

The Role of Science in Law

To My IPSC Colleagues:

The following is an excerpt from a book project. I have included sections that I believe will be of greatest interest to the IPSC audience.

Warmest regards,

Robin Feldman

The Role of Science in Law

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“[Our aim] is to encourage the application of scientific methods to the study of the legal system. As biology is to living organisms, astronomy to the stars, or economics to the price system, so should legal studies be to the legal system”²

The allure of science has always captivated members of the legal profession. Its siren’s song has followed us throughout much of American legal history. Science offers a tune of perfection, of elegance, of solid dependability and the promise of endowing law and legal actors with the respect and deference from society that we crave. Most importantly, we look to science to rescue us from the experience of uncertainty and the discomfort of difficult legal decisions.

The notion of what constitutes science and what it would take to make law more scientific varies across time. What does not vary is our constant return to the well. We are constantly seduced into believing that some new science will provide answers to law’s dilemmas, and we are constantly disappointed.

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² Richard Posner, *Afterword*, 1 J. LEGAL STUD. 437 (1972).

Our perpetual forays to find better law through science are incapable of solving law's frustrations, but they do create distortions in the legal realm. When the legal system relies on science to craft its rules, those rules lack the flexibility and dexterity necessary for effective participation in the process of legal evolution. The rules are poorly understood by the legal actors who must apply them, which makes them ill-suited to the process of interpretation, evolution, and adaptation that is essential to the enterprise of law. Instead of engaging in this evolutionary process, we become fixated on scientific categorizations, as if lines drawn by science have some mysterious power that we can access by invoking them.

Moreover, in our efforts to reach for science, we lose sight of the fact that law's questions are not resolvable by science. Science can help determine the ways in which things are the same and the ways in which they differ. Science, however, cannot tell us whether that sameness matters from the perspective of legal rights and obligations.

Most importantly, detouring into science creates the illusion of reasonable resolution when the issue is neither resolved nor is the decision reasonable. We hide behind scientific markers to mask our failure to decide the legal issues at hand or to take responsibility for the decisions we have made. Thus, we gain authority by obscurity, a process that inevitably back-fires, leaving more chaos and confusion in the doctrines.

This pattern of behavior reflects our doubts about whether law is capable of resolving difficult issues and our smoldering suspicion that science could do it better. The challenge for modern legal scholars is to understand how our image of law and science becomes distorted and how we can adjust that vision to find a more effective intersection for the two domains.

In this quest, the manuscript begins by separating law's attempts to reach for science into two forms. In one form, we try to internalize science's power. In another form, we try to externalize law's problems. The manuscript identifies both phenomena in modern law, using examples from doctrines related to abortion, internet searching, gene patenting, environmental regulation, and antitrust. The piece then describes how these attempts to reach for science fail.

Part II of the manuscript traces the instinct to reach for science back through the early 1800s. This part examines both the more formal legal theory movements as well as individual doctrinal moments in which American law reaches for science in an attempt to solve its problems and is subsequently disappointed when the solution fails to live up to its promise.

Part III explores the nature of law and the discordance of scientific solutions. In particular, this part notes that societal change and human nature drive law towards the open spaces created by whatever doctrinal structure exists. Law is constantly driven to adapt to changing circumstances within existing frameworks as tested and refined through various spheres of acceptance. Science is ill-suited to this process of adaptation.

Finally, Part IV suggests how to make law and science work together more effectively within the domain of law. This section argues that the key is not to rest legal rules on scientific measurements, but rather to use the insights of science to align incentives and test assumptions underlying the legal rules we choose. In addition, where the legal system interacts with science, we must move towards speaking in a common language, one that will be susceptible to the process of interpretation and adaptation that is essential to law. Most importantly, the section argues that we are unlikely to avoid the

cycles of exaltation and disappointment unless we are willing to embrace the imperfections of law. It is our misguided yearning for completeness and perfection in law that drives us to look for rescue in the form of science.

As I work on this project, I am constantly reminded of how often this pattern appears, not just across time, but in modern law. For example, the New York Times Magazine recently featured a long article gushing about how historians of the future will look back on the 1990s as the time when neuroscience began to “transform the American legal system.” The article describes how researchers can now use brain scans to see what portions of the brain are activated by a particular person during a given activity.

The article describes the great enthusiasm of those who believe that this research will eventually allow the legal system to scientifically answer questions such as when individuals should *not* be held accountable for their actions and whether a particular individual will engage in future criminal activity. Most important, we are told that the scans can answer the elusive question of just what are our deeply shared beliefs upon which the legal system should be based.

Brain scan imaging and the information it reveals are indeed marvelous. Nevertheless, the excitement over law and neuroscience follows the well worn paths of hope. If only science could give us categories, or something to measure, or if we could find the right configuration of experts, law’s problems would dissolve. Before we are swept away by the latest vision of how science will solve law’s problems, it is worth thinking about our past failures in this realm.

[The expanded version of the paper will have a section exploring differences between science and law. For example, imagine if every time scientists figure out

something about nature, nature tried to change it. Suppose that when we figure out something about how a cell replicates, the cell says, “Ah, I’d better try another route.” If that were true, science would be a very different enterprise. Yet that is the nature of law, and the nature of human beings within the legal system. As academics, we are never separate observers. It isn’t just a question of observational bias, it is a question of observational interference, something that is much more of a problems for law than for science. To expand on a response Judge Easterbrook gave when asked to comment on the process of judging, you get a very different answer if you observe rats running in their mazes than if you ask them about the experience. As legal academics, we are always part of the rat pack, and our comments and observations are part of the workings of the system itself.

The expanded version also discusses why grouping different forms of sciences, physical sciences, social sciences, etc, is important to understand the instinct within law to look for the authoritative other, and the dangers when that authoritative other is based on terms and concepts that legal actors don’t have the expertise to understand.]

I. The Allure of Science in Modern Law

Law’s attempts to reach for science can be separated into two essential forms. In one form, legal actors try to adopt the mantle of science. We craft legal rules based on scientific lines of demarcation or cloak ourselves in scientific jargon for shelter

and comfort. In another form, we simply defer to scientists, endowing scientists and other experts with the power to decide legal questions that we despair of answering ourselves. Thus, in some circumstances, we try to internalize science into law, and in other circumstances, we try to externalize the problems of law.³ [In the expanded version of the paper, this section goes on to provide a general introduction to the notion of internalization and externalization.]

1. Science markers in abortion cases

The classic example of internalization, that is, reaching for science markers to

³ For other perspectives on the interrelation of law and science, see Roscoe Pound, *Law and the Science of Law in Recent Theories*, 43 YALE L. REV. 525 (1934); DAVID FAIGMAN, *LEGAL ALCHEMY: THE USE AND ABUSE OF SCIENCE IN THE LAW* (1999); Ronald Dworkin, *Social Sciences and Constitutional Right-the Consequences of Uncertainty*, J. L. ED., Vol. 6, No. 1, at 3 (1977); Steven Goldberg, *The Reluctant Embrace: Law and Science in America*, 75 GEO. L. J. 1341 (1987); Dean Hashimoto, *Science as Mythology in Constitutional Law*, 76 OR. L. REV. 111 (1997); Oliver Wendell Holmes, *Law in Science and Science in Law*, 12 HARV. L. REV. 443 (1899); Richard Lempert, "Between Cup and Lip": *Social Science Influences on Law and Policy*, LAW & POLICY, Vol. 10, No. 2 & 3 at 167 (1988); Karl N. Llewellyn, *The Theory of Legal "Science"*, 20 N.C. L. REV. 1 (1942); Howard T. Markey, *Jurisprudence or "Juriscience"?*, 25 WM. & MARY L. REV. 525 (1984); J. Alexander Tanford, *The Limits of a Scientific Jurisprudence: The Supreme Court and Psychology*, 66 IND. L.J. 137 (1991); Charles R. Tremper, *Sanguinity and Disillusionment Where Law Meet Social Science*, LAW & HUMAN BEHAVIOR, Vol. 11, No. 4, at 267 (1987); John Veilleux, Note, *The Scientific Model in Law*, 75 GEO. L.J. 1967 (1987). For perspectives on American Legal Theories in general, see NEIL DUXBURY, *PATTERNS OF AMERICAN JURISPRUDENCE* (1995); MARK KELMAN, *A GUIDE TO CRITICAL LEGAL STUDIES* (1987); GARY MINDA, *POSTMODERN LEGAL MOVEMENTS: LAW AND JURISPRUDENCE AT CENTURY'S END* (1995); JOHN HENRY SCHLEGEL, *AMERICAN LEGAL REALISM AND EMPIRICAL SOCIAL SCIENCE* (1995); ANTHONY J. SEBOK, *LEGAL POSITIVISM IN AMERICAN JURISPRUDENCE* (1998); Guido Calabresi, *An Introduction to Legal Thought: Four Approaches to Law and to the Allocation of Body Parts*, 55 STAN. L. REV. 2113 (2003); Ronald Dworkin, *The Model of Rules*, 35 U. CHI. L. REV. 14 (1967); Thomas C. Grey, *Langdell's Orthodoxy*, 45 U. OF PITT. L. REV. 1 (1983); Herbert Hovenkamp, *Positivism in Law & Economics*, 78 CAL. L. REV. 815 (1990); Avery Wiener Katz, *Positivism and the Separation of Law and Economics*, 94 MICH. L. REV. 2229 (1996); Arthur Allen Leff, *Law and*, 87 YALE L.J. 989 (1978); Martha C. Nussbaum, *The Use and Abuse of Philosophy in Legal Education*, 45 STAN. L. REV. 1627 (1993); Richard Posner, *Legal Scholarship Today*, 45 STAN. L. REV. 1647 (1993); Edward L. Rubin, *Law and the Methodology of Law*, 1997 WIS. L. REV. 521 (1997); Austin Sarat & Jonathan Simon, *Beyond Legal Realism?: Cultural Analysis, Cultural Studies, and the Situation of Legal Scholarship*, 13 YALE J. L. & HUMAN. 3 (2001); Howard Schweber, "Langdell, We Hardly Knew Ye," 17 LAW & HIST. REV. 145 (1999); see also, Edgar S. Cahn, *An Anthropologist Examines the Lawyer Tribe*, 17 YALE J.L. & HUMAN. 291 (2005); Daniel R. Ernst, *The Lost Law Professor*, 21 LAW & SOC. INQUIRY 967 (1996). Brian Bix, *Positively Positivism*, 85 VA. L. REV. 889 (1999); Thomas C. Grey, *Modern American Legal Thought*, 106 YALE L.J. 493 (1996); Christopher L. Sagers, Book Note, 95 MICH. L. REV. 1927 (1997) (reviewing GARY MINDA, *POSTMODERN LEGAL MOVEMENTS: LAW AND JURISPRUDENCE AT CENTURY'S END* (1995)).

