7. *Id.*

8. Patricia A. Lacy, *Gene Patenting: Universal Heritage vs. Reward for Human Effort*, 77 OR. L. REV. 783, 784 (1998).

9. *Id.* at 784.

10. Miller, *supra* note 1, at 896.

11. *Id.*

pair of sex chromosomes, with each chromosome carrying hundreds of thousands of genes.[12]

The original discovery that gave rise to the gene patenting controversy occurred in 1953 when scientists James Watson and Francis Crick discovered the double helical structure of DNA.[13] Building on that discovery, modern biogeneticists have developed a means of separating the two strands of natural DNA to obtain gene sequences.[14] In the United States, the Office of Health and Environmental Research of the Department of Energy had originally conducted research and development of human genes.[15] However, in 1988, the National Research Center recommended that the United States support the evolution of the HGP.[16] Eventually the National Institutes of Health (NIH) established the National Center for the Human Genome Research, which currently provides support in the research and development of the HGP.[17]

After the National Center for the Human Genome Research was established, an international effort toward the sequencing of the entire human DNA structure evolved. To develop the HGP on an international level, the Human Genome Organization (HUGO) was established, consisting of 239 consultants from twenty-three countries.[18] The HGP is an international cooperative effort with long-term goals that include sequencing the entire human genome, and disclosing all results.[19] This organization is the primary organization mapping the human DNA sequence.[20] Understanding the programs and research efforts of the HGP is necessary for one to identify the parties interested in securing property rights in HGP discoveries.

II. PATENTS AND THE HUMAN GENOME

This section of the article discusses the patent development of the human genome. It first identifies some of the reasons that companies and organizations seek to acquire patents on human genomes. Then, the section explains the patent application procedure as it relates to the human genome in the United States. Finally, it sets out the genome patent history in the United States.

In order to register a patent in the United States, an individual or corporation must apply through the United States Patent and Trademark Office (PTO).[21]

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12. *Id.*
13. Lacy, *supra* note 8, at 784.
14. *Id.*
15. *See* Allyn L. Taylor, *Globalization and Biotechnology: UNESCO and An International Strategy to Advance Human Rights and Public Health*, 25 AM. J.L. & MED. 479 (1999).
16. Sturges, *supra* note 2, at 230.
17. *Id.*
18. *Id.* at 231.
19. *Id.*
20. Sturges, *supra* note 2, at 231.
21. *Id.* at 234.

Patents are applied for to protect inventions so that financial rewards can be earned to compensate inventors and encourage further creative work. Because a great deal of money is needed to take advantage of discoveries in biotechnology, and because most money does not come directly from the government, private sources of funding are necessary.[22] To encourage private investment and initiative, the patent system establishes and protects rights in inventions. The possibility of patent protection and property rights in biotechnology provides the potential for great financial return to investors. Facilitating predictability in capital biotechnology investment is important and is fostered by providing certainty of ownership and property rights under the patent laws.[23]

To successfully receive a patent on a genome sequence, an applicant must meet several federal statutory patent standards. Biotechnology inventions normally qualify for utility patents, so long as they fall within the statutory framework of Title 35 U.S.C. §10, which provides in relevant part that "[W]hoever invents or discovers any new and useful process, machine, manufacture, composition of matter, or any new and useful improvement thereof, may obtain a patent therefore."[24] In determining the patentability of DNA sequences, courts have generally referred to the rules that apply to chemical inventions.[25]

In addition to the above, there are several standards that an invention must meet to receive patent protection. The first requirement a product must meet in order to secure a patent is that the invention must have practical utility.[26] In general, for an invention to have utility, it must actually be able to achieve some specific desired result.[27] The Supreme Court elaborated on utility in *Brenner v. Manson* when it invalidated a patent claim to a process making a steroid compound that lacked any demonstrated utility.[28] The Court rejected the patent claim because it failed to disclose any utility for the chemical produced by the process.[29] The Court stated that a process or product with no known uses, or that is useful only in the sense that it may be the subject of scientific research, is not patentable.[30] "It is not a reward for the search, but compensation for successful completion."[31] In terms of the human genome, DNA sequences are useful for diagnosing certain genetic diseases or traits, such as cystic fibrosis or Tay-Sach's disease.[32]

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22. D. Bejamin Borson, *The Human Genome Projects: Patenting Human Genes and Biotechnology. Is the Human Genome Patentable?*, 35 IDEA 461, 467 (1995).
23. *Id.*
24. Miller, *supra* note 1, at 906.
25. *Id.* at 907.
26. *Id.* at 908.
27. *Id.*
28. *See* Brenner v. Manson, 383 U.S. 519 (1966).
29. *Id.* at 534-35.
30. *Id.*
31. *Id.* at 536.
32. Borson, *supra* note 22, at 470.

