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Patents and the University

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PATENTS AND THE UNIVERSITY

This Article advances two novel claims about the internalization of academic science within patent law and the concomitant evolution of “academic exceptionalism.” Historically, relations between patent law and the university were characterized by mutual exclusion, based in part on normative conflicts between academia and exclusive rights. These normative distinctions informed “academic exceptionalism”—the notion that the patent system should exclude the fruits of academic science or treat academic entities differently than other actors—in patent doctrine. As universities began to embrace patents, however, academic science has become internalized within the traditional commercial narrative of patent protection. Contemporary courts frequently invoke universities’ commercial nature to reject exceptional treatment for such institutions. The twin trends of internalization and exceptionalism have evolved again in recent legislative patent reform. On one hand, the interests of academic science have become completely internalized within the patent system to the extent that they inform general rules of patentability applying to all inventions. On the other hand, academic exceptionalism has been resurrected in the form of special statutory carve-outs for universities. Turning from the descriptive to the normative, this Article concludes with recommendations for improving the patent system’s regulation of academic science.

TABLE OF CONTENTS

INTRODUCTION ................................................................. 2
PART I THE TRADITIONAL EQUILIBRIUM: SEPARATION AND
EXCEPTIONALISM ............................................................ 5
   2. Anti-Patenting Norms................................. 8
   3. University Patenting Practices..................... 9
B. Patent Law Viewing Academic Science: Separation and Exceptionalism ........................................... 15
   1. Patentable Subject Matter.............................. 16
   2. Utility.................................................. 19
   3. The Common Law Experimental Use Exception 19
   4. Remedies ........................................... 21
PART II TRANSITION: PATENTS ENTER THE ACADEMY....... 22
A. Academic Science Viewing Patent Law: Increased Patenting and Attendant Cultural Shifts .................. 29
   1. Evolving Norms and Universities’ Embrace of Patenting .................................................. 29
   2. University Patenting Practices .......................... 31
   3. Shifts in Policy and Institutional Structure ...... 36
B. Patent Law Viewing Academic Science: Doctrinal Internalization and the Demise of Exceptionalism. 39
   1. Eroding Doctrinal Hedges ............................. 39
   2. Rejecting Academic Exceptionalism ................. 40
   3. Analysis .......................................................... 48

PART IV  STATUTORY INTERNALIZATION AND THE REVIVAL OF ACADEMIC EXCEPTIONALISM .......................... 49
A. The Bayh-Dole Act .............................................. 50
B. The CREATE Act .................................................. 51
C. The America Invents Act ..................................... 53
   1. First-Inventor-to-File-or-Publish ....................... 53
   2. Preferential Treatment for Universities in the Prior Use Rights Defense ................................ 55
   3. Micro entity Status ............................................. 57

PART V  ANALYSIS, ASSESSMENTS, AND PRESCRIPTIONS ..... 58
A. Analysis .............................................................. 58
B. Assessments and Prescriptions ............................. 60
   1. Patentability ...................................................... 60
   2. Obtaining and Licensing Patents ....................... 63
   3. Infringement ...................................................... 64

CONCLUSION ................................................................ 65

“Interestingly enough, apparently many scientists like Faraday care little for monetary rewards; generally the motives of such outstanding geniuses are not pecuniary.”1

“Duke . . . like other major research institutions of higher learning, is not shy in pursuing an aggressive patent licensing program from which it derives a not insubstantial revenue stream.”2

INTRODUCTION

In December 2012, Carnegie Mellon University won a $1.17 billion jury verdict in a patent infringement suit against Marvell Technology Group.3 If the verdict withstands post-trial motions and

2 Madey v. Duke Univ., 307 F.3d 1351, 1362 n.7 (Fed. Cir. 2002).
3 Rich Lord, Carnegie Mellon Wins $1.17 Billion in Patent Case, PITTSBURGH POST-
appeals, it will be the largest award in the history of U.S. patent litigation. The case is notable not only because of the enormous stakes involved but also because of the identity and behavior of the patentee—a university. Carnegie Mellon has been accused of being a “patent troll,” an entity that amasses patents, does not manufacture any products, and exploits patent exclusivity to extract rents from innovative parties. In a broader sense, Carnegie Mellon’s suit illustrates a remarkable transformation in universities’ relationship with the patent system since its humble origins about a century ago.

The question of how universities should fit in the patent system is an important one, for universities possess enormous innovative potential. In 2010, universities spent $61.2 billion on research and development, with federal funds accounting for 61% of this total. University research has produced thousands of important inventions, from medicines to search engines. In FY 2011, universities received 4,700 U.S. patents, executed 4,899 licenses, and received over $2.5 billion in patent-related income. While impressive to some, such statistics also raise concerns over the commercialization of universities and the subordination of academic values to financial imperatives. Indeed, the unique norms, incentives, and missions of universities suggest that academic inventions fit uncomfortably in a patent system predicated on exclusive rights and profit maximization. Such considerations give rise to significant policy questions regarding how universities should interact with the patent system to achieve academic, technological, and economic objectives.

To address this question, this Article examines the coevolution of patent law and the university. First, integrating historical analysis with recent doctrinal and statutory reforms, it advances a novel descriptive theory regarding the “internalization” of academic science within patent

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6 Other examples include Bufferin, computer-aided design (CAD), diagnostic tests for cancer and osteoporosis, Gatorade, Lycos, music synthesizers, stannous fluoride, Taxol (an anticancer drug), and the “gene splicing” technique that produced the biotechnology industry. See John Fraser, Communicating the Full Value of Academic Technology Transfer: Some Lessons Learned, 1 TOMORROW’S TECH. TRANSFER 9, 10 (2009); Donald S. Siegel et al., Toward a Model of the Effective Transfer of Scientific Knowledge from Academicians to Practitioners: Qualitative Evidence from the Commercialization of University Technologies, 21 J. ENG. TECH. MGMT. 115, 118 (2004) [hereinafter Siegel et al., Effective Transfer].

7 ASSOC. OF UNIV. TECH. MANAGERS, supra note.
law. While patents’ permeation of university culture has attracted significant attention, this Article explores the underappreciated trend of academic science’s integration into the core of patent law. Historically, relations between patent law and the university were characterized by mutual exclusion, based in part on perceived normative conflicts between academia and exclusive rights. However, as universities began to embrace patents in the late twentieth century, academic science became “internalized” within the patent system. Unlike earlier eras, academic science is now a frequent subject of patent litigation and doctrine. Contemporary patent courts, responding to institutional changes, view universities as fully integrated into the commercial narrative of patents. More recently, academic science has been “internalized” not only in patent doctrine, but also in statute. Due to legislative reforms, the interests of academic science, a formerly peripheral concern, are now “hardwired” in the patent statute. Patent law regulates a significant portion of academic activity, and universities are wielding their political might to regulate patent law.

Second and relatedly, this Article argues that throughout this process of mutual internalization, “academic exceptionalism” has evolved considerably. Academic exceptionalism stands for the normative proposition that the patent system should exclude the fruits of academic science or treat academic entities differently than other innovative actors. Early patent doctrine exhibited academic exceptionalism based in part on the unique, noncommercial norms of university research and patenting. However, due in large part to universities’ increasingly commercial nature, patent courts in the late twentieth century have rejected academic exceptionalism. Most recently, academic exceptionalism has evolved again in the legislative context. On one hand, exceptionalism has vanished to the extent that academic interests now inform general rules patentability that apply to all inventions. On the other hand, academic exceptionalism has manifested again in special legislative carve-outs that benefit universities.

Third, turning from the descriptive to the normative, this Article assesses these developments and offers prescriptions for enhancing the patent system’s treatment of academic science. It explores the tensions that arise between the twin trends of academic internalization and exceptionalism. Offering several prescriptions, it argues against academic exceptionalism in the patentability context while supporting more informal

regulation of university licensing and endorsing academic exceptionalism in the infringement context.

Before proceeding, a methodological point is in order. In exploring the patent system’s regulation of academic science, it is important to acknowledge several distinctions. For example, the norms and interests of the “scientific community” may differ from those of individual universities. Furthermore, universities are far from monolithic. Attitudes toward patenting may differ among public versus private, secular versus religion, and land-grant versus non-land-grant institutions. Within a single university, high-level leadership, technology transfer administrators, and faculty scientists may all view patents differently. Such distinctions, however, should not elide the commonalities that bind such constituencies together.¹ University-based, academic research is a discrete and powerful domain of innovation that interacts with patent law in unique and significant ways, a phenomenon that this Article explores in detail.

This Article proceeds in five Parts. Part I explores the historical separation of academic science and patent law, manifested both in noncommercial university norms and “academic exceptionalism” in patent doctrine. Part II explores a historical shift culminating in the late twentieth century, when the Bayh-Dole Act and other developments led patents to move to the core of academic science. Part III considers the contemporary period in which patents have largely permeated the culture of university science. It explores the less appreciated ways in which patent doctrine has “internalized” academic science and rejected academic exceptionalism. Part IV examines the culmination of academia’s internalization within the patent system in legislative patent reform, most notably the America Invents Act. It also describes how academic exceptionalism, which courts have rejected, has been resurrected in statute. Part V turns from the descriptive to the normative, offering principles to guide the intersection of academic science and the patent system.