resolve legal dilemmas, can be found in decisions related to abortion. In one of the most contentious areas of modern American law, courts reached for a simple scientific line to try to resolve tensions among the interests of the mother, the interests of the fetus, the interests of the physician, and society's interests related to all of these. Specifically, the federal courts in *Roe v. Wade* and its progeny settled into dividing lines based on conceptualizing pregnancy in 3 trimesters.⁴ In the first trimester, the state could not intervene.⁵ In the second trimester, the state could intervene on the theory that the risk of harm to the mother from abortion matched or exceeded the risk of harm to the mother from childbirth.⁶ Finally, in the third trimester, the state could intervene in the interests of protecting the fetus.⁷

Rather than providing an authoritative and acceptable resolution, the scientific line was assailed from both the right and the left from its inception. It was abandoned decades later by a Supreme Court decision acknowledging that both the mother and the state have interests throughout the gestational period.⁸

The scientific line was doomed from the start, given that it ignored the fundamental philosophical issues. No scientific line could ever resolve the underlying

⁴ See *Planned Parenthood v. Casey*, 505 U.S. 833, 872 (1992) (discussing and rejecting the "rigid" trimester approach of *Roe* and its progeny); see also *Roe v. Wade*, 410 U.S. 113 (1973). *Roe* actually focused more on viability than the line between the second and third trimester, but subsequent cases, scholarship, and legislation focused on the third trimester line as well as *Roe*'s line between the first and second trimester. See *Planned Parenthood v. Casey*, 505 U.S. 833, 873 (arguing that the trimester line was not part of the essential holding of *Roe*); *Roe v. Wade*, 410 U.S. at 163-64 (focusing on the first/second trimester line and the viability line).

⁵ See *Planned Parenthood v. Casey*, 505 U.S. at 872, *Roe v. Wade*, 410 U.S. at 163.

⁶ See *Planned Parenthood v. Casey*, 505 U.S. at 872, *Roe v. Wade*, 410 U.S. at 163.

⁷ See *Planned Parenthood v. Casey*, 505 U.S. at 872.

⁸ See *Planned Parenthood v. Casey*, 505 U.S. at 872-73. The mother's interest was already recognized as existing throughout the gestational period but deemed outweighed in the third trimester by the state's compelling interest in protecting the fetus, except where the life of the mother is at stake. The State's interest was not recognized as existing throughout the gestational period until the trimester line was abandoned.

question of when life begins, how we should treat even potential life, and what forum is the right one in which to address these questions. These excruciatingly difficult legal issues persisted, despite efforts to find an “objective” scientific line. Nevertheless, having chosen a scientific line, the law continued to cling to it, even as it proved inadequate from a scientific standpoint as well as a philosophical one. In fact, the trimester line remained as a point of fixation even as the safety point for the mother to have an abortion moved later than the first trimester and the viability point for the fetus moved earlier than the third trimester.⁹ Having grabbed onto a scientific marker that failed to resolve the legal questions, we held onto it for decades, even as it failed to comport with medical science. The simple scientific line was a failure, but it took decades to abandon it.

2. Science markers in internet searching cases

The penchant for technological line drawing also can be found in modern copyright cases. Consider for example, a recent Federal District Court opinion granting an injunction against the search engine company Google for displaying thumbnail images as part of its search results.¹⁰ When someone enters a search into the Google search engine, the results may include a tiny image from the websites that Google offers as search results. The question is whether Google has violated copyright law by making and displaying an unauthorized copy of something from the website. This is one of a

⁹ See, e.g., Hashimoto, *supra* note x, at 144-45 (complaining that the Supreme Court in *City of Akron v. Akron Center for Reproductive Health* confronted substantial data which indicated that abortions were safer than normal childbirth at up to sixteen weeks, well beyond the end of the first trimester); see also *City of Akron v. Akron Ctr. for Reproductive Health*, 462 U.S. 416 (1983).

¹⁰ See *Perfect 10 v. Google, Inc.* -- F.Supp.2d --, (C.D.Ca. 2006).

number of cases concerning “linking,” that is, when a web site or a search engine displays information from another web site.

The district court ruled that the legality of Google's actions turned on whether the images displayed by Google were ever technically on Google's servers rather than only residing on the web site that Google is linking to.¹¹ This distinction echoes a line hinted at by the Ninth Circuit when it withdrew an earlier opinion concerning linking.¹²

A technical distinction of this kind cannot possibly help the law come to terms with the question of how to respect copyright holders’ rights while still adapting to the increased interconnectivity of web sites and the role of search engines in our daily lives. These issues will continue to haunt the legal system as further cases emerge, and the *Google* decision will be of little help. There is no shelter to be found in grasping for technological dividing lines, although examples abound in copyright law.¹³

3. Science markers in patent cases

In no area of law is there a greater temptation to use science than in patent law. This is not surprising given that the subject matter of patent law is science itself. If nowhere else, surely it must be appropriate to incorporate science in an area of law that involves defining a scientific invention?

¹¹ *See id.* at 10-11, 13.

¹² *See id.* at 10-11 (describing *Kelly v. Arriba*); *see also Kelly v. Arriba Soft Corp.*, 336 F.3d 811, 816 (9th Cir. 2003), *amending* 280 F.3d 93 (9th Cir. 2002).

¹³ Other examples of technological line drawing in copyright cases include *Metro-Goldwyn-Mayer Studios, Inc. v. Grokster Ltd.*, 380 F.3d 1154, 1165-66 (9th Cir. 2004), *reversed and remanded*, 125 S. Ct 2764 (2005) (ruling that the legality of a peer-to-peer file sharing service, turned on whether the transferred files resided on the defendant's servers) and *UMG Recordings, Inc. v. MP3.com, Inc.*, 92 F.Supp.2d 349, 351 (S.D.N.Y. 2000) (ruling that the legality of a virtual music locker service, in which music owners could access CDs at any location through the Internet, turned on the nature of the file actually transferred and not on whether the consumer owned a copy of the music).

The task we engage in when we define an invention by interpreting a patent is the same as the task we engage in throughout law as we interpret precedent. The essence of both involves interpreting the meaning of language and the boundaries of that language in ever-changing circumstances. Rather than acknowledging the commonality, however, modern patent law consistently hides behind scientific lines of demarcation and science jargon in an effort to resolve difficult legal questions. Once again, the failure to grasp the nettles of our legal quandaries creates chaos in the doctrines.¹⁴

Consider the Federal Circuit's struggles with the question of how to properly identify the boundaries of a genetic invention. The expanded version of this section explains genetic inventions and describes the challenges inherent in defining the boundaries of those inventions. For the purposes of the shorter version, it is sufficient to note that the Federal Circuit sidestepped a number of difficult questions in this area of law more than a decade ago by choosing the following simple scientific line.¹⁵ Genes are made up of nucleotide building blocks. In essence, the court said, "Give us the nucleotide sequence and we will give you the gene, no matter how simple the procedures are for moving from the current information to that sequence."¹⁶

With these decisions, the court adopted a clean, simple line based on a scientific marker to try to resolve a series of extraordinarily complex issues. This body of case law

¹⁴ See *infra* note x (referencing H.L.A. Hart).

¹⁵ See *In re Deuel*, 51 F.3d 1552 (Fed. Cir. 1995); *In re Bell*, 991 F.2d 781 (Fed. Cir. 1993).

¹⁶ See *Deuel*, 51 F.3d at 1558 (holding that the gene described in the patent was not an obvious invention because the prior art did not specifically list or suggest the nucleotide sequence); National Research Council of the National Academies of Science, *A PATENT SYSTEM FOR THE 21ST CENTURY* 92 (Stephen A. Merrill, Richard C. Levin & Mark B. Myers eds., 2005) [hereinafter, *National Academies*] (noting that the court in *Bell* and *Deuel* created a *per se* rule that the obviousness of obtaining a gene can *never* be relevant to patentability).

has been remarkably unsuccessful and has received unrelenting criticism.¹⁷ In some areas, short-circuiting the inquiry has distorted the results of cases, protecting genetic claims that fail to meet international standards for biotech inventions¹⁸ or to satisfy the level of invention required for other types of inventions.¹⁹ In other areas, the approach has led to under-protection of genetic inventions, sending shock waves through the biotech industry. Across the board, the resulting case law is confused and chaotic.