The second requirement necessary to receive a patent for an invention is that it be novel.[33] The requirement that an invention be novel forbids the granting of a patent on a product that already exists in the market.[34] The requirement that an invention be novel exists to ensure that the public is not prejudiced by the grant of a patent on an invention or technology already existing in the public domain.[35] As it relates to the HGP, the "novelty" patent standard can normally be satisfied if a claimed DNA composition is of increased purity so that it is sufficient to distinguish the product from its unpurified, naturally occurring form.[36]

The third requirement necessary to acquire a patent and thereby a property right is the nonobviousness requirement.[37] The patent law states that the invention will not be patentable if at the time of its making, it would have been obvious to a person having ordinary skill in the relevant art.[38] For biotechnology inventions, objective factors include: the commercial success of the invention, the length of time a need for the invention had been felt before the invention was made, copying, expected results, and failure of other inventors to come up with the solution offered by the invention in question.[39]

Companies in the United States began applying for patents for partial sequences of the human genome in 1991.[40] In that year, the NIH applied for the first patent on behalf of Dr. Craig Venter, a former employee of the NIH.[41] The NIH wanted to ensure a patent to secure the United States' economic strength in the global biotechnology industry.[42] Since that time, the NIH alone has filed applications for over 2,750 partial DNA sequences, and the PTO has also issued patents to companies for genetic discoveries.[43]

In conclusion, while the U.S. patent system is expensive and sometimes difficult, it provides the means by which property rights on the human genome are secured. In light of the large expense, investment, and effort that goes into the research and development of the HGP, it is not surprising that companies and organizations want to protect their investment through a patent and reap the benefits from their labor in financial terms. Due to this financial incentive, an understanding of the laws that govern the gene patentability determination is essential.

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33. Miller, *supra* note 1, at 910.
34. *Id.*
35. *Id.*
36. *Id.* at 911.
37. Miller, *supra* note 1, at 912.
38. *Id.*
39. *Id.*
40. Sturges, *supra* note 2, at 234.
41. *Id.*
42. *Id.*
43. *Id.* at 235.

III. MAJOR U.S. CASE LAW ADDRESSING PATENT RIGHTS AND BODY PARTS

There are two seminal court cases that have dealt with the issue of property rights in the human body. This section of the article discusses those two cases. First, it addresses *Diamond v. Chakrabarty*.[44] Then, it addresses *Moore v. Regents of the University of California* and criticisms of that case.[45] Finally, this section analyzes *Moore* in relation to *Chakrabarty*.

The major Supreme Court case concerning the assignment of property rights to the human genome is *Diamond v. Chakrabarty*.[46] In this case, the Supreme Court held that live, human-created bacterial microorganisms are patentable.[47] The Court classified the genetically altered living organisms as "manufacturers" or "compositions of matter" because they were not natural occurrences in nature.[48] The Court stated that "anything under the sun that is made by man is patentable," and that the linchpin for patentability was human intervention.[49]

This case set forth a new standard for the imposition of biological property rights. Interpreted in the context of state and federal laws that prohibit the sale or inheritance of certain human body parts, this case appears to stand for the proposition that while selling a limb or an organ is not permissible, there are some types of human material that can carry with them at least limited property rights.[50]

After *Chakrabarty*, the major case that deals with the assignment of property rights to human body parts is *Moore v. Regents of the University of California*.[51] *Moore* is the most important, and virtually the only case on the subject of the body part ownership that reflects the new value of the human body in light of scientists' ability to identify and patent specific physical body parts.[52] In this case, Mr. Moore was diagnosed as having hairy cell leukemia, which necessitated the removal of his spleen.[53] Therefore, Mr. Moore consented to have his spleen removed.[54] Unbeknownst to Mr. Moore, after his spleen was removed, it was promptly taken to his doctor's research lab. There the doctor began research involving various cells contained in the excised spleen.[55] For the next seven years, Mr. Moore returned to the doctor to have various blood and tissue

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44. *See* Diamond v. Charkrabarty, 447 U.S. 303 (1980).
45. *See* Moore v. Regents of the University of California, 793 P.2d 479 (1990).
46. *Charkrabarty, supra* note 44.
47. *Lacy, supra* note 8, at 788.
48. *Id.*
49. *Id.*
50. Stacey Sutton, *The Real Sexual Revolution: Posthumously Conceived Children*, 73 ST. JOHN'S L. REV. 857, 920 (1999).
51. *Moore*, 793 P.2d 479 (1990).
52. *See* William Boulier, Note, *Sperm, Spleens, and Other Valuables: The Need to Recognize Property Rights in Human Body Parts*, 23 HOFSTRA L. REV. 693 (1995).
53. *Id.* at 701.
54. *Id.*
55. *Id.*

samples taken, with the understanding that these medical procedures were necessary to his health and well being.[56]

