The Role of Science in Law

Abstract

The allure of science has always captivated members of the legal profession. Its siren's song offers a tune of perfection and the promise of endowing law with the respect and deference from society that we crave. We continually look to science to rescue us from the discomfort of difficult legal decisions, and we are constantly disappointed.

The powerful allure of science flows in part from our distress over the imperfections of law. With 20th Century legal theory ringing in our ears, it is tempting to see law as a hopeless enterprise, distorted by biases, hampered by ineptitude, and cluttered with contradictions. 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 call of science is particularly strong.

This article traces the interrelation of law and science from the early 1800s through modern law, analyzing law's attempts to import science into law and attempts to export law's problems to science. Using examples from doctrines related to abortion, gene patenting, environmental regulation, antitrust law and the insanity defense, the article explores the nature of law and suggests approaches to make science work more effectively within the domain of law. Most important, the article argues that we are unlikely to avoid the cycles of exaltation and disappointment unless we are willing to abandon our misguided yearning for completion and perfection in law.

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 important, 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 article 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 article 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 article 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. This is not to suggest that law is entirely unbounded. The legal system's requirement that one's reason, or desire wrapped in reason, bounce off of others applies some discipline. Nevertheless, law is constantly driven to adapt to changing circumstances within existing frameworks as tested and refined through various spheres of acceptance. The part concludes that 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 that drives us to look for rescue in the form of the hand of science.

I. The Allure of Science in Modern Law

The yearning for science appears in various forms in modern American legal thought. In one form, we adopt the mantle of science ourselves. We craft legal rules based on scientific lines of demarcation, or we 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 themselves. Thus, in some circumstances, we try to internalize science into law, and in other circumstances, we try to externalize the problems of law.[3]

[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

Both of these strategies continually fail, but they are exquisitely revealing. They reflect a persistent image that law is weak and ineffective, a pale shadow in its own domain of what the sciences can project in theirs. This image leads courts repeatedly into the same types of traps.

In particular, hiding behind science creates the illusion of reasonable resolution where the solution is not reasoned nor is the issue resolved. In other words, hiding behind science allows us to ignore the lack of resolution or to mask the preferences embodied in the outcomes. It relieves us of the psychic pressure of having to decide as well as the pressure of having to take responsibility for the decisions we have made or failed to make. [4]

Moreover, science is incapable of resolving legal issues. Our efforts to draw simple, scientific lines leads to continued conflict and increased doctrinal chaos. It is an

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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).

[4] *See* Martha L. Fineman & Annie Opie, *The Uses of Social Science Data in Legal Policymaking: Custody Determinations at Divorce,* 1987 WISC. L. REV.107, 125 (arguing that social science data may be used as a substitute for a critical inquiry into the assumptions behind the policy choices); *see also* Trubek, *supra* note x, at 618 (noting the CLS critique that social science methods hide an implicit and conservative political message behind a neutral and technocratic facade); *cf.* JEROME FRANK, LAW & THE MODERN MIND, 172 (1963) (noting that the suspense required to arrive at adequate judgment is painful, therefore the judge whose judgment is routine is avoiding the pain of suspended judgment).

ironic result, given that one might expect incorporating scientific rules to bring more certainly and objectivity, rather than greater chaos.

Most importantly, when we borrow from science to establish legal doctrines, it is easy to forget that scientific lines themselves are artificial constructs. Scientific categories are often no more than proxies, ways of 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. In reaching for scientific solutions, we become fixated on scientific categorizations, as if lines drawn by science have some mysterious power that we can access by invoking them.[5]

A. Incorporating Science Markers into Law

In trying to resolve difficult legal issues, courts all too frequently reach for scientific markers in an effort to resolve intractable questions. We look to science for simple lines that can be grafted onto legal doctrines.

The classic example of this phenomenon occurred in decisions related to abortion. In *Roe v. Wade* and its progeny, courts settled into rigid dividing lines based on conceptualizing pregnancy in 3 trimesters.[6] In the first trimester, the state could not

5 *Cf.* Roscoe Pound, *Mechanical Jurisprudence*, 8 COLUM. L. REV. 605, 606 (1908) (arguing that "[t]he effect of all system is apt to be petrification of the subject systematized. Perfection 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").
6 *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).

intervene.[7] 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.[8] Finally, in the third trimester, the state could intervene in the interests of protecting the fetus.[9]

The approach 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.[10] The scientific line was doomed from the start, given that it ignored the fundamental philosophical issues. No scientific line could ever resolve the underlying 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, we continued to cling to it, even as it proved inadequate from a scientific standpoint as well as a philosophical one. 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.[11] Having grabbed onto a scientific marker that failed to resolve the legal questions, we held onto it for decades, even when it failed to comport with medical science.

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[7] *See* Planned Parenthood v. Casey, 505 U.S. at 872, Roe v. Wade, 410 U.S. at 163.
[8] *See* Planned Parenthood v. Casey, 505 U.S. at 872, Roe v. Wade, 410 U.S. at 163.
[9] *See* Planned Parenthood v. Casey, 505 U.S. at 872.
[10] *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.
[11] *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).

1. 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.[12] 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 number of cases concerning "linking," that is, when a web site or a search engine displays information from another web site.[13]

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.[14] This distinction echoes a line hinted at by the Ninth Circuit when it withdrew an earlier opinion concerning linking.[15]

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

[12] *See* Perfect 10 v. Google, Inc. -- F.Supp.2d --, (C.D.Ca. 2006).
[13] *See id.*
[14] *See id.* at 10-11, 13.
[15] *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).

technological dividing lines, although examples abound in copyright law.[16]

2. Science markers in patent cases

In no area of law is there a greater temptation to use science then 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?

Patent law, however, is no different from any other area of law. It requires the same tools and proceeds by the same interpretive methods that we employ throughout the law. In fact, patent law provides the perfect example of how the process of legal inquiry is different from science and how science can play only certain particularized roles in the legal realm.

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.

Consider, first, 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

[16] 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).

patent describes making the calculation at a ground control center, does the patent extend to systems that accomplish the same steps onboard the spacecraft?[17]

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.[18] 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.[19] Reaching even more broadly, we could choose to interpret the language as including something that was uncontemplated 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 invention.[20] 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.[21] 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

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[17] *See* Hughes Aircraft Co. v. United States, 717 F.2d 1351 (Fed. Cir. 1983).
[18] *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).
[19] *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).
[20] *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).
[21] *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).

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.[22]

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.[23] 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 must be indicated clearly, or the power is left to the states.[24] 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

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[22] *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).

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

[23] *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).

[24] *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).

time of the Constitution whereas our nation's armed forces now include an Air Force given the advent of military flight.[25] 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?[26]

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 question for us.[27]

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.

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[25] *See*, U.S. Const. art. I.; Lessig, *supra* note x, at 1376-77.
[26] *See* Ollman v. Evans, 750 F.2d 970, 995-96 (D.C. Cir. 1984) (Bork, J., concurring), cert. denied, 471 U.S. 1127 (1985).
[27] 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.

Most importantly, legal doctrines, and our understanding of them evolve as new cases cast light on the contours of those doctrines. When the legal system relies on science to craft its rules, those rules lack the flexibility and dexterity necessary for effective participation in this evolution. It is a problem evident in the abortion cases described above and in the cases related to genetic inventions described below.[28]

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. 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.[29]

Consider the Federal Circuit's struggles with the question of how to properly identify the boundaries of a genetic invention. One might imagine that genes are physically separate items in a human cell, like pennies or nickels that one could pick up individually and identify the boundaries in both a physical and conceptual manner. Such is not the case at all. Human cells contain strands of DNA.[30] Genes are simply segments of those DNA strands. We designate segments of the strand as a "gene" based on what that segment does, and we assign legal rights in what is essentially a segment of a string.

If patent law grants rights in new inventions, how can a scientist claim rights to a gene in the first place? The scientist certainly did not invent the gene. The gene already exists in the human body. Patent law, however, allows inventors to claim rights in

[28] *See* text accompanying notes x-y *supra* (discussing abortion law); *see also* text accompanying notes x-y *infra* (discussing law related to genetics).
[29] *See infra* note x (referencing H.L.A. Hart).
[30] *See* KARL DRLICA, UNDERSTANDING DNA AND GENE CLONING 3 (3d ed. 1997).

something that occurs in nature when the substance has been isolated and purified from its natural state in a way that allows a new and practical use.[31] Thus, when a scientist succeeds in identifying, isolating, and purifying a gene, the scientist can claim rights in that gene outside the state of nature, as long as the scientist can satisfy the other requirements of patentability. [32]

One of those other requirements is proof that the invention is nonobvious. In other words, an inventor must show that creation of the invention would not have been a perfectly obvious step for those skilled in the relevant art. In the case of genes, how do we determine whether a scientist claiming rights in a particular gene has engaged in enough creative and inventive activity to claim an invention? Does it matter if the techniques for isolating genes are already known? Does it matter if techniques for isolating genes *and* substantial information about the gene or its products is already known?[33] How much must an inventor contribute?