**PART I THE TRADITIONAL EQUILIBRIUM: SEPARATION AND EXCEPTIONALISM**

The first phase of academic science’s interactions with patent law was largely characterized by mutual exclusion. Although U.S. universities have long served practical needs, academic norms often discouraged patenting. Furthermore, when universities first entered the patent system, they did so to advance uniquely noncommercial values. In reciprocal fashion, courts viewed academic science as falling outside of the scope of

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¹ See Rai, supra note 1, at 92 (“Basic scientific research norms share many similarities with the norms of academic institutions generally.”).
patentability and afforded universities a rather privileged normative status within the patent system, thus reflecting academic exceptionalism.

A. Academic Science Viewing Patent Law: Noncommercial Norms and Forbearance

1. The Applied Nature of U.S. Universities

At first glance, universities’ historical segregation from the patent system appears rather curious given the pragmatic orientation of U.S. academic institutions. Early American colleges and universities adopted a highly practical nature to help meet the needs of a young country. In this spirit, Thomas Jefferson established the University of Virginia in 1825 in order to provide “an useful American education.” The decentralized nature of American universities contributed to this orientation; universities depended on local funding for revenue, and thus had to be responsive to local economic and educational needs. A major development in orientating universities toward practical imperatives was the establishment of land-grant colleges in the mid-nineteenth century. Contrary to the largely “verbalistic” curricula of prior universities, these colleges focused on solving practical problems and providing instruction in agriculture and the mechanical arts. This trend was bolstered by the

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11 See ALEXIS DE TOQUEVILLE, 2 DEMOCRACY IN AMERICA 48, 52-53 (1876) (famously noting the practical, applied nature of the American scientific mind).
12 WASHBURN, supra note , at 26.
15 Carstensen, supra note , at 35-36.
16 See Dov Greenbaum, Academia to Industry Technology Transfer: An Alternative to the Bayh-Dole System for Both Developed and Developing Nations, 19 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 331, 333-34 (2008); WASHBURN, supra note , at 29.
establishment of Agricultural Experiment Stations under the direction of land-grant colleges. These experiment stations were “in the business” of developing findings and techniques that were ready for use by farmers and had a clearly pragmatic character.

Consistent with their practical orientation, many early U.S. universities cultivated close connections with industry. From 1890 to 1900, several universities established partnerships with commercial entities in the Northeast industrial corridor. In an era of scarce public funds for research, universities relied substantially on private money for support. Universities played a key role in the development of new engineering and applied sciences disciplines as well as research-based pharmaceutical firms. Rather than focusing exclusively on fundamental scientific principles, much university research throughout the late 19th and 20th centuries addressed practical problems in agriculture, public health, and industry. Particularly in the life sciences, relationships between universities and industry flourished between World War I and World War II. By 1940, 50 U.S. companies were supporting 270 biomedical research projects at 70 universities.

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18 7 U.S.C. § 361A et seq.; see Carstensen, supra note, at 34-35.
19 Jeannette Colyvas et al., How Do University Inventions Get into Practice?, 48 MGMT. SCI. 61, 65 (2002) [hereinafter Colyvas et al., How Do University Inventions Get into Practice?]; see Arthur D. Little, Industrial Research in America, 38 SCIENCE 643, 649-50 (1913).
21 GARY W. MATKIN, TECHNOLOGY TRANSFER AND THE UNIVERSITY 18 (1990). Some commentators around this time period, however, questioned the ability of universities to work with industry. See C. E. Kenneth Mess, The Organization of Industrial Scientific Research, 42 SCIENCE 763, 766 (1916).
22 WASHBURN, supra note, at 34.
23 See Rosenberg & Nelson, supra note, at 327.
25 David C. Mowery & Bhaven N. Sampat, The Bayh-Dole Act of 1980 and University-Industry Technology Transfer: A Model for Other OECD Governments?, 30 J. TECH. TRANSFER 115, 124 (2005) [hereinafter Mowery & Sampat, Bayh-Dole]; Little, supra note, at 652. Of course, such commercial forays were not without their critics. See H. A. Rowland, A Plea for Pure Science, 29 SCIENCE 242, 243 (1883); THORSTEIN VEBLEN, THE HIGHER LEARNING IN AMERICA: A MEMORANDUM OF THE CONDUCT OF UNIVERSITIES BY BUSINESS MEN (1918); Dean Barus, Quotations: Research and Teaching, 57 SCIENCE 445, 446 (1923); University and Industry, 30 SCIENCE 919, 920 (1916). By the 1920s, however, opinion had solidified among many academic scientists that universities could legitimately serve industrial interests. BOK, supra note, at 139.
27 Blumenthal, supra note, at 2452.
2. Anti-Patenting Norms

Given the pragmatic orientation of U.S. universities, these institutions’ historical aversion to patenting might seem somewhat odd. However, scientific norms prioritizing communal sharing over individual property rights contributed to deep skepticism of patents.\textsuperscript{28} As sociologist Robert Merton documented in the early twentieth century, academic science relies heavily on sharing of information, theories, and research materials for collective progress.\textsuperscript{29} Scientific knowledge thus constitutes “a common heritage in which the equity of the individual producer is severely limited.”\textsuperscript{30} Drawing on his empirical work, Merton argued that science combines four normative pillars: universalism, communism, disinterestedness, and organized skepticism.\textsuperscript{31} Patents particularly conflict with the “Mertonian” norm of communism, the principle that “[t]he substantive findings of science are a product of social collaboration and are assigned to the community.”\textsuperscript{32} In a system in which scientists freely disclose their discoveries and build upon each other’s claims, individual property rights in scientific knowledge are whittled “down to a bare minimum.”\textsuperscript{33} As Merton observed, “The communism of the scientific ethos is incompatible with the definition of technology as ‘private property’ in a capitalistic economy.”\textsuperscript{34}

Merton’s classic account of the communal norms of academic science, while influential, has been subject to critique. Commentators argue that Merton’s norms are more “aspirational” than “descriptive.”\textsuperscript{35}

\textsuperscript{28} Bhaven N. Sampat, Patenting and US Academic Research in the 20th Century: The World Before and After Bayh-Dole, 35 RES. POL’Y 772, 776 (2006) (“[I]t is likely that strong norms militating against academic patenting checked any ambitions universities may have had to patent in instances where publication or open dissemination would suffice for ‘technology transfer.’”); Michael J. Madison et al., The University as Constructed Cultural Commons, 30 WASH. U. J. L & POL’Y 365, 381 (2009).

\textsuperscript{29} Merton’s empirical observations resonated with theoretical models of scientific progress. See, e.g., Thomas Kuhn, The Structure of Scientific Revolutions (1996) (highlighting the importance of communal work in establishing and displacing scientific paradigms); Michael Polanyi, The Republic of Science: Its Political and Economic Theory, 1 MINERVA 54 (1962) (describing an autonomous scientific community with a high degree of internal communication).


\textsuperscript{31} Merton, supra note , at 270-78; see also Etzkowitz, Entrepreneurial Science, supra note , at 14; see Rai, supra note , at 89 (noting that other sociologists of science, such as Bernard Barber and Warren Hagstrom, came to similar conclusions).

\textsuperscript{32} Merton, supra note , at 273.

\textsuperscript{33} Id.; see Eisenberg, Patents and the Progress of Science, supra note , at 1047.

\textsuperscript{34} Id. at 275; see Margo Bagley, Academic Discourse and Proprietary Rights: Putting Patents in Their Proper Place, 47 B.C. L. REV. 226 (2006).

\textsuperscript{35} Greenbaum, supra note , at 328-29; F. Scott Kieff, Facilitating Scientific Research: Intellectual Property Rights and the Norms of Science—A Response to Rai and Eisenberg, 95 Nw. U. L. REV. 691, 697 (2001); see Eisenberg, Patents and the Progress of Science, supra note , at 1048 n, 128.
and note that academic science has always exhibited secrecy, rivalry, and non-communitarian incentives. As we will see, generalizations are difficult in this realm, for some institutions and scientists embraced patenting even in the early twentieth century. Some observers have disputed not the existence of academic sharing norms, but the perceived incompatibility of these norms with patents. Ironically, some early commentators cited the tenacity of communal norms as a safeguard that weighed in favor of patenting on university discoveries; because scientists were so committed to disinterested inquiry, it was unlikely that patents and profit motives would adulterate research agendas.

While subject to some debate, there is little doubt that academic norms of open disclosure and communal sharing informed universities’ early resistance to patenting. In the early twentieth century, many actors in academic science looked down upon patenting. Jacques Loeb of the Rockefeller Foundation, for example, warned that “if the institutions of pure science go into the handling of patents I am afraid pure science will be doomed.” The foundation even threatened to stop funding the research of UC Berkeley’s Herbert Evans if he tried to benefit financially from his research through patents. Following World War I, there was an international movement, primarily based in Europe, to protect “scientific property.” Tellingly, however, this movement never gained much traction in the United States, and several committees of the National Research Council rejected the feasibility and desirability of establishing rights to scientific property.