The Federal Circuit has been unable to resolve the chaos and conflicts in these doctrines because it is looking to science to draw a simple line and provide a concrete solution. Science, however, has no such answers. Pointing to “nucleotide sequences” cannot relieve courts of the responsibility of grappling with difficult questions concerning the nature of the problem addressed by a particular invention, the extent of the advancement created, and the significance of any differences between the advancement and later inventions. These are complex legal questions that must be addressed in the context of the evolution of legal doctrine. When we ignore these questions and turn to science for simple lines of demarcation, it is not surprising that these lines are a failure.

Not only is science ill-equipped to answer legal questions, it is important to remember that scientific categories are themselves no more than proxies, ways of

¹⁷ See, e.g., Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology Specific?*, 17 BERKELEY TECH. L.J. 1155, 1179-80 (2002); Anita Varma & David Abraham, *DNA is Different: Legal Obviousness and the Balance Between Biotech Inventors and the Market*, 9 HARV. J.L. & TECH. 53 (1996); PHILIPPE G. DUCOR, PATENTING THE RECOMBINANT PRODUCTS OF BIOTECHNOLOGY (1998); Arti K. Rai, *Intellectual Property Rights in Biotechnology: Addressing New Technology*, 34 WAKE FOREST L. REV. 827 (1999); Arti K. Rai, *Addressing the Patent Gold Rush: The Role of Deference to PTO Patent Denials*, 2 WASH. U.J.L. & POL'Y 199 (2000). Univ. of Rochester v. G.D. Searle & Co., 375 F.3d 1303, 1314 (Fed. Cir. 2004 (Rader, J., dissenting to the denial of review en banc) (listing thirty-one academic articles criticizing the *Lilly* decision)).

¹⁸ See *National Academies*, *supra* note x, at 93 (criticizing the American doctrine and noting that all other industrialized countries approach the non-obviousness of novel genes by focusing on the technical hurdles faced by the inventor.).

¹⁹ See Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology Specific?*, 17 Berkeley Tech. L.J. 1155, 1183-85 (2002) (arguing that the Federal Circuit's standards differ for biotechnology and software).

developing groupings that can create shared understandings within the scientific community. Such constructs may help scientists talk about and explore a natural phenomenon, but in a legal context, one can easily lose sight of their artificiality and the assumptions they embody. Even the idea of a "gene" is based on an artificial construct. It is a way of conceptualizing a continuous string as if it were broken up into pieces, pieces in which the law now assigns rights.²⁰ However useful this construct may be, it is still artificial and necessarily glosses over distinctions that may become important as the case law evolves.²¹ If we simply adopt these categories on blind faith without recognizing that they are artificial, we lose the ability to ask whether they fit the legal issues properly as those issues unfold.²²

One could argue that some of the problems with borrowing science rules reflect problems with adopting rules in general. After all, adopting any type of rule rather than a standard gives courts less flexibility. Science rules, however, create different dimensions of the problem. When courts adopt ordinary rules, those rules can be shaped and changed as new cases illuminate the contours of the doctrines. When courts adopt science rules, grafting them onto legal doctrines, the legal system can easily become fixated on those rules. We do not understand the subtleties of the underlying science and we tend to

²⁰ Cf. Rebecca Eisenberg (noting that the concept of a gene is based on an artificial notion of dividing DNA according to function).

²¹ For example, when we talk about a single gene or even the human genome, we are glossing over the fact that significant differences can exist from person to person or between copies of the same gene within a person. Great biological consequences can arise from such small differences, and yet these are differences that we routinely ignore in the legal system. For example, in the *Hoechst* case, the question arose as to whether ownership of one patented gene gave rights to its allototype. This was not the question before the court but rather a side issue which had arisen. The court recognized that a difference existed between the patented gene and the one later claimed by the patentee. Going against its own precedent, the court found any differences to be insignificant and moved on. See *Amgen Inc. v. Hoechst*, 314 F.3d at x.

²² Categorization, although useful, is an artificial construct that cannot transform reality. "Philosophy does not stand outside the world any more than man's brain is outside him because it is not in his stomach." See Karl Marx, *Rheinische Zeitung*, (July 14, 1882), reprinted in 1 KARL MARX & FREDERICK ENGELS, COLLECTED WORKS, 195 (1975); see also Nussbaum, *supra* note x, at 1645 (discussing Marx).

endow it with mythical powers. As a result, we fail to engage in the natural evolution and adaptation of the resulting doctrines. The issue is not whether we adopt a rule as opposed to a standard. Rather, the issue is where does the rule come from and can it properly evolve.

B. Outsourcing Legal Dilemmas

The section above described how modern courts try to incorporate science into law, crafting legal rules based on scientific lines of demarcation. Rather than trying to incorporate science into rules of law, however, some courts and scholars simply defer to scientists and other experts, granting them the power to resolve uncomfortable legal issues.

The instinct to defer to science is in full view in a 2006 Supreme Court case concerning property rights and environmental regulations. In *Rapanos v. U.S.*,²³ the Supreme Court considered whether federal agencies had exceeded the jurisdiction Congress granted them in the Clean Water Act. The Act grants jurisdiction over certain issues related to “navigable waters.”²⁴ In particular, the case addressed whether Congress intended the term “navigable waters” to extend to wetlands not adjacent to any waters that are actually navigable.

While acknowledging that the term “navigable waters” as used in the Act reaches beyond the traditional notion of capable of navigation,²⁵ some justices complained that

²³ *Rapanos v. U.S.*, 126 S. Ct. 2208 (2006).

²⁴ *See id.* at 2220.

²⁵ *See id.*

the agencies had stretched the definition “beyond parody.”²⁶ The case reflected a long struggle in which the relevant federal agencies had attempted to define their jurisdiction under the Act as reaching to the full extent of Congress’s power to regulate, and the Supreme Court had rejected such an expansive interpretation.

A sharply divided Supreme Court failed to produce a majority opinion. Four Justices joined a plurality opinion, with one of the four filing an additional concurring opinion. A fifth, Justice Kennedy, concurred only in the result. The other four justices joined in a dissenting opinion, with one filing an additional dissent.

Faced with a contentious issue and a clearly divided court, Justice Kennedy attempted to smooth the waters by offering an alternative solution. Justice Kennedy suggested that the proper approach would be to allow the agencies to determine on a case-by-case basis whether the wetlands at issue are likely to play an important role in the integrity of an aquatic system that includes navigable waters as traditionally understood.²⁷

Justice Kennedy’s test is an inspired compromise, but it begs the question in the case. The test may indeed tell us whether particular wetlands have a sufficient connection to waters involved in interstate commerce so that Congress has the power to regulate them. It cannot, however, tell us whether Congress *intended* to regulate them.

²⁶ See *id.* at 2222; see also *id.* at 2215 (noting that the agency had interpreted its jurisdiction to include normally dry land features such as roadside ditches, arroyos, or areas that are connected to water by flooding once every 100 years); see also *id.* at 2249 (Kennedy, J. concurring in result) (noting that the standard adopted by the agencies seems to leave wide room for regulation of drains, ditches, and streams remote from any navigable-in-fact water and carrying only minor water-volumes towards).

The case reflected a long struggle in which the relevant federal agencies had attempted to define their jurisdiction under the Act as reaching to the full extent of Congress’s power to regulate, and the Supreme Court had rejected such an expansive interpretation. See *id.* at 2235-2236 (Roberts, J. concurring).

²⁷ See *id.* at 2249 (Kennedy, J. concurring in result).

There is something comfortable and familiar about Justice Kennedy's deference to the experts. Let the experts at the agencies parse through the hydrologic interconnections of various parts of the water system and the extent to which these parts relate to traditionally navigable waters. Science will show us the way.

Once again, however, deferring to science cannot solve the relevant legal question, although it can produce a wealth of impressive sounding information. Science can help determine whether things are the same and can identify the ways in which they differ. Science cannot, however, tell us whether that sameness matters from a legal perspective.

C. Import & Export Combined

[The longer version of the paper describes debates in modern antitrust law between Chicago School and Post-Chicago scholars reflecting concerns over whether courts have the ability to apply sophisticated economic analysis and suggesting different implications for choosing among legal doctrines.]

II. The Repetitions of History

In modern law, one can see many examples in which courts and scholars reach for science when faced with uncomfortable legal dilemmas. We internalize science by borrowing science rules for legal rules or we externalize our problems by giving scientists and other experts the power to make legal decisions. Our deference to these pillars of neutral rationality is supposed to bring clarity, certainty, and a resolution that all

can respect. The strategy continually fails, however, leaving as much chaos, confusion, and disagreement as before.

What is most striking about this process is that we rediscover it, generation after generation, in field after field of law. Law's fascination with science reaches back hundreds of years into American legal history. At times it takes the form of trying to make law into a science or to make lawyers into scientists. At times it takes the form of simply deferring to scientific fields. Throughout this history, however, the pattern of behavior reflects our doubts about whether law is capable of resolving difficult issues and our eternal hope that science can do it better.

The notion of what constitutes science and what it would mean to make law more scientific varies across time and among scholars.²⁸ What does not vary is our constant return to the well. We continually expect science to rescue us from the discomfort and uncertainties of law, and we are constantly disappointed.