The Federal Circuit sidestepped these difficult issues more than a decade ago by choosing a simple scientific line.[34] 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

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[31] *See* Parke-Davis & Co. v. H.K. Mulford Co., 189 F. 95, 103 (S.D.N.Y. 1911), *aff'd*, 196 F. 496 (2d Cir. 1912). *See also* Merck & Co. v. Olin Mathieson Chem. Corp., 253 F.2d 156, 162 (4th Cir. 1958); Robin C. Feldman, *Rethinking Rights in Biospace,* 79 SO. CAL. L. REV. 1, 5-8 (describing the evolution of patent law that leads to patenting of genetic inventions).

[32] *See* Amgen Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1329 (Fed. Cir. 2003) (holding in a protein case that the scientist who isolated and identified the protein EPO had rights to EPO produced from any source and by any particular method other than the way nature intended); *see also* JANICE M. MUELLER, AN INTRODUCTION TO PATENT LAW (2003) (describing the five elements of patentability: proper subject matter, novelty, utility, nonobviousness, and adequate disclosure).

[33] *See* In re Bell, 991 F.2d 781 (Fed. Cir. 1993); *see also* In re O'Farrell, 853 F.2d 894 (Fed. Cir. 1988) (noting that the general technology for identifying and isolating genes is already available).

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

sequence." [35] In other words, the court tried to impose a simple, scientific line to settle the conflicts.

The Federal Circuit took the same approach to other difficult issues regarding the patenting of genetic inventions. For example, assuming biotech inventors clear the non-obviousness hurdle, how can they sufficiently demonstrate that they actually have in hand what they claim to have invented? In addition, how should patent law define the limits of what the inventor has? Again, the Federal Circuit responded with the cry of "nucleotide sequence." Inventors would receive a patent only when they described the nucleotide sequence of the relevant gene (or the amino acid sequence of the relevant protein), and they would control anything with precisely that nucleotide sequence.[36]

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 has been remarkably unsuccessful and has received unrelenting criticism.[37] For example, in the area of nonobviousness, short-circuiting the inquiry has distorted the results of

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[35] *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).

[36] *See Regents of the University of California v. Eli Lilly & Co.*, 119 F.3d 1559 (Fed. Cir. 1997); *See* Enzo Biochem, Inc. v. Gen-Probe Inc., 285 F.3d, 1013, (Fed. Cir. 2002), *revised by See* Enzo Biochem, Inc. v. Gen-Probe Inc., 296 F.3d 1316, 1330 (Fed. Cir. 2002).

[37] 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).

cases, protecting genetic claims that fail to meet international standards for biotech inventions[38] or to satisfy the level of invention required for other types of inventions.[39]

While the nucleotide sequence requirement asks for too little in some areas, it asks for too much in others. For example, as described above, the Federal Circuit declared that the question of whether an inventor actually has the claimed invention in hand turns on whether the inventor listed the nucleotide sequence in the patent application. This development sent chills through the biotech industry as inventors, who had routinely deposited their inventions in public data banks as proof of creation, watched the Federal Circuit invalidate their patents.[40]

The *Enzo* case,[41] which implemented this principle, was reissued within a few months in response to a firestorm of criticism. *Enzo II*[42] reinstated the patent and tried to suggest a narrow area of exception to the nucleotide sequence requirement, but it left a

[38] *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.).

[39] *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).

[40] In addition, patent law allows inventors to claim a group of items based on information gained from identifying a limited number of members of the group. Requiring that inventors list nucleotide sequences, however, could suggest that inventors must on identify and list the sequence for every member of a group in order to claim the group. This creates tremendous tension between different doctrinal areas. For a general description of conflicts within this area of law, see Feldman, *Rethinking Rights, supra* note x.

[41] *See* Enzo Biochem, Inc. v. Gen-Probe Inc., 285 F.3d, 1013, (Fed. Cir. 2002) [hereinafter *Enzo I*], *revised by* Enzo Biochem, Inc. v. Gen-Probe Inc., 323 F.3d 956 (Fed. Cir. 2002) [hereinafter *Enzo II*].

[42] *See Enzo II, supra* note x, at 964 (suggesting that a written description of structural details of sequencing might not be necessary where sufficient correlation of structure and function exists); brief of Government as amicus curiae at 4-5 requesting en banc consideration in Enzo Biochem, Inc. v. Gen-Probe Inc., 323 F.3d 956 (Fed. Cir. 2002) *quoted in* Univ. of Rochester v. G.D. Searle & Co., 375 F.3d 1303, 1309 (Fed. Cir. 2004) (Rader, J., dissenting from denial of en banc) (noting that the Federal Circuit's decisions have not taken a clear and uniform position regarding the purpose and meaning of the requirements in the written description area); Univ. of Rochester v. G.D. Searle & Co., 375 F.3d 1303, 1309 (Fed. Cir. 2004) (Rader, J., dissenting from denial of en banc) (arguing for a re-examination of the Federal Circuit's written description doctrine); see Robin C. Feldman, *The Inventor's Contribution*, 9 UCLA J.L. & TECH. 6 (2005) (noting that *Enzo II* has left confusion in its wake).

trail of uncertainty in its wake.[43]

The Federal Circuit has been unable to resolve the chaos and conflicts 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 lines themselves are constructs. 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.[44] However useful this construct may be, it is still artificial and necessarily glosses over distinctions that may become important as the case law evolves.[45] If we simply adopt these categories on blind faith without recognizing that they are artificial, we lose the ability to

[43] *See* sources cited at note x [prior note].
[44] *Cf.* Rebecca Eisenberg (noting that the concept of a gene is based on an artificial notion of dividing DNA according to function).
[45] 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 allotype. 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].

ask whether they fit the legal issues properly as those issues unfold.[46]

Choices made within science are themselves value-laden, which makes science less than the neutral arbitrator it might appear. The problem, however, is much more fundamental. In law, we tend to imagine that science is clear and certain. Thus, when we borrow science rules to establish legal rules, we ignore the fact that any choices have been made at all. We cling desperately to the rules as if they are based on solidity and certainty, rather than on constructs. Most importantly, our faith in science blinds us to the questions that a scientific line cannot answer for the cases in front of us and as the cases emerge in the doctrine.

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.,[47] 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

[46] 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).
[47] Rapanos v. U.S., 126 S. Ct. 2208 (2006).

issues related to "navigable waters."[48] 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,[49] some justices complained that the agencies had stretched the definition "beyond parody."[50] 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

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[48] *See id.* at 2220.
[49] *See id.*
[50] *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).

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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.[51]

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.

There is something comfortable and familiar about Justice Kennedy's test 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 sections above have described modern efforts to bring science into law by importing scientific lines of demarcation as legal rules. They have also described efforts to export law's difficult questions by deferring legal questions to scientific experts. Some modern areas of law display both of these trends, importing science into law as well as

[51] *See id.* at 2249 (Kennedy, J. concurring in result).

exporting laws questions to scientific experts. Consider modern debates in the application of economics to antitrust law.

The pervasive influence of economics in modern legal thought is undeniable. As Richard Epstein has noted, the magnitude of the Law and Economics revolution is hard to explain because the analysis of most private law subjects today is so heavily influenced by economic thought that scholars could not proceed without it.[52] This is particularly true of antitrust law, where it is difficult to imagine examining a firm's behavior under the antitrust laws without applying sophisticated economic analysis.

With law's wholesale adoption of economics into the antitrust arena, we consistently run into one simple problem: Courts can't do it, particularly where the practice at issue must be evaluated over time and in complex market settings.[53] In fact, one prominent Law and Economics scholar, Frank Easterbrook, has argued that courts are unable to apply even basic economic analysis in individual cases.[54]

> "The inquiry mandated by the Rule of Reason is whether the challenged agreement is one that promotes competition or one that suppresses competition. . . . It must consider the facts peculiar to the business to which the restraint is applied; its condition before and after the restraint was imposed; the nature of the restraint and its effect, actual or probable. The history of the restraint, the evil believed to exist, the reason for adopting the particular remedy, the purpose or end sought to be achieved are all relevant facts. These formulations are empty.

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[52] *See* Richard A. Epstein, *L aw and Economics: Its Glorious Past and Cloudy Future*, 54 CHICAGO L. REV. 1167, 1167, 1173 (1997).

[53] *See e.g.*, Barry Wright Corp. v. ITT Grinnell Corp., 724 F.2d 227, 234 (1st Cir. 1983) (arguing that law cannot replicate economics); *see also* United States v. Topco Assocs., 405 U.S. 596, 609, 611-12 (1972) (footnote omitted) (arguing that courts are of limited utility in examining difficult economic problems, ill-equipped and ill-suited to analyze, interpret, and evaluate the myriad of competing interests and the endless data that would surely be brought to bear on such decisions); A. Douglas Melamed, *Exclusionary Conduct Under the Antitrust Laws: Balancing, Sacrifice, and Refusals to Deal*, 20 BERKELEY TECH. L.J. 1247, 1250 (2005) (noting that some critics of certain modern antitrust cases complain that antitrust courts either cannot be counted on to get difficult economic and technical issues right); *cf.* SI Handling Systems v. Heisley, 753 F.2d 1244, 1266-69 (3d Cir. 1985) (Adams, J. concurring) (noting in a trade secret case, "it would seem that a court cannot act as a pure engineer or scientist").

[54] *See* Easterbrook, *Limits*, *supra* note x.