Without Mr. Moore's knowledge, the doctor had managed to use Mr. Moore's spleen and other tissue to establish a cell line which the doctor eventually patented.[57] The cell line, derived from both Mr. Moore's cells and the doctor's hard work, was at one time estimated to be worth over three billion dollars due to the variety of rare products the cell line was capable of producing.[58] Mr. Moore subsequently sued the doctor, alleging a claim of conversion, and claiming that he had property rights in his cells and amputated spleen.[59] The California Supreme Court rejected Mr. Moore's claims.[60] The court held that Mr. Moore had no right to possession of his cells and once the cells were removed from his body, they were considered abandoned.[61]

In ruling against Mr. Moore, the court referenced the economic and social benefits that cell research provided. In part, the court rejected the conversion claim by stating that the conversion claim and property right claim threatened to destroy the economic incentive to conduct important medical research.[62] The court stated that if the use of cells in research is a conversion, then with every cell sample a researcher purchases a ticket in a litigation lottery.[63] Furthermore, the court declared that because liability for conversion is predicated on a continuing ownership interest, companies are unlikely to invest heavily in developing, manufacturing, or marketing a product when uncertainty about clear title exists.[64]

The court concluded in *Moore,* that economically it was not rational to grant Mr. Moore rights in his cells. Applying an economic analysis to this case, Mr. Moore suggested that the externalities of the transaction between he and his doctor were too adverse to justify his denial of rights. He suggested that the transaction costs associated with enforcing his rights were minimum in comparison to the costs of denying his rights.[65] By deciding in favor of the Regents, the court implied that the transaction costs and externalities that research institutions and hospitals would incur if individuals were granted property rights in their cells was too high to justify the imposition of those rights.[66] While socially it may have been more preferable for individuals to have rights in their

56. Boulier, *supra* note 52, at 702.
57. *Id.*
58. *Id.*
59. *Moore*, *supra* note 45.
60. *Id.*
61. *Id.*
62. *Id.* at 495.
63. *Moore*, *supra* note 45, at 496.
64. *Id.* at 495.
65. ROBIN PAUL MALLOY, LAW AND ECONOMICS: A COMPARATIVE APPROACH TO THEORY AND PRACTICE 35 (1990).
66. *Id.*

cells, economically the costs associated with the maintenance and enforcement of those rights was not justified in light of the social benefit that cell research created. The *Moore* court was more concerned with economic policy considerations and the formulation of biotechnology law, rather than an ethical analysis.[67]

In spite of the holding in *Moore*, studies have demonstrated a suspicious and potentially unethical relationship between academics researching the human genome and drug companies. For example, it has become increasingly apparent that instead of protecting the technology industry from the specimen sources' demands, it may be necessary to protect society—and the specimen sources—from the technology industry.[68] One recent survey done by Boston researchers found that the ties between academic institutions and the technology industry are both numerous and detrimental.[69] The survey confirmed the widespread impression that involvement between commercialization and the academic-industry are associated with the tendency of life-sciences faculty to withhold research results.[70] The survey also found that researchers who were engaged in commercialization of their research were three times more likely to delay publication of their results and more than twice as likely to refuse to share information or materials.[71] In fact, forty-four percent of those surveyed stated that the delay was due to a company agreement, or to protect the financial interests of the scientists.[72]

The court's decision in *Moore* endorsed the Kaldor-Hicks theory of economic efficiency. The Kaldor-Hicks theory is not concerned with whether or not a reallocation of resources will make certain individuals worse off, but it is concerned with whether or not society's aggregate utility will be maximized.[73] According to this theory, reallocation of resources is efficient if those who gain from the transaction obtain enough to fully compensate those who lose from the transaction, even though there is no requirement that actual compensation occur.[74] Concluding that the economic and social benefits that cell research provided outweighed Mr. Moore's individual rights, the court implied that gains in gene research, invention, and ingenuity are paramount over individual genetic tissue rights.

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67. Barbara Looney, *Should Genes Be Patented? The Gene Patenting Controversy: Legal, Ethical, and Policy Foundations of an International Agreement*, 26 LAW & POL'Y INT'L BUS. 231, 257 (1994).

68. Erik B. Seeney, *Moore 10 Years Later—Still Trying to Fill the Gap: Creating a Personal Property Right in Genetic Material*, 32 NEW ENG. L. REV. 1131, 1166 (1998).