For example, looking back at the first half of the nineteenth century, many American legal scholars advocated approaching law as a science.²⁹ To some, the notion meant conceptualizing law as an organized system, rather than a loose collection of precedents. To others, it meant approaching law as an outgrowth of moral science. To still others, it meant law as analogous to natural science. The latter group, in particular, argued that the study of law should follow the methods and reasoning of scientific investigation applied in the natural sciences at the time. Observations of law, like the

²⁸ See, Howard Schweber, The "Science" of Legal Science: The Model of the Natural Sciences in Nineteenth Century American Legal Education, 17 LAW & HIST. REV. 421, 421-22 (1999) (comparing differing views of nineteenth century legal scholars concerning the meaning of law as a science).

²⁹ See *id.* at 422. (explaining the differing views described below.). Yearnings to make law into a science did not originate in American legal history. Other traces can be found in early Roman law and in later European Law. See PETER STEIN, ROMAN LAW IN EUROPEAN HISTORY 79, 99 (1999). The focus of this piece, however, is on the repeated appearance of this theme in American legal history

observations of nature, should trace the origins and developmental paths of legal doctrine to identify the enduring and stable principles.

[The section continues by describing the rise and fall of various legal movements that look to science to solve law's problems. It includes a discussion of early versions of classical legal theory in the pre and post-civil war period as well as a discussion of the rise of the administrative state in the early twentieth century. The section also describes movements such as Legal Realism, Legal Process, and Critical Legal Studies and their interrelation with images of science's strengths and law's weaknesses.]

In addition to the more formal movements, our history abounds with individual moments in which we turn to science to solve law's intractable problems. We are constantly seduced into believing that some new science will provide answers to vexing legal questions, and we are constantly disappointed.

Consider the criminal law question of when a defendant should be found not guilty by reason of insanity. For over a century, the American test for criminal insanity flowed from an 1843 British case focused on the question of whether the defendant showed a complete lack of cognitive ability at the time of the crime.³⁰

Dissatisfaction with the test swelled in the late 1950s and early 60s, culminating in passage of Section 4.01 of the Model Penal Code.³¹ The new test was widely accepted, becoming adopted in almost every federal circuit and in many states as well.³²

It was hailed as a triumph of science. The new test was perceived as embodying the

³⁰ See Julie E. Grachek, *The Insanity Defense in the Twenty-First Century: How Recent United States Supreme Court Case Law Can Improve the System*, 18 In. L.J. 1479, 1483 (2006) (describing history of the modern insanity defense and the M'Naghten test); see also *M'Naghten's Case* (1843) 10 Clark & Fin. 200, 210 [8 Eng. Rep. 718, 722].

³¹ Model Penal Code § 4.01(1) (1962) (imposing the standard that the defendant was not responsible if, as a result of mental defect or disease, the defendant lacked substantial capacity to appreciate the criminality of the act or to conform conduct to the requirements of the law).

³² See *People v. Drew*, 22 Cal. 3d 333, 345 (1978)

latest advances in psychological knowledge and medical thought, ones that would provide authoritative, neutral grounds upon which we could all agree.³³ Science would show us the way through the difficult question of whether one should be held criminally accountable for one's actions.

The honeymoon was remarkably short-lived. By the early 1980s, courts and legislatures, reacting to highly publicized cases in which defendants were found not guilty under the new standard, retreated from the Model Penal Code rule with remarkable speed.³⁴ California, for example, which had adopted the Model Penal Code test in a case in 1978, returned to the prior test with a ballot initiative 4 years later.³⁵

Our embrace of science and our intense disappointment with the Model Penal Code insanity test reflect the problems of trying to import science for the drafting of legal rules. The question of whom we should hold criminally responsible for their actions is a question of morality and societal values.³⁶ Morality is not easy, and no science can take that burden off the shoulders of the law.

One could argue that the abandonment of the Model Penal Code standard reflected popular over-reaction to highly publicized cases, rather than a carefully considered rejection of the doctrine based on its inadequacies. Even from this perspective, however, to the extent that science was expected to provide an authoritative and neutral resolution behind which society could rally, it was a dismal failure.

³³ See, e.g., *People v. Drew*, 22 Cal. 3d 333, 345- 347 (1978).

³⁴ See PAUL APPELBAUM, *ALMOST A REVOLUTION: MENTAL HEALTH LAW AND THE LIMITS OF CHANGE*.

³⁵ Compare *People v. Drew*, 22 Cal. 3d. 333, 345 (1978) (adopting the Model Penal Code standard) with *People v. Skinner*, 39 Cal. 3d. 765, 768, 776 (1985) (interpreting the 1982 California ballot initiative as intending to return to the M'Naghten standard).

³⁶ See Richard E. Redding, *The Brain-Disordered Defendant: Neuroscience and Legal Insanity in the Twenty-First Century*, 56 AM. U. L. REV. 51, 85 (2006) (noting shifts in insanity rules in light of the acquittal of John Hinckley for shooting President Reagan under the Model Penal Codes standard).

III. The Nature of Law

In determining how to use science appropriately in the domain of law, one must first consider the nature of law itself. For this section, I will focus particularly on the unfolding of case law. This is not to suggest that legislation and administration are any less valid as expressions of the legal process. They do, however, involve specialized considerations beyond the legal behaviors that are the focus of this manuscript.

The art of law involves taking prior authorities and distilling a common logic that can extend to new circumstances.³⁷ It is not a scientific expedition but rather a delicate dance of interpretation and adaptation. This enterprise involves identifying relevant groupings that provide comparisons, choosing among the conflicting sets of logic that might emerge, and arguing persuasively for that choice.

In this process, one cannot overestimate the importance of the fact that the issues arising in case law are constantly new. Despite the massive volume of laws and cases, courts are continually faced with new circumstances and new legal issues for two reasons. First, society itself is constantly changing. The domain of interstate commerce, for example, takes on an entirely different dimension with the invention of automotive transport.³⁸ Similarly, the question of what constitutes fair use of one's own copy of a

³⁷ Cf. ANTONIN SCALIA, A MATTER OF INTERPRETATION: FEDERAL COURTS AND THE LAW, 8-9 (1997) (comparing the growth of the common law to a Scrabble board in that no rule previously announced can be raised but qualifications can be added. "The first case lays on the board . . . and the game continues").

³⁸ See *Ollman v. Evans*, 750 F.2d 970, 995-96 (D.C. Cir. 1984) (Bork, J., concurring), cert. denied, 471 U.S. 1127 (1985).

Although, in modern American case law, authorities include mainly prior cases and legislation, at times in our history, custom and practice have played a greater role. See Lessig, *supra* note x, at 1403 (noting that prior to 1870, custom held a more central focus in American judicial decision making).

recording must be analyzed differently when anyone with a computer can remix the sounds of the recording.

Consider an example from Trademark law. Trademark law protects a trademark holder from others who would use the protected mark in a way that creates consumer confusion.³⁹ The arrival of the Internet, however, creates new level of complexity for the notion of consumer confusion. Suppose I sell cars and operate a web site advertising my cars. Can I design my web cite so that Internet search engines offer my site as one of the results when someone enters “Toyota” as a search term? Am I violating trademark law even if those who visit my site never see the word “Toyota” and have full knowledge that they are clicking on a competitor rather than Toyota when they click on my site?⁴⁰ In other words, can Trademark law protect Toyota’s interests even when, from the consumer’s perspective, there is no use of the mark and no confusion? One cannot even contemplate this question without the invention of the Internet and the advent of search engines.⁴¹

It is not just technological change but also social change that creates new issues for the courts.⁴² Questions concerning fathers’ rights and grandparents’ rights were unlikely to arise before the decline of the family unit in American society in the second

³⁹ See, e.g., *Qualitex Co. v. Jacobson Products Co. Inc.*, 514, U.S. 159 162,173 (1995) (discussing the Lanham act).

⁴⁰ See Margreth Barrett, *Internet Trademark Suits and the Demise of “Trademark Use”*, 39 UC DAVIS L. REV. __ (2006) (forthcoming) (discussing metatag use); see also *Brookfield Communications, Inc. v. West Coast Entertainment Corp.*, 174 F.3d 1036, 1045 (9th Cir. 1999); *Bihari v. Gross*, 119 F.Supp.2d 309, 312 n.3 (S.D.N.Y. 2000).

⁴¹ For other wonderful examples of questions that could only arise in the modern era, see Sonia Katyal, *Semiotic Disobedience*, (manuscript on file with author) (describing artist-activist groups on the web that imitate the operations of a corporation or create fake membership networks).

⁴² Cf. Grey, *Langdell’s Orthodoxy*, *supra* note x, at 39 (noting that Langdell’s formalism was not readily adapted to the period of rapid social change in the early years of the twentieth century).

half of the 20th century. This constant march of technological and social change ensures a steady stream of new issues for the courts.

Most importantly, legal issues are constantly new because the law itself drives both behavior and legal argument into new areas. Judges set boundaries based on the case in front of them. Those wishing to escape the constraints will naturally look for open territory, the interstices among those things that have been decided. In this way, courts are continually driven to evaluate new questions, adapting and interpreting old precedents. [This section continues with an example from labor law in the 1990s in which both human behavior and legal argument sought out available openings in existing case law, presenting the courts with novel issues.]

Law can never be merely the static ordering of what exists. Societal change and human nature guarantee that cases will reach beyond the confines of existing legal doctrine. Novelty alone is not the problem. The problem is that cases will naturally emerge within the spaces created by whatever structure exists, rendering that structure insufficient for resolving the question. This inclination towards the undecided drives the evolution of law and dooms any attempt to capture law within a fixed structure.

Thus, law cannot fulfill the vision of a great intelligence constantly learning and improving as it builds upon its experience. The pressure of change ensures that law is not a process of perfecting what has gone before, but rather a constant struggle to adapt to the new.