Judges and justices rightly protest that courts cannot make these judgments."[55]

Easterbrook, himself a judge, is echoing complaints heard from other corners of the bench.[56] He argues that while an economist at least has the ability to approach the evaluation of unfamiliar business practices, a judge today does not.[57] The problem is partly one of capacity. Judges, juries, lawyers, and even most staff members at the Federal Trade Commission and the Department of Justice, are not economists. By crafting antitrust rules grounded in economic analyses, however, we ask all of these parties to engage in sophisticated economics. It is not surprising that the results are disappointing. As Justice Breyer wrote in an antitrust opinion prior to joining the Supreme Court:

> [W]hile technical economic discussion helps to inform the antitrust laws, those laws cannot precisely replicate the economists' (sometimes conflicting) thinking. For, unlike economics, law is an administrative system the effects of which depend upon the content of rules and precedents only as they are applied by judges and juries and by lawyers advising their clients. Rules that seek to embody every economic complexity and qualification may well, through the vagaries of administration, prove counter-productive, undercutting the very economic ends they seek to serve.[58]

Lack of capacity, however, is not the only reason economic analyses yield disappointing results in a legal setting. It is also a problem of the forum. There is a difference between the simplifying assumptions that can be applied in an economist's pristine lab and the messy complexity that emerges in an individual case. This is particularly true when a real firm's behavior must be evaluated over time, among

[55] *See id.* at 11-12; *see also id.* at 11 (arguing that it is fantastic to suppose that judges and juries could conduct a full inquiry into the economic costs and benefits of a particular business practice in the setting in which it has been used).
[56] *See* sources cited *supra* note x. [citing Topco and Barry Wright Corp.. etc.]
[57] *See* Easterbrook, *Limits*, *supra* note x, at 11.
[58] Barry Wright Corp. v. ITT Grinnell Corp., 724 F.2d 227, 234 (1st Cir. 1983) (citations omitted).

multiple products, and within markets that are far from idealized and populated with executives who have imperfect information. The reality of any individual case makes economic rules difficulty to apply in a manageable form.

Nevertheless, having imported economic analysis, what is to be done? For some, the answer lies in limiting law's domain. Courts should act only in certain categories of cases that involve application of more simplistic models.[59] This approach, of course, has the happy circumstance of giving preference to one school of economic thought over another. It is the Chicago School's theories that tend to be based on the streamlined economic models and the Post-Chicago School's theories that require consideration of more complex factors.[60] The two lead to drastically different implications for when courts should intervene in business behavior.

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[59] *See* Oliver E. Williamson, *Delimiting Antitrust*, 76 Geo. L.J. 271, 277-279 (1987) (identifying a modern school of antitrust thought that believes courts have limited ability to deal with tradeoffs or more sophisticated economic reasoning, that these conditions are unchanging, and that simpler legal rules should be applied); *see also* Areeda & Turner, *Scherer on Predatory Pricing: A Reply*, 89 HARV. L. REV. 891, 897 (1976) (noting that long-run possibilities should be disregarded as too indeterminate and unsuitable for any administrative rules that could give them recognition); White, *supra* note x, 1173 (describing McGowan's view that in the realm of reality, courts must make decisions under conditions of imperfect information, not only as to the anticompetitiveness of the scrutinized conduct but also as to the impact of their decisions, since incomplete information implies a risk that whatever the court decides, the decision is wrong); Steven Salop, *Section 2, Consumer Welfare Effects, and the Flawed Profit-Sacrifice Standard*, forthcoming ANTITRUST L.J. at 53, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=871511 (noting that some antitrust scholars argue that implementing the consumer welfare standard is beyond the competence of judges and juries); *See* Jacobs, *supra* note x, at 38 (noting that Chicago scholars doubt the judiciary's ability to use complicated strategic models and to analyze their antitrust implications); *see also* David McGowan, *Between Logic and Experience: Error Costs and United States v. Microsoft Corp.*, 20 BERKELEY TECH. L.J. 1185, 1186 (2005).

Chicago school scholars like Melamed and Werden express some faith in the courts' ability to engage in a degree of measurement, although they would limit measurement to more basic economic analyses. *See* Melamed, *supra* note x, at 1255-56 (advocating the "profit sacrifice" test which compares the benefits and costs to the defendants of the conduct in question); Werden, *supra* note x, at 16 (advocating the "no economic sense" rule which measures whether the conduct likely would have been profitable under the assumption that a monopoly was not created because the existing competitors were not excluded). As described below however, scholars like Frank Easterbrook seem to be saying that courts cannot really handle even basic economic analyses like the Rule of Reason so let's just do it as infrequently as possible by applying filters. *See* Easterbrook, *supra* note x.

[60] *See, e.g.*, Robin C. Feldman, *Defensive Leveraging in Antitrust*, 87 GEORGETOWN.. L.J. 2079, 2084-2088 (1999) (explaining Chicago and post-Chicago school perspectives); Hovenkamp, *Antitrust Policy after Chicago, supra* note x, at 224-25 (noting that the simplicity of the Law and Economics models made it

For others, the solution is to establish filters, groupings of cases for which the court will ignore unfamiliar business practices rather than engaging in a detailed analysis of the effects of those practices in the particular case.[61] The notion that streamlined legal categories can be developed from insights that we gain across time makes sense. Nevertheless, one must ask how we derive those filters. If we are not using the experience of examining individual cases to develop the categories, there is a risk that the categories are simply dictated by economists, perhaps even a particular group of economists or a particular period of economic theory. In that case, judges would move from acting as economists to simply deferring to economists.

The instinct to defer to economists does not reside only with Chicago Scholars. For example, Oliver Williamson, a post-Chicago scholar has suggested that antitrust rules could contain the following introductory statement: "Temporarily, pending further economic analysis and deeper understanding of the economic institutions and practices in question, the legal rule for dealing with this class of cases will be . . ."[62] Again, the question is not whether new insights can be developed over time upon which antitrust law may rely. The question is whether economists are the sole mechanism of development of those insights, which the courts then passively accept, or whether the courts play an active role in developing and shaping those insights that become adapted as legal rules.

Deferring to economists would be an abdication to science rather than an appreciation of what science can bring to judicial decision making. Even that abdication

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much easier to declare behavior such as product differentiation harmless whereas this behavior have been considered suspect previously); Michael S. Jacobs, *The New Sophistication in Antitrust*, 79 MINN. L. REV. 1, 37 (1994) at 37 (noting that Post-Chicago scholars have used industrial organization and game theory approaches to develop models of strategic behavior and argue that the broad generalizations of price theory may be inappropriate when individual firms act strategically).

[61] *See* Easterbrook, *supra* note x, at 14-39 (describing proposed filters).

[62] *See* Williamson, *supra* note x, at 279.

might seem like blessed relief, if it brought clarity and certainty to a difficult area of law. The proposed filters and simplified models, however, are value laden and subject to dispute even among those who agree that filters should be adopted.[63] Reaching for the science of economics cannot bring the rationality and neutrality that we crave.

There has always been a trade-off in law between precision and simplicity. In this case, however, the plea for simplicity arises because science is considered too complex to apply in a judicial or administrative setting. We should not ask, "What is wrong with those courts and agencies that they cannot apply economics?" Rather, we should ask, "What is wrong with this system of measurement for the judicial setting?"

This is not to suggest that antitrust should proceed without the benefit of economic insights. Economics, as the core of antitrust, is here to stay, and it will continue to play an important role in encouraging the development of rational utilitarian frameworks for this area of law. Given the limits of economics in a judicial setting, however, the question is where we should turn in our efforts to make those economic insights useful in a judicial setting.[64]

Wherever we turn, we must avoid a fixation with measurement. There may be things we can measure with precision and things we cannot measure, but the task of law is not defined by the task of measurement. For example, we may not the able to precisely

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[63] *Compare* Melamed, *supra* note x (advocating the "profit sacrifice test") *with* Werden, *supra* note x, (advocating the "no economic sense rule"); *see also* text accompanying notes x-y, *supra.*

[64] In an early case at the intersection of patent and antitrust, the Supreme Court refused to rely on antirust rules for a finding of patent misuse. The court suggested, however, that the logic of why certain behaviors raised concerns in an antitrust context would give further insight into why those behaviors might be of concern in the context of patent policy. The rules, however, would have to be based on patent law. *See* Motion Picture Patents Co. v. Universal Film Mfg., 243 U.S. 502, 514, 517-18 (1917); *see also* Feldman, *Insufficiency*, *supra* note x, at 407 (describing the development of patent misuse). Antitrust insights might inspire the formation of patent misuse rules, as long as the formation of those rules rests on the logic of patent policy. Similarly, economic insights may inspire antitrust rules, as long as antirust rules rest on the logic of legal policy and are not simply economic formulas substituted for legal rules.

measure the size of a particular market that would have developed but for strategic anti-competitive behavior. Nevertheless, we might still choose to respond to a firm that repeatedly suppresses the emergence of any future technology that might erode its monopoly power. The impossibility of the task should not matter if the task is not the essence of the enterprise.

Most importantly, the deeper challenge is to recognize a consistent pattern of behavior in the legal system. We begin with an over-exuberant embrace of a science as the solution to our difficult legal problems. Over time, the limitations of that science in the legal realm become apparent. This should suggest a problem with the rubric, an indication of the way in which science cannot assist law. Instead, it is interpreted as a weakness of law, a point at which law must cease to operate and lawyers must defer to experts. Worse yet, the experience is simply forgotten and played out repeatedly at other times and in other segments of the legal realm.