3. University Patenting Practices

36 See e.g., Greenbaum, supra note , at ; Merges, Property Rights Theory and the Commons, supra note , at 147.
37 HAMSON, supra note , at 212.
38 See, e.g., Etzkowitz, Knowledge as Property, supra note , at 396 (describing the debate over patent policy at MIT in the 1930s); Rai, supra note , at 88 (noting that communal norms largely governed the scientific community prior to 1980).
40 BOK, supra note , at 139.
42 Letter from Albert L. Barrows, Assistant Sec’y, Nat’l Acad. of Sciences, to Dr. William Allen Pusey (November 5, 1931), Nat’l Acad. of Sciences Archives, Chicago, Ill.; Letter from Vernon Kellogg, Permanent Sec’y, Nat’l Acad. of Sciences, to J. David Thompson, Sec’y, Am. Comm. on Int’l Intellectual Cooperation, Nat’l Research Council (May 2, 1928), Nat’l Acad. of Sciences Archives, Chicago, Ill.
Based in part on these traditional scientific norms, university scientists in the early twentieth century rarely patented their discoveries.\textsuperscript{43} Instances occasionally arose, however, and the first wave of meaningful university patenting occurred after World War I.\textsuperscript{44} In the early twentieth century, scientific norms against exclusive rights in academic discoveries merged with institutional norms of serving the public interest to define a uniquely noncommercial approach to university patenting.

Case studies of university patenting in the early twentieth century reveal a deep anxiety over blending academia and commerce as well as a commitment to utilizing patents to serve the public interest. In 1907, Frederick Cottrell at UC Berkeley invented the electrostatic precipitator, a filtration device that removes harmful particles from flowing gases. In a rather novel move, he patented his discovery.\textsuperscript{45} He did not, however, assign it to UC Berkeley, for Cottrell was wary of the impact of patenting and licensing on scientific culture.\textsuperscript{46} (For its part, the university was concerned that its charter did not permit involvement in commercial ventures.)\textsuperscript{47} In 1912, motivated largely by a desire to separate the university from commercial concerns, he established an independent firm called Research Corporation to manage his patents.\textsuperscript{48} Consistent with its academic origins, Research Corporation channeled whatever licensing revenues it generated back into funding scientific research.

Academic, noncommercial norms also surrounded T. Brailsford Robertson’s patenting of tethelin. A decade after Cottrell, Robertson, also of UC Berkeley, discovered tethelin, a substance that promotes human tissue growth. He patented his invention\textsuperscript{49} and assigned his rights to the university, thus producing what may have been the first patent owned by the University of California.\textsuperscript{50} The Berkeley regents were initially reluctant to take the patents because of the perceived impropriety of a public university contracting with private firms.\textsuperscript{51} Indeed, this patent

\textsuperscript{44} Mowery & Sampat, \textit{University Patents}, supra note , at783.
\textsuperscript{45} U.S. Patent No. 895,729 (filed July 9, 1907).
\textsuperscript{46} Sampat, supra note , at 774.
\textsuperscript{47} Weiner, \textit{Patenting and Academic Research}, supra note , at 51.
\textsuperscript{49} U.S. Patent No. 1,218,472 (filed Oct. 8, 1918).
\textsuperscript{50} MATKIN, supra note , at 59-60.
\textsuperscript{51} Weiner, \textit{Patenting and Academic Research}, supra note , at 52.
arrangement was so novel that *Science* magazine declared that it “should be subjected to careful scrutiny and the fullest possible criticism.”

Ultimately, the regents established an independent patent-management corporation, naming themselves as trustees, rather than taking title in the university itself. Throughout, Robertson and the university stressed their intention to use the patent to serve the public interest. Among other objectives, patenting would ensure that the University of California could monitor the quality of tethelin-based therapies, thus safeguarding patient health. Notwithstanding these lofty goals, Robertson’s plan elicited significant criticism from an academic community deeply suspicious of patents. Johns Hopkins University later rejected Robertson as a candidate for a chair in Physiology in part because he had patented tethelin.

The patenting of insulin further reflects academic skepticism of patents and the “altruistic” manner in which universities tried to use them. In 1923, researchers at the University of Toronto patented a method of making insulin and assigned it to the university. The decision to patent insulin was highly controversial and clashed with traditional norms prohibiting the privatization of research discoveries. In making this decision, the researchers were influenced by the University of Minnesota’s patenting of thyroxin, which allowed the university to safeguard the commercial manufacture of this substance. Following this model, the University of Toronto established an “insulin committee” in 1922 to manage the patent even before it was granted. The university was wary of monopolies on manufacturing insulin, so after granting Eli Lilly a one-

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54 University of California, Release, 26 September 1917, University Archives, Berkeley (statement of T.B. Robertson); see Weiner, *Science in the Marketplace*, supra note , at 125; see Robertson, *supra* note .
55 Robertson, *supra* note , at 376.
57 BOK, *supra* note , at 139. Of course, not all academics opposed patenting. See, e.g., B.S. Hedrick, *On Patent Laws as a Means for the Advancement of Science*, 1 *Science* 166 (1880). Land-grant universities, which have a particularly “applied” orientation, were more open to patenting. Furthermore, patents in engineering aroused less suspicion than those in health and medicine.
60 Cassier & Sinding, *supra* note , at 154-55.
year exclusive license for experimental development, the university nonexclusively and widely licensed the patent. In so doing, the university used the patent as “a tool to discipline the industrial world, to organize the distribution and use of the new drug, and to guarantee its accessibility.” Indeed, the university exploited its normative leverage as a public, academic institution in negotiations with commercial licensees. Ultimately, this “democratization of industrial property” facilitated the rapid availability of manufactured insulin.

The University of Wisconsin’s patenting practices reveal both the public-minded nature of academic patenting as well as the high standard of conduct expected of academic entities. In the 1920s, university researcher Harry Steenbock invented a process for irradiating food with UV light, thus enhancing its vitamin D content. Steenbock’s process represented a promising treatment for rickets, a disease caused by vitamin D deficiency that particularly afflicted poor populations. Quite controversially, Steenbock obtained four patents related to irradiation technology. Steenbock’s motivations for patenting ranged from the altruistic to the blatantly parochial. On one hand, he was influenced by the University of Toronto’s experience with insulin to utilize patents to ensure the “safest, most healthful dissemination” of irradiated foods. Additionally, he sought to preempt “patent pirates” who would patent his discovery and then charge exorbitant fees for its application. Furthermore, he aimed to generate licensing royalties to fund further research. On the other hand, Steenbock also intended to use patents to

62 Blumenthal, supra note , at 2452.
63 Cassier & Sinding, supra note , at 155; MATKIN, supra note , at 60.
64 Cassier & Sinding, supra note , at 156.
65 Cassier & Sinding, supra note , at 166.
66 Cassier & Sinding, supra note , at 160.
67 See Weiner, Patenting and Academic Research, supra note , at 55-57.
68 See Mowery & Sampat, University Patents, supra note , at 788; Apple, supra note , at 378-79; Weiner, Patenting and Academic Research, supra note , at 56.
70 Apple, supra note , at 377; see Archie M. Palmer. Medical Patents, 137 JAMA 497, 504 (1948). Harry Steenbock, The Induction of Growth Promoting and Calcifying Properties in a Ration by Exposure to Light, 60 SCIENCE 224, 225 (1924) (“To protect the interest of the public in the potential commercial use of these and other findings soon to be published, applications for Letter Patent, both as to processes and products, have been filed with the United States Patent Office....”); Harry Steenbock & A. Black, Fat-soluble Vitamins: The Induction of Growth-Promoting and Calcifying Properties in a Ration by Exposure to Ultra-Violet Light, 61 J. BIOLOGICAL CHEM. 405, 405 (1924) (same).
71 Apple, supra note , at 377. Patent “piracy” was a commonly-perceived problem in the early years of university patenting. See Mowery & Sampat, University Patents, supra note , at 784.
72 Apple, supra note , at 377.
protect the local dairy industry in Wisconsin by keeping irradiation technology away from manufacturers of oleomargarine, the “butter of the poor.”

Although some of his motivations were self-interested, Steenbock felt that as a scientist, he should distance himself and the university from the commercial, profit-making aspects of patenting. For this and other reasons, Steenbock helped create the Wisconsin Alumni Research Foundation (WARF), an independent entity that manages the university’s patents. Tellingly, Steenbock initially refused to accept any share of royalties. In its rather sharp business practices, WARF was the exception that proved the rule regarding the norms of academic patenting. WARF received significant criticism for its hard-nosed business arrangements and threats of patent enforcement, which were all the more controversial given that they diverged from traditional academic patent practices.


Early patent policies on the part of universities also reveal a unique academic skepticism of patents. To begin, many universities had no official patent policy prior to World War II, thus illustrating the peripheral status of intellectual property to academic functions. While the University of California required employees to report patentable inventions to the university starting in 1926, it did not adopt a formal patent policy until 1943.