69. *Id.*

70. *Id.*

71. Seeney, *supra* note 68, at 1167.

72. *Id.* at 1166.

73. Malloy, *supra* note 65, at 39-40.

74. *Id.*

In the context of the *Chakrabarty* decision, the decision in *Moore* not to extend a property right to Mr. Moore is easily understood.[75] Under *Chakrabarty*, a person would have a property right in his or her biological material only if the material is the product of human intervention.[76] Thus, Mr. Moore would have a recognizable property right only in the tissue of his spleen.[77] He would not have a recognized property right in the cell line based on the tissue of his spleen because the cell line was not the product of his human ingenuity.[78] Thus, Mr. Moore could not state a claim for a percentage of the cell line's profit because only inventors who contributed to the intellectual development of the cell line may share in the resulting profits, a contribution Mr. Moore did not make.[79]

These cases represent some of the different standards that United States courts have set concerning individual ownership of body parts. The gene ownership standard hinges on the amount of human ingenuity that is utilized in the development of a cell or an organ. The legal standards set forth reflect the neoclassical economic system that exists within the United States, as courts extend patent rights to individuals and corporations on the basis of economic efficiency and wealth maximization.[80] In spite of these cases, there are other international arguments addressing how HGP discoveries should be handled.

IV. THE COMMON HERITAGE ALTERNATIVE

This section of the article discusses the most commonly supported alternative to issuing patents for the human genome, the "common heritage of mankind principle" (CHP). First, it discusses the characteristics of the CHP and its development. Second, it discusses the application of the CHP to the HGP. Finally, the article applies economic principles to the CHP, and discusses arguments supporting and criticizing the CHP.

The CHP is an international legal concept which conveys equal property interests to all people.[81] The doctrine includes four characteristics: 1) no country can appropriate for itself the territory in question; 2) all states have responsibility for managing the territory; 3) all states share in the benefits from exploitation of the territory or its resources; and, 4) all countries must use the territory for exclusively peaceful purposes.[82] In addition to these four elements, some

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75. Richard L. Furman, Jr., *Genetic Test Results and the Duty to Disclose: Can Medical Researchers Control Liability?*, 23 SEATTLE U. L. REV. 391, 423 (1999).

76. *Id.*

77. *Id.*

78. *See* Sturges, *supra* note 2.

79. Jeffrey A. Potts, *Moore v. Regents of the University of California: Expanded Disclosure, Limited Property Rights*, 86 Nw. U. L. REV. 453, 482 (1992).

80. Malloy, *supra* note 65, at 53.

81. Sturges, *supra* note 2, at 246.

82. *Id.*

legal bodies include a fifth characteristic, that all countries have a shared responsibility for preserving the unique or irreplaceable resources of the territory in question for future generations.[83] Examples of the application of the CHP are the moon, deep seabeds, and other celestial bodies.[84]

The CHP has gained broad international support since the United States began patenting developments in the HGP. When United States courts began granting patent protection, the international community was outraged. They were upset in part because the HGP was established as an international collaboration in which all participating countries shared their discoveries and information.[85] The work and energy of many, not just U.S. scientists, had created developments in the HGP, and therefore it was unjust for United States courts to suddenly institute patent rights to developments generated from international cooperation.[86] Because of this outrage, supporters of the CHP suggest that the principle apply to all developments or discoveries in the HGP.[87]

The CHP endorses a liberal economic theory. This theory states that the conception of natural or inalienable rights is merely a metaphorical road block that stands in the way of progress on social welfare.[88] If the CHP is applied to the HGP, all individuals would have equal rights to an equal share of any discovery or manipulation of their individual DNA sequence developed by researchers. While it is true that in the liberal context, an individual's rights to DNA developments would be contingent upon the global political process, CHP supporters suggest that this structure is necessary in order to preserve each individual's equal right to their gene potential.[89]

Supporters argue that the CHP should apply to the HGP because the human genome is literally part of every humankind's common heritage, and because it is the manifestation of human evolution, a natural process caused by human adaptation and development.[90] In support of the theory, common heritage supporters suggest that allowing private companies to own a genome is like allowing companies to own another part of the human body such as an eye or a nose.[91] Moreover, if companies own property rights to the genome, then they

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83. *Id.*

84. Sturges, *supra* note 2, at 247.

85. *Id.* at 231.

86. Dr. Victor McKusick of the Johns Hopkins Medical Center has written that "(t)he genome initiative should be viewed as an international effort, characterized by a free exchange of information." Keith Aoki, *Authors, Inventors and Trademark Owners: Private Intellectual Property and the Public Domain,* 18 Colum.-VLA J.L. & Arts 191 (1994).