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.[65] 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.[66] 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 observations of nature, should trace the origins and developmental paths of legal doctrine to identify the enduring and stable principles.

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[65] *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).

[66] *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

As Bishop explained, laws that govern men in society, "operate steadily, constantly, and uniformly; as does the law which draws the rivulet steadily and constantly down-stream . . . [a]nd as a particular motion of the stream is not the law of the stream, but only evidence of the law."[67] In other words, like the natural science taxonomists of the time, legal scholars should engage in an exhaustive and exact study of laws and cases to discover the universal and natural governing principles of human affairs.[68] These natural governing principles were supposed to be universally acceptable and understandable to all through "common sense," given that everyone was presumed to share the experience of perception and that everyone's perceptions were presumed to be consistent.[69] This movement represented reconceptualizing law as analogous to the natural science movement of the time.

This approach, however, failed to bring clarity or universal agreement concerning legal principles. Among its many problems, scholars following the natural science approach argued strongly in favor of slavery during the Civil War. When those views were discredited in the post Civil War era, the theoretical approaches were discredited as well.[70]

Law's love affair with the natural sciences flourished again in the 1870s and found an institutional home with the arrival of Christopher Columbus Langdell as the dean of

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[67] JOEL P. BISHOP, THE FIRST BOOK OF THE LAW 47 (1868); *see also* David Dudley Field, SPEECHES, ARGUMENTS, AND MISCELLANEOUS PAPERS OF DAVID DUDLEY FIELD 526-27 *Magnitude and Importance of Legal Science* (A.P. Sprague, ed.) (1884) (analogizing the proper study of law to descending from a mountaintop in order to understand the landscape in its vast, varied, and finite details) [available at www.heinonline.org].

[68] *See* Schweber, *supra* note x, at 450-51; *see also* Daniel Mays, *Whether Law is a Science: An Introductory Lecture Delivered to the Law Class of Transylvania University, on the 8th of November, 1832*, 369 (1832) (arguing that "[C]ases are useful; but their greatest use is, that they serve to illustrate principles. If they are read and not resolved into elementary principles, the profit of the reading is not worth the time it occupies") [available at www.heinonline.org.].

[69] *See* Schweber, *supra* note x, at 442-45 (describing the influence of Scottish Common Sense theory on Baconism and the influence of Baconism on nineteenth century American legal thought).

[70] *See id.*, at 455-56.

Harvard Law School.[71] Langdell wanted to transform legal education from the teaching of a craft into a scholarly endeavor worthy of a place of honor among the great universities of the nation.[72] To bring legal education into this fold, Langdell suggested that using scientific methods, scholars could identify fundamental principles and axioms which lawyers could apply to reach the proper solution to any legal problem.[73] Cases would be the data set for the scientific inquiry, and from this data set, one could derive the fundamental principles of private law.[74]

This legal science was not a deductive science, like mathematics, in which a series of true statements can be used to derive another statement that is necessarily true.[75] Rather, it was more an inductive field science, like botany, in which one uses a series of examples from the available specimens to derive general principles.[76]

The notion of law as a clear and structured science also offered relief from the bewildering array of issues emerging in the late 1800s. With industrialization, the range and complexity of the economic transactions regulated by case law expanded dramatically.[77] This change put tremendous pressure on a legal system that frequently

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[71] *See* Grey, *Langdell's Orthodoxy*, *supra* note x at 1.
[72] *See* Martha C. Nussbaum, *The Use and Abuse of Philosophy in Legal Education*, 45 STAN. L. REV. 1627, 1629 (1993).
[73] *See* Bix, *Positively Positivism*, *supra* note x, at 892; Grey, *Langdell's Orthodoxy*, *supra* note x at 5. Publications at the time included THE SCIENCE OF LAW (1874) (containing a foldout chart of The Scheme of a Body of Laws for the Modern State); S AMOS, THE SCIENCE OF LAW 119 (1874) (noting that law is composed of elements as permanent add universal as the elements of human nature itself); and E. CAMPBELL, THE SCIENCE OF LAW, ACCORDING TO THE AMERICAN THEORY OF GOVERNMENT 6 (arguing that "the principles of justice are a definite body of immutable principles, and hence constitute a true science"). *See* Veilleux, *supra* note x, at nn 44-48 and accompanying text (describing these and other scholarly publications of the late 1800s).
[74] *See* Veilleux, *supra* note x, at 1975.
[75] *See*, Bix, *supra* note x, at 892 (noting that Langdell's analyses were not deductive).
[76] *See*, Bix, *supra* note x, at 892; SIMON BLACKBURN, THE OXFORD DICTIONARY OF PHILOSOPHY 192 (1994) (describing inductive reasoning).
[77] *See* Lessig, *supra* note x, at 1403.

relied on a judge's understanding of long-standing customs.[78] One could not rely on custom in the face of rapid changes in the nature and complexity of societal interactions. Law, conceptualized as a structured science, offered great appeal in times of turmoil and increasing complexity. [79]

The legal system, however, stubbornly refused to conform to any notion of a rational science. Its treasured data bank of cases failed to reveal a clear structure of higher order principles branching into ancillary rules, despite valiant efforts at analysis. [80] In particular, critics pointed out that cases frequently contradicted each other and any apparent guiding principles.[81] Later attempts to organize the law into restatements and treatises produced great and complex compendiums lacking the simple clarity suggested in the notion of law as a science.[82]

As law failed to live up to the notion of an inductive natural science, other schools of thought emerged in opposition. For example, the Progressives, including scholars like Holmes, Pound and Cardozo, suggested that legislators were the main instruments of law rather than judges and argued that law could be understood as policies rather than rules.

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[78] *See id.*

[79] *See* CHRISTOPHER C. LANGDELL, A SELECTION OF CASES ON THE LAW OF CONTRACTS viii-ix (1871) *quoted in* Stephen M. Feldman, *The New Metaphysics: The Interpretive Turn in Jurisprudence*, 76 IOWA L. REV. 661, 661 n.5 (1991) (arguing that "[l]aw, considered as a **science**, consists of certain principles or doctrines. . . . If these doctrines could be so classified and arranged that each should be found in its proper place, and nowhere else, they would cease to be formidable from their number.").

[80] As Austin noted in his lectures on jurisprudence, "[i]deal completeness and correctness . . . is not attainable . . . though the system had been built and ordered with matchless solicitude and skill." *See* 2 AUSTIN, LECTURES ON JURISPRUDENCE 997-98 (5th ed. 1885).

[81] *See* Felix S. Cohen, *Transcendental Nonsense and the Functional Approach*, 35 COLUM. LAW. REV. 809 (1935) (noting that the practice of legal reasoning often ignores facts and practical consequences and rather is based on the manipulation of legal concepts in certain approved ways.); *see also* KELMAN, *supra* note x, at 46 (noting that one of the most entertaining sports that critics of Langdellian legal science engaged in was to tweak their treatise-writing, rule-collecting Formalist forbearers for announcing that they had discovered legal rules that were, on inspection, utterly vacuous and question begging).

[82] *See* Grey, *American Legal Thought*, *supra* note x, at 500 (describing the collaboration between Langdellians in writing the first Restatements, and noting the Legal Realist critiques of these Restatements as well as the treatises of the era); Arnold, Institute Priests and Yale Observers--A Reply to Dean Goodrich, 84 U. PA. L. REV.. 811, 820 (1936) (criticizing restatements).

Many Progressives felt that although an exact, internal legal science was a chimera, law could be reconstructed as a policy science around social science. Law would not be a deductive science but a science of informed experiment in which appropriate legal actors could use social science to guide them to various policies that could be tested and refined across time.

In this context, Progressives urged that legislators and experts at administrative agencies should apply social science as a guide to the proper policies. Judges, too, could apply social science to fill in the gaps left by legislators in their quest for the right policies, although their role should be limited. Thus, law itself might not be a physical science, but legal actors could operate like social scientists, engaging in a type of informed experiment to find their way to an enlightened path for society.

The Legal Realists followed quickly on the heels of the Progressives.[83] They argued that The Progressives' cherished policy science was no more clear or predictable than the rules and axioms of a natural science approach. Legal Realists believed that laws and precedents were indeterminate, capable of a myriad of interpretations. Words, according to the Legal Realists, are inherently open-ended.[84] Moreover, conflicting rules

[83] *See* Stephen M. Feldman, *The Transformation of an Academic Discipline: Law Professors in the Past and Future (or Toy Story Too),* 54 J. LEGAL EDUC. 471, 482-83 (2004) (noting the development of Progressive legal theories such as those of Roscoe Pound around the turn of the twentieth century, and the emergence of Legal Realism in the 1920s and 1930s).