Even more revealing, early patent policies heavily emphasized using patents to serve the public interest. While a 1925 policy from Columbia notes the university’s objective of financially

73 Apple, supra note , at 377-78.
74 Apple, supra note , at 380; see RIMA APPLE, VITAMANIA: VITAMINS IN AMERICAN CULTURE 42 (1996).
75 In addition, Steenbock had had some rather frustrating experiences with university administration in the past. Apple, supra note , at 381-83.
76 See Weiner, Science in the Marketplace, supra note , at 128.
77 Apple, supra note , at 388. Steenbock later relented, partly at the urging of WARF, which argued that other inventors would not assign their patents to WARF without such inducement. Apple, supra note , at 388.
78 Etzkowitz, Knowledge as Property, supra note , at 389; Mowery & Sampat, University Patents, supra note , at 788; see H.A. Toulmin, Jr., Commercial Research by Universities Threatens Science and Education, PRODUCT ENGINEERING, June 1947 (criticizing WARF for exploiting publicly-sponsored technology while not granting licenses for products outside of the dairy industry); Weiner, Patenting and Academic Research, supra note , at 56-57 (describing a 1943 U.S. Senate subcommittee hearing where WARF was accused of abusing its patent rights); see Monopoly On Vitamin D Charged, Official Denounces Research Foundation, DESERET NEWS, Oct. 21, 1943, available at http://news.google.com/newspapers?nid=336&dat=19431021&id=pNRSAAAAIBAJ&sjid=on8DAAAAIBAJ&pg=7030,5167954.
79 See Mowery & Sampat, University Patents, supra note , at 789.
81 MATKIN, supra note , at 62.
benefiting from patents, it also stresses the importance of monitoring the quality of manufactured articles and ensuring that the public can obtain them at reasonable prices. 82 MIT’s first patent ownership policy from 1932 is typical in stating that the university “shall hold and administer these rights for the ultimate benefit of the public.” 83

Universities were particularly reluctant to use patents to restrict access to health-related technologies. Harvard University decided in the 1920s to refuse to profit from faculty research in public health and therapeutics. 84 Its 1934 patent policy states, “No patents primarily concerned with therapeutics or public health may be taken out by any member of the University, except with the consent of the President and Fellows; nor will such patents be taken out by the University itself except for dedication to the public.” 85 Similarly, Yale University’s 1934 policy states that “it is, in general, undesirable and contrary to the best interests of medicine and the public to patent any discovery or invention applicable in the fields of public health or medicine.” 86 An influential 1948 survey of patent policies confirms similar policies at leading universities. 87 According to the survey, many scientists felt that “the results of their research, both patentable and otherwise, should be shared ‘without fee or stipulation.’” 88 At Harvard, Yale, Johns Hopkins, Columbia, and Chicago, policies against patenting biomedical discoveries lasted until the 1970s. 89

Turning from policy to institutional structure, universities’ unease with patenting further manifested itself in the organizational separation of academic and patenting functions. The perceived impropriety of mixing academia and commerce, as well as the difficulty of managing patents, discouraged universities from directly handling patenting and licensing. 90 Accordingly, early forays into the patent system were marked by

82 The Administration of Patents by Columbia University, 61 SCIENCE 382, 383 (1925); see also Palmer, supra note , at 498 (“[Patenting medical discoveries] is not considered to be wrong in itself, but to be desirable in order to control them in the public interest”).
83 MATKIN, supra note , at 62. This policy also cautioned against unduly encouraging faculty members to engage in invention at the expense of other academic duties. See Etzkowitz, Knowledge as Property, supra note , at 399.
84 Sally Smith Hughes, Making Dollars out of DNA, 92 Ists 541, 547 (2001)
85 MATKIN, supra note , at 69; see Hughes, supra note , at 547.
86 Palmer, supra note , at 500. However, the policy did allow patenting on a case-by-case basis when necessary to protect the public interest and as long as profits would not accrue to the scientist or university. Id.
87 Palmer, supra note , at 498.
88 Palmer, supra note , at 498.
89 At Harvard, this policy was only altered when the university entered into a sponsored research agreement with Monsanto.
90 Mowery & Sampat, University Patents, supra note , at 782; Popp Berman, supra note , at 842; Mowery & Sampat, University Patents, supra note , at 787; Palmer, supra note , at 508. Cottrell warned that any institution dealing with licensees “cannot avoid being eventually drawn into every phase of the problem” of technological development. Cottrell, supra note , at 225.
functional segregation. As noted, Cottrell created Research Corporation largely to insulate the University of California from the commercial aspects of patenting.\textsuperscript{91} In 1937, MIT signed the first invention administration agreement with Research Corporation for similar reasons,\textsuperscript{92} and dozens of other universities followed suit.\textsuperscript{93} As described above, the University of California did not take title to Robertson’s tethelin patent directly but created an independent corporation to manage it. Finally, the WARF model proved very influential; by 1956 there were more than fifty similar, separately incorporated organizations handling university patents.\textsuperscript{94} As these examples demonstrate, anxiety over integrating universities into the patent system manifested itself even in the institutional structure of academic patenting.

* * *

In norms, practice, and policy, universities and university scientists sought to distance themselves from the commercial aspects of patents while utilizing exclusive rights to serve the public good. As Bhaven Sampat observes, “throughout much of the 20\textsuperscript{th} century, universities were reluctant to become directly involved in patenting and licensing activities precisely because of fears that such involvement might compromise, or might be seen as compromising, their commitments to open science and their institutional missions to advance and disseminate knowledge.”\textsuperscript{95} University entities were reluctant to patent scientific discoveries, particularly in the realm of health and medicine.\textsuperscript{96} When universities did patent discoveries, they did so not simply to maximize revenues, but to ensure product safety, prevent patent “piracy,” and disseminate technologies widely to the public.\textsuperscript{97} Furthermore, institutional segregation helped “buffer” scientists and universities from the business of patents.

B. Patent Law Viewing Academic Science: Separation and Exceptionalism

\textsuperscript{91} See Mowery & Sampat, University Patents, supra note , at 791.
\textsuperscript{92} See Sampat, supra note , at 774-75; Mowery & Sampat, University Patents, supra note , at 788; Etzkowitz, Knowledge as Property, supra note , at 403-04.
\textsuperscript{93} Sampat, supra note , at 775.
\textsuperscript{94} Apple, supra note , at 390.
\textsuperscript{95} Sampat, supra note , at 774.
\textsuperscript{96} Jonas Salk, the University of Pittsburgh researcher who discovered the polio vaccine, famously did not patent his vaccine, noting, “Who owns my polio vaccine? The people! Could you patent the sun?” See Sara Boettiger & Brian D. Wright, Open Source in Biotechnology: Open Questions, INNOVATIONS, fall 2006, at 50; Josephine Johnston & Angela A. Wasunna, Patents, Biomedical Research, and Treatments: Examining Concerns, Canvassing Solutions, HASTINGS CTR. REP., Jan.–Feb. 2007, at S2. A significant funder of Salk’s research, the National Foundation for Infantile Paralysis (now the March of Dimes) did not allow patents or receipt of royalties for funded inventions. See Seth Shulman, Cashing in on Medical Knowledge, MIT TECH. REV. March 1, 1998.
\textsuperscript{97} See Mowery & Sampat, University Patents, supra note , at 784-85.
While universities long distanced themselves from patent law, patent doctrine also distanced itself from academic science. In several ways, patent courts created “doctrinal hedges” separating the fruits of academic science from the domain of exclusive rights. In some contexts, patent doctrine further engaged in “academic exceptionalism” by treating university entities differently than other actors in the patent system. Notably, academic exceptionalism arose in part from courts’ perception of the noncommercial character of university science. While I do not contend that courts intentionally responded to particular patenting practices by universities, the general norms of academia helped inform a rhetorical vision of universities that helped justify—or at least rationalize—a hands-off approach to academic science.

1. Patentable Subject Matter

The doctrinal separation of academic science from patent law is best illustrated in the law of patentable subject matter. Drawing on English antecedents, U.S. doctrine has long prohibited patenting abstract principles and natural properties, thus excluding raw scientific discoveries from patentability. In 1852, the Supreme Court observed:

It is admitted, that a principle is not patentable. A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right. Nor can an exclusive right exist to a new power, should one be discovered in addition to those already known . . . The same may be said of electricity, and of any other power in nature, which is alike open to all, and may be applied to useful purposes by the use of machinery.

The next year, Justice Grier, dissenting in the famous case of O’Reilly v. Morse, stated:

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98 See Rochelle Dreyfuss, Protecting the Public Domain of Science: Has the Time for an Experimental Use Defense Arrived?, 46 ARIZ. L. REV. 457, 462 (2004) [hereinafter Dreyfuss, Public Domain of Science] (arguing that a traditional distinction between basic and applied science was “essentially hardwired into law”).

99 See 35 U.S.C. § 101 (defining patentable subject matter as “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof.”). The statutory definition of patentable subject matter has remained largely unchanged over the history of the U.S. patent system.

100 Boulton v. Bull, 126 ENG. REP. 651, 667 (1795) (“Undoubtedly there can be no patent for a mere principle.”) (opinion of Lord Eyre, C.J.); see Joshua D. Sarnoff, Patent-Eligible Inventions after Bilski: History and Theory, 63 HASTINGS L.J. 53, 63 (2011).