87. Sturges, *supra* note 2, at 246.

88. Malloy, *supra* note 65, at 69.

89. *Id.* at 249-252.

90. *Id.* at 249.

91. *Id.* at 250.

have the right to decide what will be done with it. This is a dangerous proposition.[92]

Supporters of the CHP also suggest that the HGP will provide the most effective global benefit only if the CHP is applied to it. If the CHP is applied to the HGP, supporters suggest that: 1) the genome will not be appropriated by any country or private corporation within that country; 2) all states will share responsibility for setting regulations and laws for permissible uses of the genome; 3) all states will share in the benefits derived from the HGP, which would mean that all gene sequences would be publicly accessible; 4) the genome will be reserved exclusively for peaceful use; and 5) the worldwide community will have a shared responsibility for preserving the genome intact for future generations.[93] Supporters also argue that a treaty signed by the international community designating the HGP common heritage status would eliminate state concerns about investment risk.[94]

In response to these arguments, scientists and corporations who conduct gene research argue that they deserve patents to their HGP discoveries. Researchers and companies who apply for patents rely on an economic argument to support their acquisition of property rights over patents. Companies argue that because they have already invested millions of dollars patenting their results, they should be entitled to property rights over the patents.[95] They suggest that if they cannot reap the benefit from their investments, the capital for HGP investment will dry up and further development will not occur.[96] Indeed, if the purposes of patent rights are to reward invention, promote disclosure, and ensure public benefit from scientific advancement, it seems fundamentally unfair to require researchers and investors to expend enormous resources, publicize results, and provide benefit to the public without the guarantee of potential return on their investment.[97]

Critics of the CHP rely in part on a "Tragedy of the Commons" doctrine to criticize the CHP. The "Tragedy of the Commons" doctrine suggests that once a product is owned by all, the incentive to nurture it atrophies.[98] Supporting the application of this theory, the NIH and drug companies have predicted that without the ability to patent DNA sequences discovered through the HGP, investment would disappear.[99] For example, Reid Atler, Director of NIH's Office of Technology Transfer, argued that "[I]f everything goes into the public domain there is much less incentive to invest time and money in developing a

92. Sturges, *supra* note 2, at 250.
93. *Id.* at 251.
94. *Id.*
95. Sturges, *supra* note 2, at 252.
96. *Id.* at 238.
97. Lacy, *supra* note 8, at 802.
98. Duncan M. Davidson, *Reverse-engineering of Software,* 276 PLI/Pat 95 (1989).
99. Sturges, *supra* note 2, at 237.

product. Our concern is to protect the invention early enough to give meaningful patent protection to companies that might seek a license from NIH."[100] In addition, one survey of drug companies estimated that companies would not have developed approximately sixty percent of pharmaceutical products had they not been able to patent their discoveries.[101]

V. INTERNATIONAL GENE TREATMENT AND THE NECESSITY FOR THE APPLICATION OF PRICE THEORY ECONOMICS

This section of the article discusses the different international perspectives regarding the patentability of gene research. First, it discusses the manner in which gene discoveries are treated in Europe. Second, it discusses how gene discovery is treated in lesser developed countries (LDCs). Finally, it addresses United States policy toward the patentability of gene development, and argues that the United States policy of granting patents to HGP discoveries should continue.

In Europe, the European Commission regulates HGP patentability. This Commission issues opinions and rulings to the European Union concerning developments in the biotechnology and gene research area.[102] The Commission has held that in spite of the resources and energy required to develop genetic research, the human body or any of its elements are not patentable.[103] Specifically, the simple knowledge of the complete or partial structure of a gene and the human body, at any stage of development, does not constitute a patentable element.[104] However, similar to United States law, patentability may be afforded to the identification of the function attached to a human gene if it offers new possibilities such as the production of new drugs, or if the intended use of the patent is sufficiently identified and specific.[105]

Differing with the European Community, LDCs have imposed restrictive measures on private entities' ability to patent genetic discoveries. LDCs have not placed an emphasis on patent systems because LDCs place less importance on individual property rights.[106] LDCs view intellectual property as community assets and believe that individuals should not own rights to something that "belongs in the public domain."[107] Moreover, LDCs have traditionally had reservations about intellectual property rights because they perceive intellectual property as confined to colonial governments and multinational corporations,

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100. *Id.*
101. *Id.* at 238.
102. Jason T. Corsover, *The Logical Next Step? An International Perspective On The Issues Of Human Cloning And Genetic Technology*, 4 ILSA J. INT'L & COMP. L. 697, 716 (1998).
103. *Id.* at 717.
104. *Id.*
105. Sutton, *supra* note 50.
106. Sturges, *supra* note 2, at 244.
107. *Id.*

who generally deprive LDCs of their rights.[108] For example, in Manila, the government has attempted to prevent multinational corporations from patenting genetic material found in their territory.[109] As of September 1, 1997, the government has voided any agreement with a multinational corporation granting the right to isolate and patent genetic material from flora and fauna located in the corporation the Philippines.[110] Any bio-prospecting must be accomplished with a government license and the consent of the community involved.[111] This legislation represents the typical LDC attitude toward the transfer of intellectual property rights.