[84] *See* Jerome Frank, *Words and Music: Some Remarks on Statutory Interpretation*, 47 COLUM. L. REV. 1259, 1263 (1947) (noting that people's annoyance with the way judges sometimes interpret apparently simple statutory language is based on the false assumption that each verbal symbol refers to one and only one specific subject, and a denial of the wide range of ambiguities a word may have that can only be resolved through consideration of context and background); Felix Frankfurter, *Some Reflections on the Reading of Statutes*, 47 COLUM. L. REV. 527, 528 (1947) (noting that words are symbols of meaning, but unlike mathematical symbols, the phrasing of a document, especially a complicated enactment, seldom attains more than approximate precision); *see also* KELMAN, *supra* note x, at 12-13(describing the Realists).

frequently cover the factual circumstance, and no autonomous mechanical rules can clearly govern the conflict.[85]

Legal Realists thought that judges inevitably responded to their own perspectives and prejudices.[86] The process of law, according to the Legal Realists, involved intuitive dispute resolution in light of unconsciously absorbed custom.[87]

Law's interrelation with science endured for the Realists, however, but in a slightly different form. For the Realists, judges and legal scholars could use social science to better understand themselves.[88] Studying themselves would help scholars reveal the indeterminate and individualized nature of judging and would help judges better understand and follow their unconscious instincts.[89] Legal actors were still analogous to social scientists but the subject of study was themselves.

The Legal Realists' faith in social science was also reflected in their devotion to the continued rise of the regulatory state. Both Realists and Progressives viewed administrative government as the scientific solution to the economic and social crises of

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[85] *See* KELMAN, *supra* note x, at 45; Roscoe Pound, *Mechanical Jurisprudence*, 8 Colum. L. Rev. 605, 606-614 (1908) (warning against the cyclical petrifaction of the common law where longstanding legal doctrines are unexamined and mechanically applied, and ultimately fail to respond to the human conditions and complexities of present day life).

[86] *See, e.g.*, Karl N. Llewellyn, *"Law and the Modern Mind": A Symposium*, 31 COLUM. L. REV 82, 83 (1931) (reviewing JEROME FRANK, LAW AND THE MODERN MIND (1930)) (contrasting the myth that the great bulk of a judge's work is "mere routine application of accepted rules" with the reality that no different from witnesses, a judge's perception of "the facts" varies according to temperament and circumstance, and a judge's selection, stress, and arrangement of "the facts" can make the most peculiar case look routine).

[87] *See* Grey, *Langdell's Orthodoxy*, *supra* note x, at 503.

[88] *See* Karl N. Llewellyn, *Some Realism about Realism: Responding to Dean Pound*, 44 HARVARD LAW REVIEW 1222 (1931) (serving as a classic example of social scientific self-examination through the employment of statistical, textual analysis upon the then-emerging writings of perceived new legal realists in order to discover if indeed a common school of legal realists exists); JEROME FRANK, LAW & THE MODERN MIND, 172 (1963) 178-80 (using psychology to explain that the wish for things certain and secure is an infantile, regressive tendency and to advocate that judges recognize that all rules and standards are fictions, to appreciate law's dynamic qualities, and to struggle against the drag of childish nostalgia for the over-secure and serene); *see also* Grey, *Modern American Legal Thought*, *supra* note x, at 510 (describing the Legal Realists).

[89] *See* Grey, *Modern American Legal Thought*, *supra* note x, at 501; see *also* LAURA KALMAN, THE STRANGE CAREER OF LEGAL LIBERALISM, 16 (1996) (noting that legal realists debunked the law as an effort to improve it by treating it as a tool of social policy).

the 1920s and 30s.[90] Judges were viewed as lacking the means, the expertise, and perhaps the will to bring about the changes necessary to keep pace with the tremendous upheavals of the time. [91]

Administrative agencies during this period were given extraordinary discretion, in deference to their expertise.[92] This deference was justified on grounds both that agency experts were superior in capacity and that their expertise made them more trustworthy. For example, in describing the need for limited judicial oversight, the Supreme Court commented that an agency "deals with a subject that is highly specialized and so complex as to be the despair of judges" and is "better staffed for its task than is the judiciary".[93] In another case, the Court expressed its faith in agency experts by noting that "the training that is required, the comprehensive knowledge which is possessed, guards against accidental abuse of its powers or, if the abuse occurs, to correct it."[94] Thus, expertise would make those at agencies the neutral and dependable arbiters of difficult legal dilemmas.

Faith in the administrative state was reinforced by the Legal Process School that began to emerge in the late 1930s in response to Legal Realism.[95] If our perspectives are hopelessly clouded and words are inherently open-ended, how are we to function as a legal system? Most importantly, if the Legal Realists were right that rules are subject to

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[90] *See* Reuel E. Schiller, *Reining in the Administrative State: World War II and the Decline of Expert Administration, in* DANIEL R. ERNST & VICTOR JEW, TOTAL WAR AND THE LAW, 185, 201 (2002) [hereinafter "*Decline of the Expert Administration"*].
[91] *See* KALMAN, *supra* note x, at 18.
[92] *See* Schiller, *Decline of the Expert Administration, supra* note x, at 286-88; Reuel E. Schiller, *Enlarging the Administrative Polity: Administrative Law and the Changing Definition of Pluralism 1945-1970,* 53 VAND L. REV. 1389, 1404 (2000) (describing New Deal era judicial deference to administrative agencies) [hereinafter "*Changing Definitions"*].
[93] *See* Dobson v. Commissioner, 320 U.S. at 245.
[94] *See* Perkins v. Lukens Steel Co., 310 U.S., at 127-28.
[95] *See,* Bix, *supra* note x, at 896 (describing the Legal Process school as a response to Legal Realism); KALMAN, *supra* note x, at 19 (discussing the timing of the emergence of the Legal Process School).

infinite interpretations and that perspectives can never be objective, how can law hope to be anything more than the subjective whims of individual judges? What rational domain is left for law?[96]

The Legal Process School offered one response to such unsettling visions of indeterminacy and unconstrained discretion. Legal Process argued that law could function best in the realm of choosing the institution or procedure appropriate for resolving a particular question.[97] Law might not have a monopoly on finding principles that would yield the right answer, or on the wise and selfless neutrality that would lead to a universally acceptable result. Nevertheless, legal actors might be particularly skilled at identifying which institutions and processes could function most appropriately for addressing the question at hand.[98]

Tucked into the Legal Process perspective was the notion that the legal system has limited competence for addressing some of the issues that come before it. In that terrain, legal actors should simply defer to the experts. This instinct to circumscribe the domain of law by deferring to experts is a theme that echoes in modern manifestations of law and science.

Critics of the Legal Process School would later suggest that arguments made about one institution can be made for any other institution.[99] From this perspective, similar arguments of bias and lack of access can be leveled at any institution in relation to

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[96] *See, id.* at 896 (describing discomfort in the wake of the Legal Realist critique).
[97] *See* KELMAN, *supra* note x, at 6.
[98] *See,* Bix, *supra* note x, at 897; Calabresi, *supra* note x, at 2143-2144 (describing the Legal Process school using the issue of ownership of body parts).; *see also* Schiller, *Changing Definitions*, supra note x, at 1402 (noting that process theorists such as Bickel, Wechsler, Wellington, Sachs and Hart, suggested each branch of government undertake tasks for which it is best suited).
[99] *See* KELMAN, *supra* note x, at 190-91 (describing Critical Legal Studies critiques of the Legal Process school and what he calls the deification of process).

any particular legal question. Thus, the promise of improving law by evaluating and comparing institutions remained unfulfilled.

In general, Law's euphoria over agency expertise, so strong in the 1920s and 30s, soured within a couple of decades. By the 1950s and 60s, Americans had gained experience abroad with the monstrous expressions of administrative power in fascist states as well as experience at home with wartime agencies that more often appeared to be "incompetent bullies" rather than rational, neutral arbiters.[100] Agencies would remain, along with their powerful impact on the American landscape. Once admitted, the administrative expertise would not be expelled. Nevertheless, the image of an administrative state in which experts would solve the legal system's intractable problems faded.[101]

One cannot examine the interrelation of law and social science without paying homage to the Law and Economics movement. Law and Economics is perhaps the most influential school of thought that has specifically tried to merge law with a particular social science, in this case economics.

Law and Economics gained prominence in the 1970s.[102] The elegance and simplicity of Law and Economics offered great appeal to a legal academic community still reeling from the devastating critiques of the Legal Realists and the indeterminacy of Legal Realism.[103] Law and Economics can be seen as suggesting a solution to the

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[100] *See* Schiller, *Decline of the Expert Administration*, *supra* note x, at 201.
[101] *See generally*, *Decline of the Expert Administration*, *supra* note x (describing the disenchantment with the administrative state and the imposition of due process requirements and court supervision).
[102] *See* KELMAN, *supra* note x, at 114.
[103] *See* KELMAN, *supra* note x, at 118 (noting that the so-called Chicago school of Law and Economics brought a message of simplicity to an academic and social world in search of simplicity); *see also* Mattei, *supra* note x, at 234-35 (noting that characteristics such as relative simplicity, political ambiguity, and universality helped fuel the spread of Law and Economics).

turmoil that had plagued post-Realist legal academics, who had been taught that legal rules were essentially no more than policy decisions.[104]

According to Law and Economics, the proper role of legal actors is to apply the insights of economics, particularly neo-classical price theory, to legal questions in an effort to craft efficient legal rules that create the proper incentives for optimal behavior.[105] This will promote satisfaction of the greatest possible level of overall societal wants.[106] For example, Law and Economics scholarship in tort law has suggested that the goal of tort law and regulation should be to create the proper incentives that will force individuals to internalize the consequences that their decisions inflicted on others, thereby minimizing the divergence between private and social costs.[107]

In one respect, one can think of Law and Economics as a particular variant of the Legal Process School. Law and Economics scholars treat "the market" as analogous to a separate institution in itself. Legal actors must consider whether the institution of the market is more capable of resolving the problem at hand than courts or administrative agencies.