A. Bounded Adaptation

It is tempting to succumb to the Legal Realist vision that law is unconstrained or the even more pessimistic Critical Legal Studies vision of law as inherently unstable and irresolvable. Nevertheless, law is bounded by two significant constraints: the pressure of precedent and the discipline of acceptance.

It is nothing novel to suggest that law is bounded by precedent. Even opinions that appear to deviate from precedent are bathed in language lauding the role of precedent in our legal system.

Our commitment to precedent is unquestionable. The more difficult question is whether that commitment is realistic when judges may be consciously or unconsciously pursuing the dictates of their own perspectives and biases. It is the discipline of acceptance, however, that gives strength to our commitment to precedent.⁴³

In particular, the final act of the art of law is persuasion and acceptance. In addition to the process of distilling common logic that can extend to new circumstances, the art of law also involves the ability to articulate that common logic in a way that can gain general acceptance. This articulation and confirmation is essential in a system that claims allegiance to precedent, and it reinforces our ability to serve that allegiance.

A variant of this perspective can be found in the views of some Legal Process scholars who argued that the rules involved in judicial decision making are sufficient to create substantial constraint on both process and outcome. For these scholars, the requirement of “reasoned elaboration” would incline courts towards the substantively best outcome.

⁴³ See Bix, *supra* note x, at 898 (describing the view of some Legal Process scholars that “Reasoned Elaboration,” the notion that rules and guidelines involved in judicial decision making are sufficient to create substantial constraint on both process and outcome, will incline courts towards the substantively best outcome).

The requirement of acceptance mitigates the distortion of personal perspective. Even if judges are unconsciously following their own biases or privileging one strain of conclusions over another, the decisions they reach and the arguments they offer in support must gain the acceptance of others with differing biases.

This perspective softens the bite of some of the criticisms of legal decision making offered by Legal Realists, Critical Legal Studies scholars, and those influenced by their scholarship. For example, many scholars have complained that legal analysis is unreliable because it depends on the lens through which one observes the problem. As Katz explains, “one’s moral vision of the world necessarily will shape the categories one chooses to describe it.”⁴⁴ Thus, when Litowitz criticized Ellickson’s description of nonlegal rules of behavior in Shasta County, he complained that what Ellickson saw was filtered through distortive models and that only critical models could explain what Ellickson missed.⁴⁵

In a similar vein, Unger’s seminal Critical Legal Studies piece argues that one cannot rely on reason for objectivity. Rather, reason is infused with subjectivity and the line between reason and desire is artificial.⁴⁶

Despite the power of these observations, the legal system’s requirement that one’s reason, or desire wrapped in reason, bounce off of others applies some discipline. It creates an incentive to find that which is more widely acceptable and to readjust when one strays too far into the subjective. One’s groupings, whatever they may be, will be

⁴⁴ See Katz, *supra* note x, at 2241.

⁴⁵ See Douglas Litowitz, *A Critical Take on Shasta County and the “New Chicago School”*, 15 YALE J. OF L. & HUMAN. 295, 299 (2003) (arguing that Ellickson missed opportunities to explain “why Shasta County is overwhelmingly white, why it has a brutal history of environmental devastation and genocide against Native Americans, why most of the property owners are men, why it has shocking rates of child poverty and substandard housing, and why it is being overrun with strip malls and low-wage jobs”).

⁴⁶ See Ungar, *supra* note x, at ____; KELMAN, *supra* note x, at 64 (discussing Ungar).

subject to the scrutiny of different legal actors with varying experiences and visions, a process that will impose some measure of restraint, although by no means perfect restraint.⁴⁷

One should have no rose-colored glasses. There will be errors -- individual mistakes, collective mistakes, and inabilities to reach any position of acceptance at all.⁴⁸ Nevertheless, the enterprise of searching for and trying out rational adaptations, unfolding across a span of cases, is at the core of the legal process.

One additional point about the process of acceptance bears mention. Adaptations will be evaluated within the prevailing norms of the society at large or of those within the sphere of acceptance. Thus, although I express much sympathy for the Legal Process notion that rules and guidelines of discussion and explanation will constrain decision making, I part company on the notion that those constraints are sufficient to lead towards some objective notion of a substantively best outcome.⁴⁹

C. Is There Something Different About Law Related to Technology?

The section above described the essential process of law. Is there something substantially different, however, about law related to technology? Perhaps it is appropriate to defer to science in legal areas related to science, particularly an area like patent law that involves defining a scientific invention.

Patent law, however, is no different from any other area of law. It requires the

⁴⁷ The American history of social mobility may also mildly tug against the narrowness of our personal perspectives. The thought, “There but for the grace of God go I” or , “There with the grace of God will I go someday” may give us a view that supports not only what is in the interests of the position we now occupy but also what is in the interests of the position we could imagine for ourselves. Compare and contrast to rational self-interest theory).

⁴⁸ Consider, for example, the decades-long struggle over the relationship between Constitutional rights and laws related to abortion.

⁴⁹ See Bix, *supra* note x, at 897-98 (discussing Legal Process scholars).

same tools and proceeds by the same interpretative methods that we employ throughout law as we interpret precedent.

Consider the process of interpreting the meaning of a patent and determining its scope. When delineating the footprint of a patent, one must ask, among other things, what the terms meant to the person who drafted the patent, and whether there are any circumstances in which we would extend that meaning. For example, if a patent holder in the aerospace industry claims a method of calculating something and the patent describes making the calculation at a ground control center, does the patent extend to systems that accomplish the same steps onboard the spacecraft?⁵⁰

In interpreting the scope of the patent language, we could declare that patent drafters must be clear and precise. If they wish to include something, they must describe it directly.⁵¹ Alternatively, we could allow leeway, for example, interpreting language to include shared understandings in the field, even if that information is not directly described in the words of the patent.⁵² Reaching even more broadly, we could choose to interpret the language as including something that was un contemplated by the drafters, perhaps even unknown at the time of the patent, but that we feel should be within the orbit of the invention. Perhaps the difference is trivial so that the accused device performs the same function in the same way reaching same result as the protected

⁵⁰ See *Hughes Aircraft Co. v. United States*, 717 F.2d 1351 (Fed. Cir. 1983).

⁵¹ See, e.g., *Chiron v. Genentech*, 363 F.3d 1247, 1255 (Fed. Cir. 2004) (strictly applying the written description doctrine); *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473 (Fed. Cir. 1998) (same).

⁵² See, e.g., *Amgen Inc. v. Hoechst Marion Roussel*, 314 F.3d 1313, 1334 (Fed. Cir. 2003) (“The specification need not explicitly teach those in the art to make and use the invention; the requirement is satisfied if, given what they already know, the specification teaches those in the art enough that they can make and use the invention without ‘undue experimentation.’”); *cf.* 3 DONALD S. CHISUM, CHISUM ON PATENTS §7.03[2][a] (2003) (noting that in patent law, the hypothetical person skilled in the art is presumed to know all of the prior art in the field).

invention.⁵³ Perhaps there has been an external shock, a fundamental technological change across all industries, such as the advent of digital technology, that was unforeseeable by the drafters of the patent.⁵⁴ We might choose to expand the meaning of the terms to encompass that change, if failure to expand would eviscerate the goal of protecting the invention.

Throughout this analysis, patent law is trying to understand terms established at a different time in a different context and apply that understanding to new facts. This enterprise, however, is at the heart of legal reasoning across all areas of law. It is the essence of interpretation of precedent, whether that precedent is case law, legislation, or the Constitution.⁵⁵

Consider, for example, constitutional interpretation. In interpreting a constitutional provision, one may begin by asking what the provision meant to the drafters and whether there are circumstances in which we would extend that meaning.⁵⁶ We could decide that the drafters of a constitutional provision or amendment should be clear and precise. If the Constitution grants a power to Congress, for example, that grant

⁵³ See *Sanitary Refrigerator, Co. v. Winters*, 280 U.S. 30, 42 (1929) (applying the so-called function-way-result test of the doctrine of equivalents).

⁵⁴ See *Hughes*, *supra* note x; see also *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 740 (2002) (a patent holder's decision to narrow claims through amendments at the PTO generally is presumed to be a general disclaimer of territory, but that presumption is rebuttable for things that the patent holder could not have foreseen).

⁵⁵ Cf. *SmithKline Beecham Corp. v. Apotex Corp.*, 247 F.Supp.2d 1011 (N.D.Ill.2003) (Posner, J. sitting by designation) (noting that the Federal Circuit deems statutory interpretation a useful analogy to claim construction and citing *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 987 (Fed.Cir.1995), *aff'd*, 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996)); Margaret Jane Radin, *The Linguistic Turn In Patent Law* 5 (manuscript on file with author) (comparing patents to statutes and contracts and arguing that the relationship of patents to the objects they cover is not unique).

⁵⁵ See *Hughes Aircraft Co. v. United States*, 717 F.2d 1351 (Fed. Cir. 1983).