In contrast to these two areas, HGP research and development in the United States has flourished because of the minimal limitations imposed by the United States government.[112] The United States is the initiator of the HGP and spends an unprecedented amount of money funding HGP research.[113] Furthermore, because of Constitutional limitations placed on the government, scientists conducting genetic research have less governmental intrusion than other countries.[114] The lack of federal regulations inhibiting privately funded institutions has enabled private institutions to remain unconstrained when initiating and developing research.[115] This freedom from restrictions and regulatory oversight has allowed the United States to emerge as the dominant leader in the race for discoveries in the HGP.[116]

The current United States model exemplifies a price theory economic model that is essential to developments in the HGP. The price theory model advocates a decentralized market system that moves property to individuals who value it more than a previous owner, and produces a net benefit which may be shared between the parties to the exchange.[117] This produces an efficient allocation of goods and services.[118] This system is possible only if property rights are defined, enforced, and exchanged so that efficient transfers can take place.[119]

It is the position of this article that in light of the flexibility that exists in the United States biotechnology market, and the large amount of capital available for the HGP, United States companies should be entitled to proprietary rights

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108. *Id.*
109. Corsover, *supra* note 102, at 753.
110. *Id.*
111. *Id.*
112. *Id.* at 731.
113. Corsover, *supra* note 102, at 731.
114. *Id.*
115. *Id.*
116. Scott A. Chambers, *Comments on the Patentability of Certain Inventions Associated with the Identification of Partial CDNA Sequences*, 23 AIPLA Q.J. 53, 56 (1995).
117. David Friedman, *Standards as Intellectual Property: An Economic Approach*, 19 U. DAYTON L. REV. 1109, 1111 (1994).
118. *Id.*
119. *Id.*

and protections. For example, freedom from government intervention has facilitated the large amount of venture capital that supports HGP research.[120] Venture capital has a significant effect on the development of the biotech industry, and is clearly the impetus behind developments reached by biotechnology start-ups.[121] As realities such as technical difficulties and limited markets have become apparent, venture capitalists have become much less willing to invest.[122] The increased competition in the venture capital market has necessitated the development of a metric for differentiating between biotechnology firms.[123] Because venture capitalists are not typically experts with respect to the technology, intellectual property rights have become the proxies for technological value.[124] It is therefore important that the patent system award patents to deserving inventions so that the companies developing those inventions can attract venture capital, and continue to sequence the entire human genome.[125] Without this profit incentive, investment in genetic information and products under the HGP will grind to a sudden stop.

VI. CONCLUSION

In the course of this article, I identified legal and economic issues relevant to the assignability of property rights under the HGP and gene research. I identified the history and development of the HGP, and discussed United States legal treatment of property interests in gene development, along with the main alternative to the assignment of property rights, the common heritage principle. I also discussed some of the different international attitudes toward property rights and the HGP. In conclusion, it seems clear that, in spite of the international contribution to the HGP, resources from the United States are largely responsible for the progress of the HGP. These resources flow into the HGP project because of the existence of a price theory economic environment. The United States legal system creates the necessary incentives to promote continued support of the HGP project by encouraging patentability and private property rights. In order to make continued progress on the HGP, patentability should be encouraged and supported.

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120. Karen I. Boyd, *Nonobviousness and the Biotechnology Industry: A Proposal for a Doctrine of Economic Nonobviousness*, 12 BERKELEY TECH. L.J. 311, 316 (1997).

121. *Id.*

122. *Id.*

123. Boyd, *supra* note 120, at 316.

124. *Id.*

125. *Id.*

1999 SUPREME COURT SURVEYS

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ADMINISTRATIVE LAW/ STANDARD OF REVIEW

Dickinson v. Zurbo
119 S. Ct. 1816 (1999).

This case addressed whether the standards set in 706 of the Administrative Procedures Act ("APA") applied "when the Federal Circuit reviews findings of fact made by the Patent and Trademark Office."

A Patent applicant filed with the Patent and Trademark Office ("PTO") for a method of improving security in a computer system which was denied because the PTO found the method "obvious from a prior art." The applicant's appeal to the Board of Patents was also denied. The applicant then appealed the Board's decision to the Federal Court of Appeals, which reversed the original submission.