The mere discovery of a new element, or law, or principle of nature, without any valuable application of it to the arts, is not the subject of a patent. But he who takes this new element of power, as yet useless, from the laboratory of the philosopher, and makes it the servant of man . . . is the benefactor to whom the patent law tenders its protection.\footnote{56 U.S. 62, 132-33 (1853).}

Lower courts reiterated this distinction between the “laboratory of the philosopher” and the domain of patentable technologies. In 1862, the Circuit Court of the Southern District of New York stated that patentable subject matter arises “beyond the mere domain of discovery,” where an inventor has directed some principle, force, or law to act on “the material world.”\footnote{Morton v. New York Eye Infirmary, 17 F. Cas. 879, 881 (C.C.S.D.N.Y. 1862) (No. 9865) (emphasis added).} Similarly, in 1895, the Ninth Circuit held that employing a scientific discovery in the same fashion that it is applied in nature is not patentable.\footnote{66 F. 552, 558 (9th Cir. 1895) (citing ROBINSON, supra note , § 186).} Notably, the court invoked this distinction to invalidate three of WARF’s irradiation patents in 1943, observing that the patent statute was aimed at rewarding the “inventor,” not the “pure scientist.”\footnote{Wisconsin Alumni Research Foundation v. Vitamin Technologists, 58 U.S.P.Q. 293 (9th Cir. 1943).}

The segregation of academic discoveries from the patent system was further corroborated by doctrine holding that natural phenomena are not eligible for patenting.\footnote{See, e.g., Ex Parte Latimer, 46 O.G., 1638, 123 (1889); Parke-Davis & Co. v. H.K. Mulford, 189 F. 95 (S.D.N.Y. 1911); see Hector M. Holmes, Book Review, 45 HARV. L. REV. 1428, 1432 (1932) (reviewing C.J. HAMSON, PATENT RIGHTS FOR SCIENTIFIC DISCOVERIES (1930)).} As the Supreme Court stated in 1948, “He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.”\footnote{Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948); see Sarnoff, supra note , at 89.} Thus, the passive observation of nature, a primary function of academic science, does not yield patentable subject matter.

Courts’ traditional exclusion of natural laws, natural phenomena, and abstract principles from patentability arose from several rationales, at least some of which resonate with the traditional Mertonian norms discussed above. For example, patentable subject matter doctrine reflected a communalistic theory of technological progress in which scientists and inventors could draw from a shared pool of “upstream” basic knowledge.
to further their research and develop downstream technologies.\textsuperscript{109} As economist Richard Nelson observes, “For this reason scientists have long argued for free and wide communication of results, and for this reason natural ‘laws’ and facts are not patentable.”\textsuperscript{110} This sentiment is reflected in patent decisions likening natural phenomena and abstract principles to “basic tools of scientific and technological work” that must remain in the public domain.\textsuperscript{111}

Additionally, courts also justified excluding academic findings from patentability on the notion that profit incentives were not necessary to motivate scientific discovery. As the Second Circuit observed in 1944,

Epoch-making “discoveries” of “mere” general scientific “laws,” without more, cannot be patented. So the great “discoveries” of Newton or Faraday could not have been rewarded with such a grant of monopoly. Interestingly enough, apparently many scientists like Faraday care little for monetary rewards; generally the motives of such outstanding geniuses are not pecuniary. Perhaps (although no one really knows) the same cannot be said of those lesser geniuses who put such discoveries to practical uses.\textsuperscript{112}

In this regard, the Second Circuit invoked the Mertonian image of the financially disinterested scientist.\textsuperscript{113} This image had some empirical support. The opinion cites scholarship by economist Paul Howard Douglas noting that prominent scientists such as Faraday, Maxwell, Darwin, Pasteur, and Agassiz were not motivated by profits in their scientific research.\textsuperscript{114} Rather, intellectual passion and a genuine excitement for discovery trumped other motivations.\textsuperscript{115} The perceived indifference of academic scientists to monetary rewards thus provided another rationale for excluding natural laws and other academic discoveries from patentable subject matter.\textsuperscript{116}

\textsuperscript{111} Gottschalk v. Benson, 409 U.S. 63, 67 (1972); see Parker v. Flook, 437 U.S. at 591-92.
\textsuperscript{113} See supra notes – and accompanying text.
\textsuperscript{115} Notably, nonfinancial incentives were important not only for traditional “men of science” but also for “practical” scientists” working in industry. Douglas, supra note, at 173-74.
\textsuperscript{116} This perception that scientists are not motivated by profit continued to hold much sway. See Dickey-John Corp. v. Intern. Tapetronics Corp., 710 F.2d 329, 348 n.9 (7th Cir. 1983) (“Yet patent law has never been the domain of the abstract—one cannot patent the very discoveries which make the greatest contributions to human knowledge, such as
2. Utility

Moving beyond patentable subject matter, the doctrine of utility also tended to drive a wedge between academic science and the patent system. While utility is a relatively low bar to patentability, it has particular traction in the context of academic science. In *Brenner v. Manson*, the Supreme Court ruled in 1966 that a process for producing chemical compounds of no known utility failed the substantial utility requirement of patentability. Notably, the fact that the compounds produced by the process were under academic investigation for potential anticancer properties was insufficient to satisfy utility. Again invoking communal norms of shared exploration, the Court cautioned that

> [u]ntil the process claim has been reduced to production of a product shown to be useful, the metes and bounds of that monopoly are not capable of precise delineation. It may engross a vast, unknown, and perhaps unknowable area. Such a patent may confer power to block off whole areas of scientific development, without compensating benefit to the public.

Citing *Katz*, the Court further observed that "'[a] patent system must be related to the world of commerce rather than to the realm of philosophy.'" Lower courts followed *Brenner*’s teaching that intermediates in producing compounds of no known utility lack utility themselves. Furthermore, they extended this rationale to the disclosure requirements of patentability, reasoning that a patent application that does not disclose a utility also does not *enable* any claimed invention.

3. The Common Law Experimental Use Exception

Patent law erected boundaries between itself and academic science not only in doctrines governing patentability, but in the law of infringement as well. One manifestation of such exceptionalism is the common law experimental use exception, which exempts from liability the

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*Einstein’s discovery of the photoelectric effect, nor has it ever been considered the allure of commercial award provided by a patent was needed to encourage such contributions.*

119 383 U.S. at 532.
120 383 U.S. at 534.
121 383 U.S. at 536 (quoting Application of Ruschig, 343 F.2d 965, 970 (C.C.P.A 1965)).
123 *Id.*
unlicensed use of patented technology for noncommercial purposes.\textsuperscript{124} Justice Story laid the foundation for this doctrine in the 1813 case of Whittemore v. Cutter, where he stated, “it could never have been the intention of the legislature to punish a man, who constructed such an infringing] machine merely for philosophical experiments, or for the purpose of ascertaining the sufficiency of the machine to produce its described effects.”\textsuperscript{125} Elsewhere, Justice Story equated infringing use of an invention with “the making with an intent to use for profit,” in contradistinction with use for mere “philosophical experiment” or to confirm details contained in the patent specification.\textsuperscript{126} This conception of experimental use proved highly influential;\textsuperscript{127} one well-regarded 1890 treatise states that “no act [is] an infringement unless it affects the pecuniary interests of the owner of the patented invention.”\textsuperscript{128} Thus, by the end of the nineteenth century, “the issue of whether experimentation amounted to patent infringement seemed to have been clearly resolved”\textsuperscript{129} in favor of experimenters.

The vast majority of cases involving the experimental use exception do not involve academic experimentation with patented inventions per se.\textsuperscript{130} However, one early case suggests that use of a patented invention for academic research qualifies for the safe harbor. In Ruth v. Stearns-Roger Manufacturing, the Stearns-Roger Manufacturing Company was held to have infringed a patent related to mining technology.\textsuperscript{131} In conducting an accounting, however, the district court

\textsuperscript{124} The experimental use exception has attracted significant scholarly attention. See, e.g., Eisenberg, Patents and the Progress of Science, supra note ; Rebecca S. Eisenberg, Patent Swords and Shields, 299 SCIENCE 1018 (2003) [hereinafter Eisenberg, Patent Swords and Shields]; Janice M. Mueller, No ‘Dilettante Affair’: Rethinking the Experimental Use Exception to Patent Infringement for Biomedical Research Tools, 76 WASH. L. REV. 1 (2001); Elizabeth A. Rowe, The Experimental Use Exception To Patent Infringement: Do Universities Deserve Special Treatment?, 57 HASTINGS L.J. 921 (2006); Katherine J. Strandburg, What does the Public Get? Experimental Use and the Patent Bargain, 2004 WISC. L. REV. 81 [hereinafter Strandburg, Experimental Use]. The experimental use exception has rarely been a successful defense in patent litigation. See, e.g., Rowe, 926 n.18 (finding only four cases in which accused infringers successfully claimed experimental use as a defense).

\textsuperscript{125} 29 F. Cas. 1120 (C.C.D. Mass. 1813) (No. 17,600); see Strandburg, Experimental Use, supra note , at 84; Dreyfuss, Public Domain of Science, supra note .