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[104] *See* KELMAN, *supra* note x, sat 125.

[105] *See* Hovenkamp, *Antitrust Policy after Chicago*, 84 MICH. L. REV. 213, 224 (noting that an important difference between the neoclassical market efficiency model, used by Law and Economics scholars, and earlier economic models is that the neoclassical model claims a much greater ability to distinguish between efficient and inefficient policies); *See* Hovenkamp, *Positivism, supra* note x, at 822, Epstein, *supra* note x, at 1170; *see also* Katz, *supra* note x, at 2238 (noting that positive law and economics sees law merely as a set of constraints within which individual citizens maximize).

[106] Hovenkamp, *supra* note x, at 825-26. *See* Hovenkamp, *supra* note x, at 825-26; *see also* Avery Wiener Katz, *Positivism and the Separation of Law and Economics*, 94 MICH. L. REV. 2229 (1996) (comparing Bentham's nineteenth-century utilitarian that a reasonable comparison of utility across society was possible and would achieve the greatest good for the greatest number of people).

[107] *See* Epstein, *supra* note x, at 1172.

Application of Law and Economics concepts requires acceptance of certain assumptions.[108] Such assumptions include that human wants can be reduced to and accurately measured in economic terms, that human beings are rational actors, and that price theory is accurate and can be applied with specificity to an individual occurrence of human or institutional behavior.[109] Most controversial has been the descriptive claim by some Law and Economics scholars that the legal system inevitably moves towards an efficient result.[110] Even some prominent Law and Economics scholars have questioned the validity of that description.[111]

Over time, many of the assumptions of Law and Economics have come under attack.[112] Some critics have argued that human beings are not rational actors possessing full and complete information.[113] Others have argued that human wants cannot be

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[108] *See* Herbert Hovenkamp, *Antitrust Policy after Chicago,* 84 MICH. L. REV. 213, 226-29 (1985) (listing basic assumptions of the neoclassical market efficiency model upon which the Law of Economics school is based).

[109] *But see*, Hovenkamp, *supra* note x, at 827 (suggesting that the profit-maximization hypothesis is probably not verifiable in any universal sense).

[110] *See* Epstein, *supra* note x, at 1169-70(describing Posner); Grey, *Langdell's Orthodoxy*, *supra* note x, at 51 (noting that Posner finds 'efficiency,' with all the connotation of approval that term carries in his theory, in the content as well as the methods of Langdellian private law).

[111] *See* Epstein, *supra* note x, at 1170 (arguing that the positive theory of an efficient common law utterly fails to explain why, with transaction costs in decline and information more readily available, judicial regulation should be expected to increase); *see also see also* John J. Donohue III, *The Law and Economics of Tort Law: The Profound Revolution*, 102 HARV. L. REV. 1047, 1049-50 (1989) (reviewing William M. Landes and RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF TORT LAW (1987)) (comparing Landes and Posner view that tort law is efficient and serves to minimize accident losses and prevention costs with Shavell's more cautious and qualified approach).

[112] *See* Katz, *supra* note x, at 2241 (arguing that methodological reductionism is a model, not a metaphysical truth, and, like all models, aesthetic and pragmatic considerations influence the decision to use it).

[113]*See* CASS R. SUNSTEIN , BEHAVIORAL LAW AND ECONOMICS (2000); William J. Barnes, *Revenge on Utilitarianism: Renouncing a Comprehensive Economic Theory of Crime and Punishment*, 74 IND. L.J. 627 (1999) (noting that the "rational actor" assumption makes it difficult for Law and Economics scholars to produce sound theories in criminal law); Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1545 (1998) (asserting that rational actors often depart from Law and Economics' central presumptions of utility maximization, stable preferences, rational expectations, and optimal processing of information as a consequence of bounded rationality, bounded willpower, and bounded self-interest; *see also* Farber, *supra* note x (describing Sunstein's book); Katz, *supra* note x, at 2229 (citing scholars who are critical of Law and Economics' rational choice theory, including Mark Kelman, *Choice and Utility*, 1979 WIS. L. REV. 769 (1979); Richard H. Pildes &

accurately expressed in economic terms.[114] Still others have expressed concern that those who engage in Law and Economics fail to test their hypotheses and conclusions with the degree of rigor that economists would demand.[115] Finally, an increasing body of literature has argued that institutional interactions are far more complex than originally suggested by the founders of Law and Economics.[116]

Despite these criticisms, Law and Economics has had a profound impact on modern legal thought. As described above, modern courts and scholars must now try to manage that economic influence and to make economic insights useful within a judicial setting.[117]

Finally, although less focused on science, one cannot understand Twentieth Century legal thought or the current state of legal thought without mention of the Critical Legal Studies (CLS) movement. CLS emerged in the 1970s around the time as the emergence of Law and Economics.

Unlike the Legal Realists, CLS scholars did not believe in the complete indeterminacy of language. Rather, CLS argued that even when language and legal rules

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Elizabeth S. Anderson, *Slinging Arrows at Democracy: Social Choice Theory, Value Pluralism, and Democratic Politics*, 90 COLUM. L. REV. 2121 (1990)).

[114] *See* Hovenkamp, *supra* note x, at 836 (arguing that Limiting welfare to wealth maximization amounts to a hopelessly impoverished view of well-being.); Nussbaum, *supra* note x, at 1636 (citing Amartya Sen and describing the difficulty of measuring human welfare).

[115] *See* Hovenkamp, *supra* note x, at 822-23 (criticizing inadequate hypothesis testing and noting that the danger of dissolving into a kind of "mathematically supported storytelling" is of particular concern in law & economics).

[116] Ian Ayres, *Playing Games with the Law*, 42 STAN. L. REV. 1291 (1990) (explaining that game theory challenges Law and Economics' presumption that market competition is efficient because under certain assumptions markets can fail to promote social welfare); Michael S. Jacobs, *The New Sophistication in Antitrust*, 79 MINN. L. REV. 1 (1994) (noting that the post-Chicago school builds on the industrial organization approach by challenging that broad generalizations of price theory are inappropriate when small numbers of firms act strategically to exploit market imperfections to the disadvantage of their competitors; Steven C. Salop, *Anticompetitive Overbuying by Power Buyers*, 72 ANTITRUST L.J. 669 (2005) (noting that companies have been known to engage in predatory "overbuying" whereby inputs are purchased solely to deny it to rivals and then discarded); *see also* Epstein, *supra* note x, at 1174 (a prominent Law and Economics scholar concluding that the study of legal doctrine and theory has to be enriched with a greater appreciation of institutional arrangements).

[117] *See* text accompanying notes x-y, *supra* (offering perspectives on current debates in antitrust law).

are crystal clear, law is destined to be inherently contradictory. This contradiction occurs because society is not committed to either a strict rule or a flexible standards approach to the interpretation of law.[118] Vacillation between the two inevitably produces instability on every significant issue, and no resolution is possible.[119] Moreover, the inevitable conflicts cause law to privilege one strain over another for reasons other than objective analysis and logic.

CLS scholars rejected the notion that legal actors could ever objectively study the consequences of alternative legal rules without the distortive effects of the artificial categories that we create and impose on legal questions.[120] Nevertheless, some CLS scholarship reads much like a psychological analysis of human beings, following the social science of the time. Unger, for example, waxes poetic on the notion that the self must seek recognition from others in order to acquire coherence.[121] Moreover, many CLS scholars advocated exposure and awareness of the bias of legal actors, wherever possible.[122] Thus, CLS encouraged legal actors to critically examine themselves as a focus of study, despite the inevitable imperfection of the enterprise.

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[118] *See* KELMAN, *supra* note x, at 45.

[119] *See id.* at 15 (describing the clash between law's affinity for rules and its attraction to legal standards).

[120] *See* KELMAN, *supra* note x, at 275; *see also* David M. Trubek, *Where the Action is: Critical Legal Studies and Empiricism*, 36 STAN. L. REV. 575, 617-18 (1984) (describing the CLS view that empirical researchers who spend years analyzing the answers to complicated surveys about disputes are like madmen wandering in an asylum that they themselves have constructed).

[121] *See* ROBERTO M. UNGER, KNOWLEDGE AND POLITICS 55-62 (1975); ROBERTO M. UNGER, AN ESSAY ON PERSONALITY 53-64, 95-100 (1984).

[122] *See* KELMAN, *supra* note x, at 275 (noting that abandoning those distortions that we can identify a surely a move towards transformation); David M. Trubek, *Where the Action is: Critical Legal Studies and Empiricism*, 36 STAN. L. REV. 575, 591 (1984) (observing that while Critical Legal Studies scholars seek to show relationships between the world views embedded in modern legal consciousness and domination in capitalist society, they also want to *change* that consciousness and those relationships. Thus, the analysis of legal consciousness is part of a transformative politics); David S. Caudill, *Disclosing Tilt: A Partial Defense of Critical Legal Studies and a Comparative Introduction to the Philosophy of the Law-Idea*, 72 IOWA L. REV. 287 (1987) (noting that a significant CLS goal is to raise awareness of unexamined, assailable preferences); *see also* G. Edward White, *The Inevitability of Critical Legal Studies*, 36 STAN. L. REV. 649 (1984) (Noting that CLS' examination of values extends beyond the individual preferences of legal actors, but also attacks the collective value system of legal culture as a whole); KELMAN, *supra* note x,

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.[123]

Dissatisfaction with the test swelled in the late 1950s and early 60s, culminating in passage of Section 4.01 of the Model Penal Code.[124] The new test was widely accepted, becoming adopted in almost every federal circuit and in many states as well.[125] It was hailed as a triumph of science. The new test was perceived as embodying the latest advances in psychological knowledge and medical thought.[126] 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

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at 275 (noting that abandoning those distortions that we can identify a surely a move towards transformation).