The Court held that the APA sets the standards that govern "judicial review of findings of facts made by federal administrative agencies." 5 U.S.C. Section 706. Therefore, the federal circuit erred in applying the standard for appellate court oversight of other court's findings of fact under a "clearly erroneous" standard. This standard is seen to be more stringent than the standard set by the APA for courts review of agencies' findings of facts. Under the APA, agency findings of facts are set aside if "found to be 'arbitrary, capricious [or] an abuse of discretion'. . . ." The PTO is an agency and Congress has set appropriate standards for the APA. Thus, absent any contrary reason why the APA standard should not be used, the APA standard should have been applied.

ANTITRUST/TELECOMMUNICATIONS

NYNEX Corporation v. DISCON, Incorporated
525 U.S. 128 (1999).

In this case, the telephone company switched suppliers to a company that was part of the "AT&T" family with NYNEX.DISCON, the former supplier alleged NYNEX violated the Sherman Act. By a unanimous decision, the court held that boycotts were illegal *per se*. However, a single buyer's decision to acquire

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a product from another competitor is not a violation of the anti-trust law "when that decision [cannot] be justified in terms of ordinary competitive practice."

CONSTITUTIONAL LAW

City Of Chicago v. Morales
119 S. Ct. 1849 (1999).

In a 5-4 decision, the Supreme Court found that a gang congregation ordinance (the "Ordinance") enacted in the City of Chicago was unconstitutionally vague. The Ordinance required a police officer, upon seeing a person reasonably believed to be a gang member loitering in a public place, to tell the person or group to leave, or failure to disperse would result in a violation. The Court found the Ordinance to be unconstitutionally vague for two reasons. First, the Ordinance fails to provide fair notice of the prohibited conduct, namely, the loitering. Second, the Ordinance failed to establish minimal guidelines for enforcement.

Saenz v. Roe
119 S. Ct. 1518 (1999).

This case dealt with whether California may amend its welfare program "by limiting new residents, for the first year they live in [the State], to the benefits they would have received in the State of their prior residence." The Court held that this change violated Section 1 of the Fourteenth Amendment, since citizens have the right to be treated equally in their new State of residence. Classifying residence would place a penalty on the right to travel, and thereby violates the Equal Protection Clause.

Knowles v. Iowa
119 S. Ct. 484 (1999).

An Iowa police officer stopped a vehicle for speeding. Instead of arresting the driver, as authorized by Iowa state statute, the officer issued the driver a citation. The officer proceeded to conduct a full search of the vehicle which resulted in the discovery of marijuana and drug paraphernalia. Driver moved for suppression of the evidence.

The Court held that the search was a violation of the Fourth Amendment, finding that this case did not satisfy the two exceptions for a "search incident to arrest." First, even though the officer safety is important, the threat to an officer's safety is much less in a traffic stop than in an arrest. Second, the need to discover and preserve evidence is a bright-line test. In this case, there was no need to search the vehicle to prevent loss of evidence or protect the officer's safety.

CONSTITUTIONAL CRIMINAL PROCEDURE/ FOURTH AMENDMENT (SEIZURE)

Florida v. White
119 S. Ct. 1555 (1999).

The Court determined in this case that the Fourth Amendment did not require the police to obtain a warrant before seizing an automobile from a public place, when the police had probable cause from prior observation of the defendant's use of his car to deliver cocaine, to believe that it was forfeitable contraband. The police seized the respondent's car without a warrant pursuant to with the Florida Contraband Forfeiture Act. Fla. Stat. § 932.701 (1997). At his trial on the possession charge, the respondent filed a petition to suppress the evidence discovered during the search of his car on the basis that it violated the Fourth Amendment.

The Court held that the seizure was not a violation of the Fourth Amendment since the respondent's car was seized from a "public area" – and therefore "did not involve any invasion of the respondent's privacy."

FIFTH AMENDMENT RIGHT AGAINST SELF-INCRIMINATION

Mitchell v. U.S.
119 S. Ct. 1307 (1999).

The issue in this case was whether a defendant retained the right to remain silent after a guilty plea had been entered. The Court held that, in a federal criminal case, the right against self-incrimination under the Fifth Amendment is not waived when a defendant enters a guilty plea. "Incrimination is complete" when a sentence is "fixed and the judgment of conviction [is] final." Additionally, the Court held that "adverse inferences" must not be drawn from the defendant's right to remain silent.

CONSTITUTIONAL LAW/ DUE PROCESS

City of West Covina v. Perkins
119 S. Ct. 678 (1999).