\textsuperscript{126} 21 F. Cas. 554, 555 (C.C.D. Mass. 1813) (No. 12,391); see also Poppenhusen v. Falke, 19 F. Cas. 1048, 1049 (C.C.S.D.N.Y. 1861) (No. 11,279).

\textsuperscript{127} Mueller, supra note , at 20.

\textsuperscript{128} 3 ROBINSON, supra note , at § 898; see Mueller, supra note , at 20-21.

\textsuperscript{129} Dreyfuss, Public Domain of Science, supra note , at 457-58.


excluded sales of materials to the Colorado School of Mines that could be combined to make an infringing device. The court concluded that some of these parts “were for use in laboratory machines used for experimental purposes, and consequently did not contribute to an infringing use.”

The court went on to note that “[t]he making or using of a patented invention merely for experimental purposes, without any intent to derive profits or practical advantage therefrom, is not infringement.” While this is a singular case, it suggests a privileged status for university research based on its noncommercial nature. Whether or not correct as a doctrinal matter, for several decades many university scientists believed that the experimental use exception immunized nonprofit university research from infringement.

Indeed, “most academic institutions freely infringed patents” until the Federal Circuit revisited the issue again in the early twenty-first century.

4. Remedies

Though more speculative, there is one prominent case involving a court extending rather exceptional treatment to a university patentee in the remedies context. In Wisconsin Alumni Research Found. v. Vitamin Technologists, Inc., WARF sued Vitamin Technologists for infringing Steenbock’s irradiation patents. The Ninth Circuit ruled for the defendants, invalidating all or portions of Steenbock’s three patents. In doing so, however, the court also made several influential statements on the appropriateness of injunctive relief. The subtext of the case was that WARF sought to enjoin Vitamin Technologist’s irradiation of oleomargarine to protect Wisconsin’s dairy interests. Such enforcement would disproportionately harm poor communities, which favored the less expensive oleomargarine over butter itself. Considering all these factors, the noted that injunctive relief would be inappropriate:

The evidence and appellee’s briefs are replete with well verified statements of the great boon to humanity of Dr. Steenbock’s scientific discoveries for the prevention and cure of rickets. The truth of such statements make the stronger the contention that it is a public offense to withhold such processes from any of the

132 13 F. Supp. at 703.
133 13 F. Supp. at 713.
135 Rowe, supra note , at 928.
136 146 F.2d 941 (9th Cir.1944).
137 See 146 F.2d 941, 949, 951, 952 (9th Cir.1944).
principal foods of the rachitic poor, or, indeed, from those of any such sufferers.\textsuperscript{138}

This dictum suggests that WARF’s patents should not constrain access to an important discovery with great potential to enhance social welfare. This rationale is at odds with prevailing Supreme Court doctrine at the time holding that patentees have no obligation to use (or license) their patents.\textsuperscript{139} Though I do not contend that the Ninth Circuit rejected the propriety of an injunction \textit{because} the invention arose from university research, this case does represent an example of a court invoking public interest concerns to extend exceptional treatment to university patents.

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In sum, there appears to be some degree of reciprocity between norms and doctrine in the early history of university patenting. Scientific norms eschewed patenting, and universities sought to avoid the taint of commercialism in their early patent practices. In reciprocal fashion, in a variety of doctrinal areas, patent courts historically excluded the fruits of academic science from patentability or treated academic entities differently from commercial actors. Notably, these “doctrinal hedges” significantly paralleled the traditional academic and public-interest norms that governed university science. The outputs of basic research did not comprise patentable subject matter partly because retaining these resources in a scientific commons would best promote technological progress. Furthermore, patents and associated profit motives were not necessary to motivate academics to generate such discoveries. Additionally, infringement need not extend to academic research, which was noncommercial in nature. In sum, an integrated system emerged where prevailing academic norms and patent doctrine achieved a rough equilibrium. As we will see, this “mutually segregating” equilibrium based on academic exceptionalism would not last, and a very different one would take its place.

\textbf{PART II \hspace{1em} TRANSITION: PATENTS ENTER THE ACADEMY}

This equilibrium began to shift as academic institutions started to vastly increase their patenting activity. While most observers locate the rise of university patenting at the end of the twentieth century,\textsuperscript{140} antecedents earlier in that century contributed to this shift. In order to generate large numbers of patentable inventions, universities needed more

\begin{itemize}
  \item \textsuperscript{138} 146 F.2d at 945.
  \item \textsuperscript{140} See, \textit{e.g.}, Univ. of Colo. v. Am. Cyanimid Co., 196 F.3d 1366, 1374 (noting that the Bayh-Dole Act, which was passed in 1980, “set the stage for modern university licensing”).
\end{itemize}
significant sources of research funding than the private trusts and donations upon which they had historically relied. To this end, massive increases in federal science funding in World War II infused universities with money.\textsuperscript{141} Key technological advances—from the mass production of penicillin to the Manhattan Project—helped win the war and revealed to U.S. policymakers the importance of large-scale science funding. Vannevar Bush, who served as chief science advisor to President Roosevelt, argued forcefully for expansive science funding to continue after the war,\textsuperscript{142} particularly in medicine and public health.\textsuperscript{143} Federal science funding increased markedly in the first post-war decade and accelerated even faster in the late 1950s.\textsuperscript{144}

Notably, scaled-up funding of university science was not framed in an imperative of immediate commercialization. Bush fully expected federal funds to facilitate the development of medicines, labor-saving devices, and other applied technologies.\textsuperscript{145} However, he rejected left-leaning calls for government to directly manage scientific research to satisfy immediate social and economic needs.\textsuperscript{146} Rather, he championed undirected scientific work and “basic” research, which promised significant, though unpredictable, long-term benefits.\textsuperscript{147} Accordingly, the orientation of university research shifted after WWII from short-term problem-solving to addressing more fundamental issues.\textsuperscript{148} Within this “linear” model of technological advance, federal funding and university research would create an upstream “reservoir of knowledge” that would facilitate downstream technological development.\textsuperscript{149} This linear model paralleled philosopher of science Michael Polanyi’s conception of an autonomous “republic of science” that would receive public support but remain insulated from political, social, and market influences.\textsuperscript{150} It also resonated with traditional Mertonian norms of noncommercial research and communal progress.

\textsuperscript{141} See MATKIN, supra note, at 20; WASHBURN, supra note, at 121; Rosenberg & Nelson, supra note, at 334 (“World War II was a watershed in the history of American science and technology and, in particular, led to a dramatic change in the roles played by American universities in scientific and technical enterprises.”). Actually, federal research funding had already increased sharply in World War I, which also saw the establishment of the National Research Council.

\textsuperscript{142} See VANNEVAR BUSH, SCIENCE: THE ENDLESS FRONTIER (1945).

\textsuperscript{143} S.P. STRICKLAND, POLITICS, SCIENCE, AND DREAD DISEASE 22 (1972); Blumenthal, supra note, at 2453.

\textsuperscript{144} Mowery & Sampat, University Patents, supra note, at 793.

\textsuperscript{145} BUSH, supra note.

\textsuperscript{146} Id.

\textsuperscript{147} Rosenberg & Nelson, supra note, at 335.

\textsuperscript{148} Yong S. Lee, supra note, at 850.

\textsuperscript{149} Timothy L. Foley & Michael Sharer, Technology Transfer and Innovation: Reexamining and Broadening the Perspective of the Transfer of Discoveries Resulting from Government-Sponsored Research, 3 \textit{COMP. TECH. TRANSFER & SOC’Y} 109, 111 & fig.1 (2005). See generally BUSH, supra note.

\textsuperscript{150} Id.; see Polanyi, supra note, at 54, 56.
As the Cold War waned, however, federal policy shifted. Policymakers began to deemphasize military superiority and focus more on ensuring American global economic competitiveness. They began to question the linear theory of technological advance that largely segregated “upstream” academic research from “downstream” commercialization. A consensus emerged that knowledge flows between academic science and industry are bidirectional and that innovation was best served by collaborative relationships among the “triple helix” of government, academia, and industry. As a result, federal science policy began to focus more on downstream research, technology transfer, and commercialization.

These policy shifts ultimately culminated in the Bayh-Dole Act. While the conventional view holds that the Act fueled a vast increase in university patenting, academic patenting was already on the rise at the time of its enactment. Responding to criticisms that government-owned patents were not being commercialized, the Department of Health, Education, and Welfare had established a system of Institutional Patent Agreements (IPAs) in the late 1960s. Under IPAs, universities with approved technology transfer capabilities could retain title to patents on federally-funded inventions and grant exclusive licenses to firms. Indeed, policy shifts that threatened IPAs helped motivate support for the Bayh-Dole Act by universities that already enjoyed the benefits of patenting federally-funded inventions.

HEW’s policy changes fed into the broader debate over who should take title to patents arising from federally-funded research.