⁵⁶ See Lawrence Lessig, *Fidelity and Constraint*, 65 *FORDHAM L. REV.*, 1365, 1373 (1997) (explaining that the two basic steps in constitutional interpretation are to locate a meaning in an original context and then to ask how that meaning is to be carried to a current context).

must be indicated clearly, or the power is left to the states.⁵⁷ We could choose to interpret the language by reference to the social context and the shared understandings of the drafters and their contemporaries. Reaching more broadly, we could choose to expand what would have been part of the shared understandings at the time of the drafters in light of changed circumstances in society and in order to give effect to the provision. Lessig offers a simple example of the third approach: Article I of the Constitution, which speaks of the army and navy, might reasonably be interpreted to include the air force, considering that the army and navy constituted the full complement of armed forces at the time of the Constitution whereas our nation's armed forces now include an Air Force given the advent of military flight.⁵⁸ As Judge Bork has explained:

Judges given stewardship of a constitutional provision—such as the first amendment—whose core is known but whose outer reach and contours are ill-defined, face the never-ending task of discerning the meaning of the provision . . . it is the task of the judge in this generation to discern how the framers' values, defined in the context of the world they knew, apply to the world we know. The world changes in which unchanging values find their application. . . . The first amendment's guarantee of freedom of the press was written by men who had not the remotest idea of modern forms of communication. But that does not make it wrong for a judge to find the values of the first amendment relevant to radio and television broadcasting. . . . Perhaps the framers did not envision libel actions as a major threat to that freedom. I may grant that, for the sake of the point to be made. But if, over time, the libel action becomes a threat to the central meaning of the first amendment, why should not judges adapt their doctrines?⁵⁹

The question of whether, how far, and under what circumstances we might expand application of a constitutional provision is a question that must be answered by legal theory and doctrine. No linguistics expert or other social scientist can answer the

⁵⁷ *Cf.*, *Deepsouth Packing Corp. v. Laitram Corp.*, 406 U.S. 518 (1972) (holding in a legislative interpretation case that if Congress wants § 271 of the patent act to apply outside US territory, it must say so explicitly).

⁵⁸ *See*, U.S. Const. art. I; Lessig, *supra* note x, at 1376-77.

⁵⁹ *See Ollman v. Evans*, 750 F.2d 970, 995-96 (D.C. Cir. 1984) (Bork, J., concurring), cert. denied, 471 U.S. 1127 (1985).

question for us.⁶⁰

Patent interpretation is like constitutional interpretation at hyper speed. With a patent, we are trying to interpret a document, and the extent of rights granted with that document, in the context of rapidly changing meaning and knowledge. In this enterprise science can offer only limited assistance. Science, whether biochemistry or linguistics, can help determine whether things are the same and can identify the ways in which they differ. Science cannot, however, tell us whether that sameness matters from a legal perspective.

Thus, even in patent law, where the logic for using to science is at its strongest, the enterprise remains the same process of legal analysis and adaptation that we engage in throughout the law.

D. The Mismatch of Science

As described above, law is constantly driven to adapt to changing circumstances within existing frameworks as tested and refined through various spheres of acceptance. Science rules are particularly ill-suited to this process of adaptation.⁶¹ If legal actors lack sufficient information about a rule to both adapt it and to challenge those adaptations, the use of that rule will interfere with the unfolding of the legal process. Thus, science rules and terms, which embody assumptions and shared understandings beyond the legal

⁶⁰ One can analogize to interpretation of a contract. A linguist can offer us varying interpretations of the words, but the questions such as what we understand the context of the agreement to be, and how much that matters, and when we will look outside the contract can only be answered by legal analysis.

⁶¹ *Cf.*, Roscoe Pound, *Mechanical Jurisprudence*, 8 COLUM. L. REV. 605, 606 (1908) (arguing that "[p]erfection of scientific system and exposition tends to cut off individual initiative in the future, to stifle independent consideration of new problems and of new phases of old problems, and to impose the ideas of one generation upon another").

realm, hinder this process. Most importantly, as described above, reaching for science can create the illusion of reasonable resolution without addressing the true problems at stake. The lack of analysis gives us insufficient information upon which to build and develop legal theories, leaving us to cling to rigid lines of demarcation instead.

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IV. The Role of Science

⁶² *Cf.*, Roscoe Pound, *Mechanical Jurisprudence*, 8 COLUM. L. REV. 605, 606 (1908) (arguing that "[p]erfection of scientific system and exposition tends to cut off individual initiative in the future, to stifle independent consideration of new problems and of new phases of old problems, and to impose the ideas of one generation upon another").

Efforts to import science into law or to export law's problems to science often fail. Nevertheless, science has an important role to play in the legal process, as long as that role is properly recognized as supportive of rather than replacing the functioning of law. Science can help guide and illuminate, but only in the context of allowing law to operate within its own parameters.

A. Aligning Incentives

Part [x] above described problems with arguments that law's domain should be circumscribed when the legal system cannot sufficiently engage in appropriate measurements. The fallacy here is not that engaging in such measurements is problematic in a judicial setting; the fallacy is that measurement is always necessary. Science is dependent on measurement. Law is not. Even when law cannot measure something in an efficient and effective manner, law still may be able to use the insights of social science to craft legal doctrine.

Consider an example from the regulation of generic drugs. Regulators and scholars have complained that patent holders and generic challengers are exploiting the regulatory system to enter into collusive settlements.⁶³ Critics argue that such

⁶³ See, e.g., Fed. Trade Commn., In the Matter of Abbott Laboratories, and Geneva Pharms, Inc.: Complaint, <http://www.ftc.gov/os/2000/03/abbottcmp.htm>; Fed. Trade Commn., FTC Charges Drug Manufacturers with Stifling Competition in Two Prescription Drug Markets, <http://www.ftc.gov/opa/2000/03/hoechst.htm>; Fed. Trade Commn., In the Matter of Schering-Plough Corp., et al., <http://www.ftc.gov/os/adjpro/d9297/index.htm>; Natalie M. Derzko, *The Impact of Recent Reforms of the Hatch-Waxman Scheme on Orange Book Strategic Behavior and Pharmaceutical Innovation*, 45 IDEA 165 (2005); Herbert Hovenkamp et al, *Balancing Ease and Accuracy in Assessing Pharmaceutical Exclusion Payments*, 88 MINN. L. REV. 712 (2004); Herbert Hovenkamp, Mark Janis & Mark A. Lemley, *The Interface Between Intellectual Property Law and Antitrust Law: Anticompetitive Settlement of Intellectual Property Disputes*, 87 MINN. L. REV. 1719, 1720 (2003); Carl Shapiro, *Antitrust Limits to Patent Settlements*, 34 RAND J. OF ECON. 339, 407 (2003); Daniel A. Crane, *Exit Payments in Settlement of Patent Infringement Lawsuits: Antitrust Rules and Economic Implications*, 54 FLA. L. REV. 747, 792 (2002); See also *Generic Drug Entry Prior to Patent Expiration: An FTC Study*, (FTC July 2002); *In re Cardizem CD Antitrust Litigation*, 332 F.3d 896, 907-08 (6th Cir.2003). But see Thomas F. Cotter, *The Interface*

settlements keep all relevant generics off the market for a period of time and extend the time during which patent holders can charge inflated prices. Without the benefit of competition from generic competitors, consumers pay higher drug prices, and the patent holder and generic company share the excess profits in the form of “settlement payments”.

The mechanism works by exploiting a provision in the Hatch-Waxman Act.⁶⁴ The Hatch-Waxman Act was intended to facilitate the entry of generic drugs onto the market in the hopes of reducing the costs of medication.⁶⁵ The act tries to encourage generic companies to challenge invalid patents or patents that are being asserted against drugs to which they do not apply. Toward this end, if a generic company files for approval of a generic drug and challenges the validity or application of patents being asserted on that drug, the generic company is awarded a 180-day period of exclusive marketing rights.⁶⁶ No other generics may enter the market until 180 days after the first

Between Intellectual Property Law and Antitrust Law: Commentary: Refining the "Presumptive Illegality" Approach to Settlements of Patent Disputes Involving Reverse Payments: A Commentary on Hovenkamp, Janis & Lemley, 87 MINN. L. REV. 1789, 1809 (2003) (arguing that although such settlements may have the potential for abuse, it is not clear that the marginal social benefit of allowing such settlements is low).

Of the three FTC actions mentioned above, two were resolved by consent decrees, and one received an FTC order finding anticompetitive actions, which was later overturned by a federal court. *See* Fed. Trade Commn., In the Matter of Geneva Pharm., Inc.: Agreement Containing Consent Order, <http://www.ftc.gov/os/2000/03/genevaagre.htm>; Fed. Trade Commn., In the Matter of Geneva Pharm., Inc.: Decision and Order, <http://www.ftc.gov/os/2000/03/genevad&o.htm>; *See* Fed. Trade Commn., In the Matter of Hoechst Marion Roussel, Inc. and Andrx Corp.: Decision and Order, <http://www.ftc.gov/os/2001/05/hoechstdo.html>; Schering-Plough Corp. v. FTC, Case No. 04-10688, Docket No. FTC9297 (11th Cir. March 8, 2005) (available at <http://www.ca11.uscourts.gov/opinions/weekops.php>) (accessed March 10, 2005).

⁶⁴ *See* 21 USC § 355(j)(2)(A)(vii) (“Hatch-Waxman Act”) [Drug Price Competition and Patent Term Restoration Act of 1984 Pub. L. No. 98-417, 98 Stat. 1585 (1984) (codified as amended in 21 U.S.C. § 355, 35 U.S.C. § 156, 35 U.S.C. § 271 (e)(1) (2000)).]

⁶⁵ *See id.*; Laba Karki, *Regulatory Amendments and Implications for Drug Patent Enforcement* 87 J. PAT. & TRADEMARK OFF. SOC’Y, 602, 609 (2005) (describing the Hatch-Waxman Act). Among other provisions, the Act allows generic drug manufacturers to rely on safety and efficacy data provided by the original patent holder of the drug. *See* Derzko, *supra* note x, at 171-72.