[123] *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.

[124] 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).

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

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

speed.[127] 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.[128]

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.[129] Morality is not easy, and no science can take that burden off the shoulders of the law.

The insanity defense is a particularly good example of law's love affair with science. When struggling to reform the old Nineteenth Century test for insanity, courts and scholars not only tried importing science rules to create a test but also tried exporting the problem to scientific experts. For example, two other standards developed in the 1950s and 1960s would have essentially shifted the decision to expert psychiatrists to opine on whether the defendant's behavior fit particular psychiatric diagnoses. These were the Durham rule, adopted in a D.C. Circuit case, and the Bonnie Rule, proposed by law professor Richard Bonnie.[130]

Attempts to export the insanity defense problem failed as well, burdened by criticism that these approaches would fail to properly identify those that society wished to hold morally accountable but rather would open the door to excessive acquittals. The

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[127] *See* PAUL APPELBAUM, ALMOST A REVOLUTION: MENTAL HEALTH LAW AND THE LIMITS OF CHANGE.
[128] *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).
[129] *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).
[130] *See* Amy D. Gundlack-Evans, *State v. Calin: The Paradox of the Insanity Defense and Guilty but Mentally Ill Statute, Recognizing Impairment Without Affording Treatment*, 51 S. DAKOTA L. REV. 122, 136-37 (2006); *see also* Durham v. United States, 214 F.2d 862 (D.C. Cir. 1954); Richard J. Bonnie, *The Moral Bliss of the Insanity Defense*, 69 A.B.A. J. 194, 196-97 (1983).

Durham rule was reversed by statute and the Bonnie standard was never adopted.[131] In lamenting the failed Durham test, Judge Bazelon, who wrote the Durham opinion, described himself as "a disappointed lover" after his efforts failed so miserably.[132]

Our legal history is full of such examples in which law, when faced with difficult and unsettling problems, turns to science in hopes of a solution and is subsequently disappointed. Similar stories can be told for attempts to let science answer whether an individual is imminently dangerous to the community in a civil commitment proceeding or whether a defendant can be rehabilitated or will only incarceration work in sexual or other crimes.

The issue has arisen with the question of what is in the best interests of the child in custody cases. In that arena, courts increasingly lean on experts to decide the underlying issue, an inclination that has proven unsatisfying. As one scholar has noted, "[c]ourts may be only too willing to be relieved of the responsibility of playing guessing games about a child's future if they are persuaded that experts' crystal balls hold the answer".[133] The problem is not just that we are asking scientists to answer legal questions. The problem is also that we are asking scientists to solve our legal quandaries with predictions about human development that they are unable to provide. Outside of extreme circumstances such as abuse or neglect, psychology lacks any methodologically sound empirical evidence allowing predictions concerning various custody arrangements.[134]

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[131] *See* Gundlack-Evans, *supra* note x, at 137.
[132] *See* Bazelon, *Veils, Value and Social Responsibility*, 37 AM. PSYCHOLOGIST 115 (1982).
[133] *See* LOIS A. WEITHORN, PSYCHOLOGY AND CHILD CUSTODY DETERMINATIONS 160 (1987).
[134] *See id.* at 161.

Other examples include legal tests imported into law from economic or social science research which are then far too complex to operate in a legal setting. The rules remain, but are honored mostly in the legal system's inability to apply them with any significant degree of accuracy. Consider the updated version of the Learned Hand test for negligence liability in tort law. The rule asks that we set negligence at the point where, properly internalized, prevention costs don't exceed accident costs. The ordinary machinery of the legal system has no way to measure that level

One can also look at rate setting in public utilities regulation. Consider Stephen Breyer's scholarship on rate regulation prior to joining the bench:

> The possibility of court review has led agencies to keep records demonstrating . . .that [the] decision was rational. . . Given the multifaceted nature of most problems, the uncertain quality of the information, and the need to consider a broad range of uncertain factors, many technical decisions … may reflect only an inspired engineering guess. The engineer may not know precisely where or how the decision emerged – even in his own mind – nor can he necessarily write down a justification for the decision at the time he made it. Thus, records for court review are often made ex post. The agency's lawyers insert into a public record sufficient information to show rational support for each key decision. Cost/benefit analyses are often prepared to support decisions already reached rather than to help determine what future decisions ought to be made.[135]

Thus, in both formal movements and individual moments, law continually turns to science to solve its problems and is continually disappointed. What is important about

[135] *See* Stephen J. Breyer, Regulation and Its Reform 117 (1982).

this pattern is not just our disappointment, but our constant return to the well. The repeated behavior is revealing in that it reflects both our vision of law and our vision of science in relation to law. We constantly despair of law's inability to resolve legal issues to our satisfaction and view science as a source of rescue from our discontent. It is this particular vision that continually gets us into trouble.

III. The Nature of Law

We can only determine how to use science appropriately in the domain of law if we 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 article.

The art of law involves taking prior authorities and distilling a common logic that can extend to new circumstances.[136] 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,

[136] *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").

for example, takes on an entirely different dimension with the invention of automotive transport.[137] Similarly, the question of what constitutes fair use of one's own copy of a 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.[138] 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?[139] 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.[140]

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[137] *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).

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

[139] *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).

[140] 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).

It is not just technological change but also social change that creates new issues for the courts.[141] Questions concerning fathers' rights and grandparents' rights were unlikely to arise before the decline of the stable family unit in American society in the second 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.

Consider an example from labor law. In the 1980s and 90s, federal courts ruled that employers are strictly liable for sexual harassment that arises from hostile environments created by supervisors.[142] Employers responded by developing internal policies and investigation procedures to find and address bad behavior by supervisors. With this apparatus in place, employers asked the courts to create an affirmative defense to the strict liability. The defense would arise in cases in which employers had created adequate procedures, but the complaining employee had failed to take advantage of what the employer provided. The Supreme Court complied, creating a new defense in response to new forms of corporate behavior.[143] In this example, therefore, both human

[141] *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).
[142] *See* Burlington Indus. Inc. v. Ellerth, 524 U.S. 742, 751-761 (1998) (describing the development of direct and vicarious employer liability standards by courts interpreting title VII).
[143] *See* Burlington Indus. Inc. v. Ellerth, 524 U.S. at 742; *see also* Faragher v. City of Boca Raton.

behavior and legal argument sought out available openings in existing case law, and the courts were faced 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.

This is not to suggest that every case is new. Some legal issues will fall squarely within precedent. Nevertheless, the path of law inevitably moves towards the new and undecided. The art of law involves adapting to those changed circumstances within the framework of what has gone before.

B. *One Right Answer?*

As described above, the art of law essentially involves adapting to changed circumstances within the framework of what has gone before. In this process of adaptation, however, is there only one right answer? Will careful legal analysis always point the way to a single result? The Langdellians certainly thought so. Even Law and

Economics can be read to imply that economic analysis, properly applied, can suggest a single most efficient rule choice among the possible options.

The Legal Realists and Progressives, however, did a remarkable job of demonstrating the futility of looking for a single right answer to a particular case.[144] As Holmes argued, outside of those cases governed by unambiguously applicable law, plausible deductions can always be constructed on both sides.[145]

How is one to choose? Are the Legal Realists correct that judicial decision making is essentially unbounded? Are laws and precedents so indeterminate, so capable of a myriad of interpretations that we are left to rely on the unconscious instincts of judges who are merely responding to varying personal prejudices?

B. *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

[144] *See supra* text accompanying notes x-y (discussing the Legal Realists).
[145] *See* Grey, *Langdell's Orthodoxy*, *supra x*, at 44 (discussing Holmes).

pursuing the dictates of their own perspectives and biases. It is the discipline of acceptance, however, that gives strength to our commitment to precedent.[146]

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.

Different legal actors operate in different acceptance spheres. Lawyers must convince judges. Trial judges convince appellate courts. Appellate judges convince other members of their panels, other members of their circuit, and the Supreme Court. The Supreme Court must answer to Congress's ability to initiate constitutional amendments and the President's ability to replace retiring justices with those who hold differing viewpoints. In addition, the entire system is subject to pressure from scholarly and popular commentary.

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.

The requirement of acceptance mitigates the distortion of personal perspective. Even if judges are unconsciously following their own biases or privileging one strain of

[146] *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).