The Court examined the issue of whether the due process of the Constitution "requires a state or its local entities to give. . .specific instruction. . .to owners who seek return of property lawfully seized . . .for police investigation or criminal prosecution?" The court held that "the due process clause does not require [police] to provide the owner with notice of state-law remedies for the property's return." The state-law remedies at issue in the instant case were published and generally available through state case law and statute. Here, the

petitioner could have turned to public sources to learn about the remedial procedures available to him.

CONSTITUTIONAL LAW/ FOURTH AMENDMENT (POLICE "RIDE ALONGS")

Wilson v. Layne
199 S. Ct. 1692 (1999).

The Court decided whether media "ride alongs" violate Fourth Amendment privacy rights; and if so, are government officials immune from personal liability under *Bivens* and §1983 because they could not have reasonably known how the court would rule on the "ride along" issue. The Court held that bringing the media or third persons into a home violates the Fourth Amendment right to privacy. However, officials in the instant case cannot be held personally liable because they could not have reasonably predicted the law in this area. The Court reasoned that "the Fourth Amendment. . .require[s] that police actions in execution of a warrant be related to the objectives of the authorized intrusion." Here, the media "served no purpose in the execution of the warrant because they did not aid in the execution of the warrant." There was no public policy reason for their presence. Further, the Court reasoned that under the doctrine of qualified immunity, the police cannot be held personally liable because this area of law was not clearly established at the time of the execution of the warrants, such that a reasonable officer would or should have known that the ride along violated petitioner's constitutional rights.

DISABILITY LAW

Murphy v. United Postal Service
119 S. Ct. 2133 (1999).

The court held that a United Postal Service employee did not meet the qualifications under the Americans with Disability Act because his high blood pressure is not a disability as defined under the Act. Murphy did not have an impairment, which "substantially limited" him from any "major life activity," as his medication allowed him to do normal things that other human beings do. Furthermore, he was not precluded from working as mechanic, but from mechanic positions that require driving commercial vehicles.

Sutton v. United Air Lines
119 S. Ct. 2139 (1999).

The issue decided in this case was whether individuals with visual impairments are "disabled" within the meaning of the Americans with Disabilities Act of 1990 ("ADA"). The Court held that visual impairments would not be classi-

fied as a disability under the ADA since the disability could be fully corrected with corrective lenses. The petitioners in this case did not show that having a visual impairment substantially limited them in one or more major life activities. Petitioners also failed to show that they were regarded as having an impairment that "substantially limits a major life activity."

Cedar Rapids Community School Dist. v. Garret F. and Charlene F.
119 S. Ct. 992 (1999).

The question presented is whether the definition of "related services" requires a public school district provide a ventilator-dependent student with continuous nursing services throughout the school day. The student is a thirteen year old quadriplegic boy who needs a ventilator to survive and daily, and one-on-one nursing services. When the school district refused to provide this care, his mother sought an administrative hearing under the Individuals with Disabilities Education Act with the Iowa Department of Education. The Administrative Judge, the District Court and the Court of Appeals all answered this question in the affirmative, concluding that the purpose of the IDEA is to "assure that all children with disabilities have . . . a free, appropriate public education which emphasizes special education and related services to meet their needs."

The Court of Appeals applied the two-step analysis set forth in *Irving Independent School Dist. V. Tatro, 468 U.S. 883,* in determining the meaning of "related services." This two-step analysis is (1) whether the requested services are included within the meaning of "supportive services;" and (2) whether the services should be excluded because they are "medical services." The Court of Appeals found that the first prong was met because the child could not be "supported" at school without the requested services. On the second prong, the court distinguished between medical services provided by a physician, which are excluded, and those services which can be performed by a lay person within a school setting. The Court found that the services required for the student did not require a doctor and thus held that the school district was required to provide these services. In reaching its conclusion, the Court stated that the overall purpose of IDEA was to ensure that all children, disabled or not, have an opportunity to receive public education. Denying these "related services" in the form of continuous care would be denying the child the opportunity to receive a public education.

EMPLOYMENT DISCRIMINATION/ CIVIL RIGHTS

West v. Gibson
119 S. Ct. 1906 (1999).

In this case, the court decided "whether the Equal Employment Opportunity Commission (EEOC) possesses the legal authority to [require that] federal

agencies pay compensatory damages [for discrimination] in employment in violation of Title VII of the Civil Rights Act of 1964?" The Court held that the EEOC has specific authority under Title VII, as amended, to enforce the provisions of Title VII "through appropriate remedies," and provides that the complaining party may recover compensatory damages in both federal government and private employment . The court read the language of this section and took a literal approach in the determination that the language authorizes the payment of compensatory damages.

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