⁶⁶ *See* 21 USC § 355(j)(5)(B)(iv). The Hatch-Waxman Act institutes a delicate dance of filing and counter filing by patents holders and generics. For detailed descriptions of this process, see Karki, *supra* note x; Derzko, *supra* note x.

generic company commercially markets the drug. This provision gives generic companies an incentive to do battle against the big guns.

Some patent holders and generic companies have settled their disputes⁶⁷ in the following manner: The patent holder pays the generic challenger in exchange for the generic company's agreement to stay out of the market for a period of time. During that period of time, the Hatch-Waxman provisions will operate to keep other generics from entering the market. The generic company loses nothing, because the 180-day market exclusivity period does not begin until the generic company begins selling the product commercially.

With no competition in the market, the patent holder can keep the price of the drug at a high level, leaving plenty of profit to share with the generic company in the form of settlement payments. The potential for abuse in such cases is clear.

Nevertheless, settlements play an important role in the litigation process and embody judgments about the costs and risks of further litigation, regardless of the strength of the case.⁶⁸

The difficult question, therefore, is whether and when to allow such payments. Here again, the problem of measurement rears its ugly head. For example, Shapiro has suggested that such settlements should be evaluated in the following manner: The settlement should be permitted only if it would "generate at least as much surplus for

⁶⁷ The generic company files for approval of the drug before the Food & Drug Association (FDA). If the generic company wants to challenge the validity or application of a particular patent against its generic drug, however, that challenge takes place in court.

⁶⁸ See *Asahi Glass Co., Ltd. v. Pentech Pharms, Inc.*, 289 F. Supp. 2d 986, 994 (N.D. Ill. 2003) (Posner, J.) (noting that a ban on settlements in which the patentee explicitly pays the alleged infringer to stay out of the market would reduce the incentive to challenge patents by reducing the challenger's settlement options should he be sued for infringement, and so might well be thought anticompetitive); see also Cotter, *supra* note x, at 1809 (arguing that The danger of channeling Hatch-Waxman litigants toward settling away from settling on terms that involve reverse payments is that doing so threatens to reduce the value of pharmaceutical patents, including valid pharmaceutical patents).

consumers as they would have enjoyed had the settlement not been reached and the dispute instead resolved through litigation.”⁶⁹ This is a wonderfully elegant solution to a complex problem. Unfortunately, it requires the type of complicated economic calculations that courts are simply incapable of applying.⁷⁰ How can a court hope to accurately measure and compare not just one but two levels of consumer surplus, particularly when one of those is the level of consumer surplus that would have existed in the hypothetical world in which the parties had failed to settle?

We may be unable to measure the impact of a particular settlement on consumer surplus with any degree of precision. Nevertheless, our inability to measure should not prevent us from applying the insights of economics in crafting a solution. The solution to this problem lies not in asking the courts to measure but rather asking the law to align the incentives of the parties with the incentives of society, to the greatest extent possible.

For example, our current system provides many incentives for generics and patent holders to collude and share the proceeds at little cost. The potential comes from the fact that both parties get a little surplus to share. That surplus comes from the potential to keep others, who are not party to the agreement, out of the market for the term of the settlement agreement. The parties thus can impose costs on third parties or consumers without having to take those costs into account.

The expanded version of the paper then describes various proposals that would alter the 180-day exclusivity rules. The choice among these rules is less important than

⁶⁹ See Shapiro, *supra* note x, at 393.

⁷⁰ *Cf.* Crane, *supra* note x, at 780 (arguing that “rather than attempting the likely impossible-and excessively costly-task of calculating the respective costs in every instance, courts . . . would do well to adopt presumptions about the relative costs of exit payment settlements based on the probability of the patentee’s success on the merits”), For another approach to the problem, see Hovenkamp, Janis, and Lemley, *supra* note x, at 1720 (proposing that ‘exclusion payments that exceed litigations costs should be presumptively illegal).

the fact that such potential rules exist. All of the rules are designed to alter the settlement incentives among the parties. We have no need to measure the consumer surplus that the parties might be exploiting in order to address their ability to engage in such exploitation. Nor do we need to ignore the economic insights that demonstrate the potential for such exploitation. Rather, we can take those insights and craft rules to address a potential problem without extensive measurement and within the parameters of law.

In a similar vein, one scholar has suggested that a court should allow a patent holder to settle on such terms only if the patent holder is likely to win on the merits.⁷¹ The argument is that if we think the patent is probably valid, we will allow the patent holder to bargain away some of its power in exchange for avoiding the cost of litigation.

This approach requires that a court evaluate the merits of the case from the perspective of the patent holder's likelihood of success. Evaluating the likelihood of legal success on the merits is something courts are far better equipped to handle than measuring consumer surplus.⁷² Once again, solutions exist if we focus on the types of tasks that the legal system is designed to accomplish.

I am not suggesting that all measurement should be excised from legal tests. Nor can I claim that all legal tests can be crafted by aligning incentives. The point is that the more we can stick to rules that reflect the types of tasks the law is designed to accomplish, the better results we will have. This is particularly true when we are trying to benefit from the insights of science, a process that can easily lead law astray.

⁷¹ See Crane, *supra*, note x.

⁷² Crane's test becomes far more complex as the author suggests a follow up four-part inquiry, including an evaluation of whether the settlement payments reflect large proportion of patentee's rents from patent disallowed. See Crane, *supra*, note x. Nevertheless, the test could be crafted as the more streamlined "likelihood of success on the merits" inquiry.

B. *Testing and Transformation*

[This section describes how science can be used to evaluate the assumptions underlying the legal rules chosen by the courts and shape those rules. It uses examples from doctrines related to voluntary civil commitment and DNA evidence.]

C. *Speaking a Common Language*

As described in the prior section, science can play an important role helping and supporting the legal system. It can test assumptions and provide insights that can be used by legal actors within the parameters of the legal system. If scientific insights are going to play a supportive role in the legal process, however, they must be expressed in a language that legal actors can understand. Parroting technical language can obscure an inability to grasp the full meaning and implications of an issue. It creates the temptation to engage in a form of sophistry, to speak in what Nussbaum describes, in the context of philosophy, as a seductive, jargon-filled way that leads us to believe we have mastered something deep for having learned to use the jargon.⁷³ We cannot effectively engage in the process of interpretation and adaptation unless we are speaking a common language.

Jargon also is the perfect vehicle for strategic behavior. It allows legal actors to use broad open-ended language and then argue later that whatever position they wish surely falls within the language chosen.⁷⁴

⁷³ See Nussbaum, *supra* note x, at 1641; *see also*. Merton (noting that esoteric scientific terminology separates the laity from understanding and makes the population ripe for new mysticisms).

⁷⁴ See Feldman, *Inventor's Contribution*, *supra* note x, at text accompanying note 24 (noting that the emergence of the separate written description doctrine reflected concerns about patent holders who mark out broad territory with their claims and then fill in information later, either as their own research advances or as they see the research of others advance).

With this in mind, law should move towards describing scientific and technological issues in plain language, wherever possible. Even in patent drafting, which embodies some of the most challenging aspects of translation in the law and science interface, a move towards plain language would significantly improve the functioning of this area of law. If legal actors cannot understand the full implications of the terms being used, they cannot do an adequate job of considering the legal questions surrounding the precedents. They are, in essence, flying blind

It is important to note that most legal actors have no scientific expertise. The district court judges charged with patent interpretation are unlikely to have any scientific expertise. The same is true for the jurors, who must decide the other elements of patent cases. Even the specialized judges of the Federal Circuit may have little knowledge or experience relevant to a particular case. Most Federal Circuit judges have neither a technical background nor patent experience when they are appointed to the bench.⁷⁵ For those who do have some scientific training, their training may have occurred decades before, an eternity away from modern computer and genetic technologies.

Despite a lack of technical expertise, some judges are remarkably skilled at translating scientific lingo into concepts that can be molded into legal doctrine.⁷⁶ For most legal actors, however, the challenge of penetrating scientific jargon creates a tendency to defer to scientists and to avoid delving deeply into the essence of the case.

The problem is not just that patents are written using scientific language, patents also are written in the form of an arcane code. Words have particularized meanings that will be understood only by the properly initiated.

⁷⁵ See *supra* note x.

⁷⁶ See, e.g., *SmithKline Beecham Corp. v. Apotex Corp.*, 247 F.Supp.2d 1011 (N.D.Ill.2003) (Posner, J. sitting by designation).

For example, patent applicants must describe the best mode of making their invention.⁷⁷ In describing that mode, applicants may explain a manner and process of making the invention that they have not actually engaged in but that they believe is the best mode.⁷⁸ The code for signaling the difference between work that an inventor has actually engaged in and work that an inventor has not, involves verb tense.⁷⁹

Subtle verb changes are unlikely to mean much to the uninitiated, regardless of whether that person has a science degree. It would be so much clearer and simpler if the patent applicant said, “This is an example of what we believe the best mode of making the invention should be, although we have not yet performed each step in this precise order.”

Patent law is full of such code-like communication. For example, suppose a patent holder describes an invention as comprising x, y, and z components. Now, one might think that the invention is made up only x, y, and z. Not so. “Comprising” is in an open-ended code word representing the fact that the invention could include elements not actually listed.⁸⁰ The word “consisting” is the proper code word used to indicate that the elements listed are the only elements.⁸¹

Rather than trying to parse the difference between an invention “comprised of” something and an invention “consisting of” something, one could simply use plain

⁷⁷ See 35 U.S.C. § 112 (2005).

⁷⁸ See Manual of Patent Examining Procedure § 608.01(p) (8th ed., 2001). Work that an inventor has not done yet is known as a paper example. See *Hoffman La Roche Inc. v. Promega Corp.*, 323 F.3d 1354, 1375 n. 2 (Fed. Cir. 2003) (Newmann, J. dissenting).