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."[147] 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.[148]

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.[149]

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 subject to the scrutiny of different legal actors with varying experiences and visions, a

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[147] *See* Katz, *supra* note x, at 2241.
[148] *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").
[149] *See* Ungar, *supra* note x, at ___; KELMAN, *supra* note x, at 64 (discussing Ungar).

process that will impose some measure of restraint, although by no means perfect restrains. [150]

I have no rose-colored glasses. There will be errors -- individual mistakes, collective mistakes, and inabilities to reach any position of acceptance at all. [151] Nevertheless, this 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, there is no assurance that law, as it evolves, will inexorably march towards the better, the more efficient, or the more enlightened. On this point, I agree with the CLS view that there is no uniform evolutionary path upon which societies tend to move and which will incline those societies towards the better.[152] Law may move slightly ahead or lag slightly behind the broader society to the extent that the legal actors who form the more immediate spheres of acceptance are stepping at a different pace from the members of society at large. Nevertheless, law is fundamentally anchored in the past through precedent and limited in its movement by the need for acceptance, defined only by the prevailing moral structures of the relevant society. Thus, although I have 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

[150] 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.

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

[152] *See* KELMAN, *supra* note x, at 244 (describing the CLS critique of adaptionist functionalism). This view is in contrast to those Law and Economics scholars who view the path of law as marching towards greater efficiency in human relations. *See* text accompanying notes x-y, *supra*.

constraints are sufficient to lead towards some objective notion of a substantively best outcome.[153]

C. *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.[154] 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 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.

IV. The Role of Science

As described above, efforts to import science into law or to export law's problems to science are misguided. Nevertheless, science has an important role to play in the legal

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

[154] *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").

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 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 may still 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.[155] Critics argue that such

[155] *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 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

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.[156] 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.[157] 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.[158] No other generics may enter the market until 180 days after the first generic company commercially markets the drug. This provision gives generic companies an incentive to do battle against the big guns.

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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).

[156] *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)).]

[157] *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.

[158] *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.

Some patent holders and generic companies have settled their disputes[159] 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.[160]

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 consumers as they would have enjoyed had the settlement not been reached and the

[159] 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.

[160] *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); s*ee 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).

dispute instead resolved through litigation."[161] 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.[162] How can a court hope to accurately measure consumer surplus, particularly 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.

Suppose, however, that we alter the 180-day exclusivity rules. Exclusivity might apply, for example, only if the generic challenger wins on the merits, not if the generic settles. If the two parties settle, other generics could still enter the market. Thus, the

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[161] *See* Shapiro, *supra* note x, at 393.

[162] *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).

parties could not bargain in the shadow of the power to keep prices about a competitive level.[163]

If we are concerned that such a rule would put too much pressure on avoiding settlement, other rules could be drafted. For example, the rule could be that the 180-day exclusivity period only applies if the challenger actually markets the drug. An agreement to postpone entry would void the exclusivity. Thus, a generic challenger could freely choose to settle. If it chooses to stay out of the market as part of the settlement, however, that decision comes at the cost of allowing others to enter. Finally, if one is concerned that no other entrants are on the horizon, one could simply disallow settlements that pay challengers not to enter. Congress could choose one of these rules or leave the choice among such rules to courts or to the FTC, which has jurisdiction to challenge anti-competitive aspects of such settlements.

The choice among these rules is less important than 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.[164] The argument is that if the patent holder succeeds, the generic will be barred from the

[163] *See Bargaining in the Shadow of the Law.*
[164] *See* Crane, *supra,* note x.

market for infringement.[165] Under those circumstances, the patent holder could choose to bargain away some of the power to exclude the generic 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 is something courts are far better equipped to handle than measuring consumer surplus.[166] In fact, courts engage in precisely this inquiry to rule on a request for a preliminary injunction. 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.

From a very broad perspective, therefore, I agree with Judge Easterbrook's suggestion that we try to establish presumptions and screening rules that can minimize the amount of measurement in which a court must engage.[167] The problem occurs, however, when the scales are tipped, when measurement is accepted only for inquiries that lead to one type of result and not for inquiries that would lead in another direction.[168] In short, science works best with law, not when law defers to science, but rather when we

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[165] *See id.*
[166] 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.
[167] *See* text accompanying notes x-y, *supra* (discussing Judge Easterbrook's antitrust proposals).
[168] *See* text accompanying notes x-y, *supra* (discussing problems with Judge Easterbrook's proposals).

use scientific insights to help craft legal rules within the proper parameters of a legal inquiry.

The same type of approach can be used to formulate rules for patenting genetic inventions. Rather than fixating on a single, scientific line like nucleoside sequence, courts should delve into the more substantive legal analysis, which would ask, "what was the problem to be overcome, what was the advancement created, and was the advancement a significant leap from what was available in the field?" This is the type of inquiry contemplated in American patent law and applied in genetic patent cases in other legal systems.[169]

B. *Checks and Balances*

Legal rules drawn by reference to scientific lines are not well-suited to the process of interpretation, evolution, and adaptation that is essential to the enterprise of law. Nevertheless, science can help evaluate the assumptions underlying the legal rules courts develop. As Faigman has explained, science restrains courts by making them accountable for the normative judgments underlying their factual suppositions.[170] "Brute reality restrains the Court."[171]

For example, in *Parham v. J.R.*, the Supreme Court considered what process is required when parents voluntarily commit their children to state mental hospitals.[172] The Court ruled that Constitutional due process requires that the child be evaluated by a

[169] S*ee also 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.).
[170] *See* David L. Faigman, *"Normative Constitutional Fact-Finding": Exploring the Empirical Component of Constitutional Interpretation*, 139 U. PA. L. REV. 541, 548 (1991) (discussing science in the context of Supreme Court jurisprudence) (hereinafter *Normative Constitutional Fact-Finding*).
[171] *See id.*
[172] *See* Parham v. J.R., 442 U.S. 584, 606 (1979).

neutral fact finder, such as a mental health professional who has the authority to refuse to admit the child to the hospital if the child does not satisfy the proper medical standards. Nevertheless, due process does not require judicial review of the decision.[173]

The Court supported its ruling, in part, with the judgment that "the state through its involuntary commitment procedures does not 'label' the child."[174] Subsequent research suggests that children are indeed labeled and stigmatized by such commitments.[175] This research casts doubt on the validity of the Court's legal conclusions, and has been the basis of criticism of the decision.[176]

Science cannot tell us how to craft an appropriate legal rule. Science can, however, play an important role in testing the assumptions underlying legal rules as the legal system develops those rules. This evaluative role integrates well with law's natural process of interpretation and adaptation. Science thereby operates within law's domain but consistent with the parameters of the legal process.

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

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[173] *See* Parham v. J.R.., 442 U.S. at 606-07.
[174] *See* Parham v. J.R.., 442 U.S. at 600-01.
[175] See Melton, *Family and Mental Hospital as Myths: Civil Commitment of Minors*, *in* CHILDREN, MENTAL HEALTH, AND THE LAW 151, 158-59 (N. Reppucci, L. Weithorn, E. Mulvey & J. Monahan eds. 1984).
[176] *See, e.g.*, Faigman, *Normative Constitutional Fact-Finding, supra* note x, at 586.

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.[177] 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.[178]

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

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[177] *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).

[178] *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).

technical background nor patent experience when they are appointed to the bench.[179] 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.[180] 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.

For example, patent applicants must describe the best mode of making their invention.[181] 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.[182] 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.[183]

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

[179] *See supra* note x.
[180] *See, e.g.*, SmithKline Beecham Corp. v. Apotex Corp., 247 F.Supp.2d 1011 (N.D.Ill.2003) (Posner, J. sitting by designation).
[181] *See 35* U.S.C. § 112 (2005).
[182] *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).
[183] *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).

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.[184] The word "consisting" is the proper code word used to indicate that the elements listed are the only elements.[185]

Rather than trying to parse the difference between an invention "comprised of" something and an invention "consisting of" something, one could simply use plain 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.[186]

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 patent 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

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[184] *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).

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

[186] *See* Zhang, *supra* note x, at 1158.

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.[187] The program has turned ponderous, impenetrable documents into more understandable communications.[188] The same spirit, although perhaps not precisely the same approach, could be applied to patents.

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.[189] 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.[190]

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

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[187] *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).

[188] 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" 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.

[189] *See* Nussbaum, *supra* note x, at 1641-42.

[190] *See id.*

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.[191]

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 throughout the legal system.[192] 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 courts[193] and a bill to allow district court judges to defer patent cases to colleagues considered better-versed in patent law.[194] Such a move is likely to exacerbate the instinct to hide difficult issues behind a blaze of technical terms,

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[191] *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")

[192] *See* text accompanying notes x-y, *supra.*

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

[194] *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.

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 may 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 history. Nevertheless, this moment may be ripe for more of the same, 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 all, including the humble lawyer. Science is transforming our lives at a remarkably rapid pace. Many of those who inhabit the halls of legal academia can remember when the day-to-day working life did not include even voicemail or email, let alone the vast networking and researching power of the internet and the range of small devices that put all of that power in a hand-held, portable form. The pace of medical science and biology has been no less breathtaking. Life-saving biotech drugs, genetically engineered crops, and medical research based on

genetic engineering have exploded in the last 25 years. Imaging techniques, which tell us what parts of the brain are active when a subject is engaged in various tasks, give researchers a window into the human brain when it is alive, well and active and allow us to hypothesize about what legal incentives may drive or affect human behavior.

All of this science feels 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 give 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.[195] 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

[195] *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).

elegant truth and exquisite objectivity of a mathematical formula or even the more 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. Law must be celebrated on its own terms, in all its glory and imperfection.

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 doomed to fail, leaving a host of problems in their wake. 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 grasp the nettles of our legal quandaries. 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 uncloud our perceptions 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 come from within.