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151 BOK, supra note , at 11.
154 Id.
155 MOWERY ET AL., 104. Public universities, which focused more on applied research and had incentives to provide a return on taxpayer investments, were more active in patenting than private institutions prior to Bayh-Dole. See Mowery & Sampat, Bayh-Dole, 119.
156 Rebecca S. Eisenberg, Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research, 82 VA. L. REV. 1663, 1691 (1996) [hereafter Eisenberg, Public Research].
157 Eisenberg, Public Research, supra note , at 1691-92; Mowery & Sampat, University Patents, supra note , at 795.
158 See Popp Berman, supra note , at 854; Eisenberg, Public Research, supra note , at 1692; Mowery & Sampat, University Patents, supra note , at 795.
159 See Colyvas et al., How Do University Inventions Get into Practice?, supra note , at 62; Sampat, supra note , at 780.
160 See U.S. DEP’T OF JUSTICE, 1 INVESTIGATIONS OF GOVERNMENT PATENT PRACTICES AND POLICIES: REPORT AND RECOMMENDATION OF THE ATTORNEY GENERAL TO THE PRESIDENT 2, 89–90 (1947); Memorandum and Statement of Government Patent Policy,
several decades, federal agencies pursued different approaches: some took title to patents themselves while others allowed grantees (such as universities) to take patents, reserving only a license for themselves.\textsuperscript{161} In the late 1970s, concerns grew that government-owned patents were stifling innovation, as firms would not develop inventions into commercial products without possessing exclusive rights. Empirical evidence corroborated these concerns,\textsuperscript{162} which were exacerbated by perceptions of lagging economic competitiveness relative to Europe and Japan.\textsuperscript{163} Political momentum began to grow in favor of reforming federal policy governing the ownership of publicly-funded inventions.

To spur the commercialization of these inventions, Congress passed the Bayh-Dole Act in 1980.\textsuperscript{164} The Act allowed and encouraged small businesses and nonprofits that received government funds to take title to patents arising from federally funded research.\textsuperscript{165} Congress enacted this legislation on the view that exclusive rights were necessary to motivate additional private investment to develop patented inventions into commercial products.\textsuperscript{166} This made intuitive sense for small business grantees that could themselves develop patented inventions into commercial products. For universities, however, patents were seen as a necessary conduit for transferring federally-funded technologies to the private sector for commercialization. While grantees certainly benefitted from Bayh-Dole, federal funding agencies retained several rights in subject inventions. For example, agencies can prevent grantees from taking to title to patents in “exceptional circumstances.”\textsuperscript{167} Additionally, agencies receive a paid-up nonexclusive license to practice subject


\textsuperscript{161} See generally Eisenberg, Public Research, supra note .

\textsuperscript{162} In the 1970s, NASA had a commercialization rate of less than 1% for inventions under its free use policy, but 18%–20% for inventions where contractors controlled patents. Aaron S. Kesselheim & Jerry Avorn, University-Based Science and Biotechnology Products, 293 JAMA 850, 851 (2005). The statistical case in favor of the Bayh-Dole Act is suspect, however, in light of significant selection bias. Eisenberg, Public Research, supra note , at 1702-05.

\textsuperscript{163} See S. REP. No. 96-480, at 1 (1979); H. REP. No. 96-1006, Part 1, at 17 (1980); H.R. REP. No. 96-1307(I), at *1 (1980).

\textsuperscript{164} 35 U.S.C. § 202 et seq.


\textsuperscript{166} See Eisenberg, Public Research, supra note , at 1669. This is, of course, a highly contested premise. Some university inventions—including certain research tools—do not require additional development for useful exploitation. In this context, patents may simply increase price and decrease access with little offsetting social gain.

\textsuperscript{167} 35 U.S.C. § 202(a).}
inventions and can “march-in” to compulsorily license inventions in certain circumstances. Ultimately, the Bayh-Dole Act represented a significant statutory and policy innovation. Among other effects, it created enormous commercial opportunities for universities and reflected a public policy of greater engagement among academia, the patent system, and industry.

In addition to legislative reforms, scientific advances and the changing nature of university research also helped accelerate academic patenting. In particular, the birth of the biotechnology industry in university laboratories helped fuel this trend. In the 1970s, Stanley Cohen of Stanford University and Herbert Boyer of UCSF developed and patented the pioneering techniques of recombinant DNA technology. Biotechnology generated enormous enthusiasm on university campuses, as it promised significant therapies and large revenues for academic patentees. It also sparked increased industrial support for university research. Between 1980 and 1983, pharmaceutical companies contributed $140 million to research conducted at 13 universities. By 1990, genetic engineering and recombinant DNA represented the technological class in which universities owned the highest proportion of patents.

The emergence of biotechnology also reflected a shift in the nature of university research. Toward the end of the 20th century, university researchers, particularly in the life sciences, developed greater facility

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170 See Croissant & Smith-Doerr, supra note , at 693 (characterizing the 1980 passage of the Bayh-Dole Act as marking a new “pivotal phase” in university-industry research relationships); Dreyfuss, Public Domain of Science, supra note , at 464.
172 Colyvas et al., How Do University Inventions Get into Practice?, supra note , at 61-62; Mowery & Sampat, University Patents, supra note , at 793-94; see generally Greenbaum, supra note , at 343-46.
175 Blumenthal, supra note , at 2453.
176 Rosenberg & Nelson, supra note , at 339.
(and interest) in moving beyond the passive observation of nature to actively manipulating the basic building blocks of life. More broadly, much contemporary academic research in the life sciences proceeds in “Pasteur’s Quadrant”: while it seeks to elucidate “basic” knowledge, it also has immediate practical implications.\footnote{177} Due to the changing nature of university research, even “basic” investigations can yield outputs that directly or with little modification satisfy legal definitions of patentability.

Developments in the patent system also spurred greater university patenting. In 1980, the Supreme Court held in \textit{Diamond v. Chakrabarty} that a genetically engineered bacterium comprised patentable subject matter.\footnote{178} In so doing, it articulated an expansive conception of patentable subject matter\footnote{179} that encompassed many of the fruits of the nascent biotechnology field (as well other fields, such as computer science).\footnote{180} As discussed further below, this and other decisions widened the door for university patents.\footnote{181} Furthermore, just two years after \textit{Chakrabarty}, Congress established the Court of Appeals for the Federal Circuit,\footnote{182} which soon emerged as “a strong champion of patentholder rights.”\footnote{183} The Federal Circuit helped create a climate even more conducive to filing patent applications, including those from university scientists.

\begin{footnotes}
\footnote{178} 447 U.S. 303 (1980).
\footnote{180} See MORVEY ET AL., \textit{supra} note , at 103; Bagley, \textit{supra} note , at 235.
\footnote{181} See infra notes – and accompanying text.
\footnote{183} Mowery et al., \textit{supra} note , at 103.
\end{footnotes}
This constellation of legal, economic, and scientific developments created a “perfect storm” that helped fuel a rapid rise in university patenting after 1980. In 1965, the USPTO granted 96 patents to 28 U.S. universities or related institutions.\textsuperscript{184} In 1992, a little over a decade after Bayh-Dole, the USTPO granted almost 1500 patents to over 150 U.S. universities or related institutions.\textsuperscript{185} By 2002, academic institutions were receiving more than 3000 patents per year.\textsuperscript{186} From 1980 to 2005, the average number of patents granted to U.S. research institutions increased by more than 480%.\textsuperscript{187} The next Part considers the impact of this development on the norms of university science and concomitant responses by patent courts.

**PART III  THE CONTEMPORARY LANDSCAPE: INTERNALIZATION AND THE DEMISE OF EXCEPTIONALISM**

Whereas traditional relationships between universities and the patent system were marked by mutual segregation, they are now characterized by a high degree of mutual internalization. This Part briefly surveys the “internalization” of patents within academic culture, a phenomenon that has attracted significant attention. It then focuses on the


\textsuperscript{185} Henderson et al., *supra* note , at 119.

\textsuperscript{186} Kesselheim & Avorn, *supra* note , at 851.

less appreciated ways that university science has been “internalized” within patent doctrine. Increasingly, academic inventions and practices are the subject of patent litigation and doctrine. And patent courts increasingly view universities as fully integrated into the central, profit-oriented narrative of the patent system, thus contributing to their rejection of academic exceptionalism.

A. Academic Science Viewing Patent Law: Increased Patenting and Attendant Cultural Shifts

As legal, economic, and scientific developments pushed universities deeper into the patent system, many academic institutions and individuals underwent a notable cultural shift.

1. Evolving Norms and Universities’ Embrace of Patenting

Through a long (and still ongoing) process of norm contestation, academic culture has become much more receptive to exclusive rights and the commercial exploitation of scientific knowledge. The rise in patenting following Bayh-Dole has challenged traditional norms of openness and communal sharing and led to “the emergence of new norms about how science should be done.” While universities used to be wary of patents, many now zealously embrace them, and faculty members actively seek to exploit the “pecuniary content of knowledge.”

Etzkowitz and Webster observe that “science and property, formerly independent and even opposed concepts referring to distinctively different kinds of activities and social spheres, have been made contingent upon each other through the concept of intellectual property rights.” These shifts mark a significant evolution away from the communalistic norms Merton described in the early twentieth century.