⁷⁹ See *Hoffman La Roche v. Promega*, 323 F.3d at 1354 (invalidating a patent for using the words “the results show”, which was ruled to be past tense when present tense was required).

⁸⁰ See Shanshan Zhang, *Proposing Resolutions to the Insufficient Gene Patent System*, 20 SANTA CLARA COMPUTER & HIGH TECH. L.J. 1139, 1157-58 & n. 147 (2004); *Gillette Co. v. Energizer Holdings, Inc.*, 405 F.3d 1367, 1371 (Fed. Cir. 2005) (noting that using the word comprising in a patent is a “signal” that the list if items in the group is open-ended).

⁸¹ See *id.*; see also Jorge A. Goldstein & Elina Golod, *Human Gene Patents*, 77 Acad. Med. 1315, 1319 (Dec. 2002).

language to explain that the components “include but are not limited to the following”. A plain language description not only communicates more clearly to those who must interpret the patent, it also increases the pressure on patent holders to actually define what they are trying to claim, rather than leaving the claim open-ended with the intention of filling in the gaps as other products emerge on the market.⁸²

Most importantly, plain language allows judges to more easily understand the implications of their decisions and puts pressure on judges to take responsibility for those decisions. In particular, for judges who *do* have technical expertise, a plain language system avoids the temptation to suggest “we, in the club know it when we see it, and that is good enough.” The requirement for clear and plain communication keeps legal actors faithful to supportable logic rather than subject to the whims of prejudice masked in obscurity.

The legal system already has a good model for requiring that participants draft in plain language. Since 1998, the Securities and Exchange Commission (SEC) has required companies to draft key sections of their disclosure documents in plain language.⁸³ The program has turned ponderous, impenetrable documents into more understandable communications.⁸⁴ The same spirit, although perhaps not precisely the same approach, could be applied to patents.

⁸² See Zhang, *supra* note x, at 1158.

⁸³ See Michael G. Byers, *Eschew Obfuscation – the Merits of the SEC’s Plain English Doctrine*, 31 U. MEM. L. REV. 135, 137 (2000); see also 17 C.F.R. § 230.421(d) (2000).

⁸⁴ For discussion of the SEC plain language program, see Byers, *supra* note x; Andrew T. Serafin, *Kicking the Legalese Habit: The SEC’s “Plain English Disclosure” Proposal*, 29 LOYOLA U. CHI. L.J. 681 (1998); see also, Securities and Exchange Commission, *A Plain English Handbook: How to Create Clear SEC Disclosure Documents*, [hereinafter “SEC Handbook”], available at <http://www.sec.gov/pdf/handbook.pdf>; Steven L. Schooner, *Communicating Governance: Will Plain English Drafting Improve Regulation?*, 70 GEO. WASH L. REV. 163 (2002).

For example, the phrase “no consideration or surrender of Beco Stock will be required of shareholders of Beco in return for the shares of Unis Common Stock issued pursuant to the Distribution”

Clarifying science is certainly a challenge, but the process of translation from one field to the next is a challenge faced by fields other than science. As Nussbaum has noted in reference to philosophy, philosophy is sometimes written in a fussy and jargon-laden way, leading people to think that it has nothing to offer the person immersed in life.⁸⁵ Nevertheless, the history of medical ethics in the United States shows that philosophers are perfectly capable of learning what they need to learn in order to speak to professionals in other disciplines.⁸⁶

Before I am burned at the stake for heresy, I should explain the limitations of what I suggest. Plain language patents will not, by any stretch of the imagination, solve all of problems in patent interpretation. Language will always be subject to varying interpretations, no matter how clear and plain one tries to make it. Moreover, patents by their very nature describe something innovative. Many patent holders find themselves in the difficult position of trying to use existing language to describe something that didn't exist when the language developed.⁸⁷

It is also true that an invention described in a patent frequently must be compared to products that did not exist at the time of the patent. This makes patent drafting a particularly challenging enterprise, which could suggest that we should give drafters some leeway to speak in strange tongues. Applying precedent to circumstances that did not exist at the time the precedent developed, however, is the essence of interpretation

becomes the following: “You will not have to turn in your shares of Beco stock or pay any money to receive your shares of Unis common stock from the spinoff.” See SEC Handbook, *supra* at 24.

⁸⁵ See Nussbaum, *supra* note x, at 1641-42.

⁸⁶ See *id.*

⁸⁷ See Radin, *supra*, note x, at 6; see also Bridgeford, 357 F.2d at 682 (arguing that “[T]he right to a patent on an invention is not to be denied because of the limitations of the English language.... [T]he limitations of known technology concerning the subject matter sought to be patented should not arbitrarily defeat the right to a patent on an invention”)

throughout the legal system.⁸⁸ Patents are no different from other precedents such as cases, codes and constitutions.

In short, patent law, like any other area of law, is essentially a process of legal interpretation, which must be carried out in the common language of such interpretation. This should cast doubt on recent legislative proposals such as a recent bill to create separate intellectual property courts⁸⁹ and a bill to allow district court judges to defer patent cases to colleagues considered better-versed in patent law.⁹⁰ Such a move is likely to exacerbate the instinct to hide difficult issues behind a blaze of technical terms, rather than facing those issues. The goal should be to encourage translation of scientific terms into understandable concepts, rather than to indulge jargon by creating its own forum.

D. The Embrace of Imperfection

The sections above have explored the inclination to reach for science in an effort to solve law's difficult dilemmas. The powerful allure of science flows in part from our distress over the weakness and imperfection of law. It is tempting to see law as a hopeless enterprise, distorted by biased perceptions, hampered by ineptitude, and cluttered with contradictions.

Moreover, there are crosscurrents in modern legal theory that make us particularly susceptible to the call of science. I do not mean to suggest that there is something unique about today. The same theme emerges repeatedly throughout hundreds of years of legal

⁸⁸ See text accompanying notes x-y, *supra*.

⁸⁹ See *Special IP Trial Courts: A Bad Idea, Lawyers Say*, IP Law 360, Feb. 1.

⁹⁰ *Anne Broache*, House OKs Specialized Patent Judges, *CNET News.com*, (Feb. 13, 2007) available at http://news.com.com/2061-10796_3-6158928.html?part=rss&tag=2327-10784-0&subj=news&tag=cnetfd.blog.

history. Nevertheless, this moment may be ripe for a re-emergence, and it offers an opportunity for reflection rather than a reflexive response.

Our vision of the appeal of science flows both from a sense that science is transformative and from a sense that science is accessible to the non-scientist in general and to the legal academic in particular. Computers make everyone an armchair empiricist. Easy internet access to scientific journals and articles gives the impression of an ability to interpret and manipulate scientific research with ease, regardless of whether we actually understand its assumptions and limitations.

In contrast to our view that science is transformative and accessible, law appears damaged and weak. There are no emerging legal theories that offer hope for galvanizing our faith in the law. Moreover, the criticisms that various schools of thought have brought to bear on the process of law seem to expose flaws that reach down to its structural integrity.⁹¹ Anything deconstructed loses power, although ultimately, the instinct to deconstruct everything loses power, itself, by leaving nothing. Nevertheless, with these critical perspectives in mind, the siren song of science is particularly strong. It tempts us to abandon the effort to find clarity and meaning in law and to abdicate to a realm that appears to offer structure and coherence. We reach for science in our never-ending quest for certainty. Lessening the desire for legal perfection, however, could soften the instinct to abdicate to science.

I do not share the despair of those who find hopelessness in the law's lack of perfection or who see chaos as the central feature of law. Law will never have the elegant truth and exquisite objectivity of a mathematical formula or even the more

⁹¹ Cf. Merton, *supra* note x, at 264 (arguing that although logically, to establish the empirical genesis of beliefs and values is not to deny their validity, this is often the psychological effect).

limited reliability of a biological theory. Law is messy, full of missteps, and the ground beneath it is constantly shifting as new cases arise and additional legislation appears. It is an imperfect process of evolution and adaptation to constantly changing circumstances. Nevertheless, it is critical to understand that science itself lacks the capacity to answer the questions that law must address.

Law is not a process that can be replaced by science. It should be embraced for what it is, rather than neutered in an attempt to make it something else.

V. Conclusion

Law's love affair with science can be traced through hundreds of years of legal history. It takes the form both of attempts to import science into law and of attempts to export law's problems to the experts of science. Even when we do not go quite so far as import or export, we all too frequently wrap ourselves in scientific jargon, as if simply adapting the language of science will endow our decisions with wisdom and elegance. Throughout this history, it is remarkable how often we turn to science to soothe concerns over the inadequacies and imperfections of law.

Our perpetual forays to find better law through science are incapable of solving law's frustrations, but they do create distortions in the legal realm. When the legal system relies on science for crafting rules, those rules lack the flexibility and dexterity necessary for effective participation in the process of legal evolution. Moreover, relying on science creates the illusion of reasonable resolution. It masks our failure to resolve the issues at hand or to take responsibility for the decisions we have made. We gain

authority through obscurity, rather than earning it through the careful unfolding of legal analysis. We pay the price with unresolved issues and doctrines that are not susceptible to the process of interpretation and adaptation that is so essential to law.

We are unlikely to escape the cycle of exaltation and disappointment unless we are willing to abandon our misguided yearning for completion and perfection in law. If, however, we can adjust our vision of both law and science, we may be able to recognize that law has no need of rescue and that science can never be a knight in shining armor. Law's answers, as imperfect as they are, must be developed within law itself.