Of course, while it is easy to schematize universities’ embrace of patenting as a stark break from prior practices, one should not paint with too broad a brush. First, as noted above, the notion that academia has always been a bastion of Mertonian sharing norms may be unduly romantic. Second, strong anti-patent norms continue to persist (and will

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188 Such issues even appeared in debates leading up to the Bayh-Dole Act, when critics warned that increasing commercialization at universities would erode scientific norms. Argyres & Liebeskind, supra note, at 435-36.
189 Etzkowitz, Entrepreneurial Science, supra note, at 26; see Merges, Property Rights Theory, supra note, at 145, 146; Rai, supra note, at 109.
190 See Sampat, supra note, at 780-81.
191 Etzkowitz, Entrepreneurial Science, supra note, at 27; see BOK, supra note, at 3.
192 Henry Etzkowitz & Andrew Webster, Science as Intellectual Property, in HANDBOOK OF SCIENCE AND TECHNOLOGY STUDIES (Sheila Jasanoff et al., eds., 1995), at 480-81; see Rowe, supra note, at 923.
193 See supra note.
likely always persist) in some areas of academia.\textsuperscript{194} Third, institutions and individuals are not monolithic, and particular universities and scientists differ in their attitudes toward patenting and commercialization.\textsuperscript{195} Fourth, in some contexts, traditional sharing and public interest norms have not been displaced, but have been adapted to a new default environment that favors exclusive rights.\textsuperscript{196}

Notwithstanding these caveats, as a general matter, academic institutions and individuals have become much more commercially oriented.\textsuperscript{197} Prior to 1980, few universities systematically reviewed laboratory work to find discoveries ripe for practical application.\textsuperscript{198} The Bayh-Dole Act helped change this state of affairs and encouraged universities to act more like commercial entities.\textsuperscript{199} According to one commentator, "[u]niversities have evolved from public trusts into something closer to venture capital firms."\textsuperscript{200} In the formerly financially disinterested realm of academia, some scientists have become jealous of colleagues who have translated academic discoveries into personal wealth, a phenomenon known as the “Porsche principle."\textsuperscript{201} At the personal level, embracing commercialization has posed challenges for scientists steeped in Mertonian “role identities."\textsuperscript{202} Some scientists delegate commercialization functions to other entities (such as graduate students) and create “buffers” to limit their business activities.\textsuperscript{203} Interestingly, these strategies parallel earlier institutional segregation within universities that

\textsuperscript{194} See Norbert Weiner, \textit{Invention: The Care and Feeding of Ideas} 151 (1993); Bok, supra note \textsuperscript{1}, at 140; Yong S. Lee, supra note \textsuperscript{1}, at 861; see Liza Vertinsky, \textit{An Organizational Approach to the Design of Patent Law}, 13 MINN. J. L. SCI. & TECH. 211, 244 (2012); Siegel et al., \textit{Effective Transfer}, supra note \textsuperscript{1}, at 121; Jason Owen-Smith & Walter W. Powell, \textit{Networks and Institutions}, in \textit{SAGE HANDBOOK OF ORGANIZATIONAL INSTITUTIONALISM} 596, 613-14 (Royston Greenwood et al. eds., 2008).

\textsuperscript{195} Sobolski et al., supra note \textsuperscript{1}, at 3138; Maryann P. Feldman & Pierre Desrochers, \textit{Truth for Its Own Sake: Academic Culture and Technology Transfer at Johns Hopkins University}, 42 MINERVA 105, 107 (2004) (describing how John Hopkins University, a major recipient of research funds, has traditionally been skeptical of patenting and licensing).


\textsuperscript{197} See, e.g., Karen Seashore Louis et al., \textit{Entrpreneurs in Academe: An Exploration of Behaviors among Life Scientists}, 34 ADMIN. SCI. Q. 110, 110 (1989).

\textsuperscript{198} Bok, supra note \textsuperscript{1}, at 28.

\textsuperscript{199} Cf. Colyvas et al., \textit{How Do University Inventions Get into Practice?}, supra note \textsuperscript{1}, at 62 (noting that the Bayh-Dole Act encouraged universities to advertise inventions to industry).

\textsuperscript{200} Leaf, supra note \textsuperscript{1}.


\textsuperscript{202} See generally Sanjay Jain et al., \textit{Academics or Entrepreneurs? Investigating the Role Identity Modification of University Scientists Involved in Commercialization Activity}, 38 RES POL’Y 922 (2009).

\textsuperscript{203} Jain et al., supra note \textsuperscript{1}, at 923.
allowed them to retain their academic identities while delegating patent management to independent entities.

Again, the emergence of biotechnology illustrates the evolution of academic norms. Cohen and Boyer initially resisted patenting their discovery of recombinant DNA technology, with Cohen being the primary holdout. He relented, however, upon the persuasion of Neils Reimers, head of Stanford’s Office of Technology Licensing. Notably, Cohen told Reimers that he would renounce any future royalties arising from a patent. The scientists assigned the patent to Stanford and UCSF, and it has gone on to become the most profitable patent in both schools’ histories. By 1996, it had generated over $150 million in royalties. Also emblematic of the times, Cohen and Boyer’s involvement in commercialization extended well beyond filing patent applications; Boyer and venture capitalist Swanson founded Genentech, and Cohen joined the scientific advisory board of Cetus. In general, university scientists have played formative roles in many leading biotech firms. With patents as an important fulcrum, academic scientists and universities have become much more integrated in the commercial exploitation of science.

2. University Patenting Practices

Contemporary patent practice by universities reflects new norms of exclusivity and commercialization that would have been unfamiliar in the early twentieth century. Case studies reflect a markedly aggressive attitude toward obtaining patents, particularly on fundamental discoveries. An examination of university patenting, however, reveals a complicated normative environment in which universities simultaneously seek profits while still serving traditional public objectives.

Returning to a familiar player, WARF has attracted significant criticism for its patents on isolated human embryonic stem cells (“hESCs”). In the late 1990s, James Thomson of the University of Wisconsin obtained three patents on isolated hESCs and assigned them to WARF. These cells have the capacity to develop into almost all kinds of human tissue and represent both fundamental research tools as well as promising platforms for future therapies. The patents “cede a remarkable

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204 Powell & Owen-Smith, supra note , at 264.
205 Hughes, supra note , at 550.
206 BOK, supra note , at 140; KENNEY, supra note , at 23.
208 BOK, supra note , at 13.
amount of territory to WARF," and commentators have warned that the patents may inhibit basic research and product development.\textsuperscript{210} WARF has actively promoted commercialization of these cells; in exchange for $1 million of sponsored research, it exclusively licensed six important cell types that can be derived from these cell lines to Geron, a private firm.\textsuperscript{211} WARF has, however, made efforts to enhance access to these patented cells for nonprofit research. Partly due to public pressure, WARF and NIH negotiated a deal by which federally-funded scientists can utilize WARF cells for research purposes, though the deal strictly restricts commercial applications.\textsuperscript{212} WARF’s stem cell patents have attracted significant criticism within the academic community and were the target of a successful reexamination challenge, which ultimately invalidated one of the patents and cast doubt on the others.\textsuperscript{213}

Perhaps even more controversial has been Columbia University’s attempt to extend patent exclusivity on cotransformation.\textsuperscript{215} In the late 1970s, Richard Axel and his colleagues at Columbia University patented cotransformation, a process for inserting exogenous DNA into a host cell to produce particular proteins. They filed for a patent in 1980, prior to the effective date of the Bayh-Dole Act.\textsuperscript{216} According to pre-Bayh-Dole rules, NIH (which helped fund the research) allowed Columbia to take title to the patent, but it cautioned the university against engaging in repressive licensing practices.\textsuperscript{217} Columbia’s cotransformation patent has been highly lucrative, with several firms paying millions of dollars in licensing fees. When the patent expired, Columbia announced that it had secured another patent in 2002, which expires in 2019, that also covers cotransformation technology.\textsuperscript{218} Several former licensees sued to declare Columbia’s patent

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\item [211] Lee, \textit{Inverting the Logic}, supra note, at.
\item [213] Lee, \textit{Inverting the Logic}, supra note.
\item [216] Leaf, supra note.
\item [217] Leaf, supra note.
\item [218] Leaf, supra note.
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invalid and unenforceable,²¹⁹ and Columbia received significant criticism for its attempts to extend exclusivity over this foundational research process.

Harvard, the Massachusetts Institute of Technology, and the Whitehead Institute for Biomedical Research have also received criticism for patenting a fundamental biological process. In 2002, these academic institutions obtained a broad patent on a basic biochemical pathway known as the NF-kB cell-signaling pathway,²²⁰ which has been linked to a wide range of diseases including cancer, osteoporosis, atherosclerosis, and rheumatoid arthritis. The institutions exclusively licensed the patent to Ariad Pharmaceuticals and joined with Ariad in suing several pharmaceutical firms for infringement.²²¹ Observers have criticized both the breadth of the NF-kB patent and as well as the universities’ decision to sue firms that are successfully developing technologies related to it.

Finally, the story of Myriad Genetics has become emblematic to many of the excesses of contemporary patenting. In the 1990s, University of Utah researcher Mark Skolnick led a team that sequenced BRCA1 and BRCA2, two genes related to breast and ovarian cancer.²²² Shortly thereafter, the University of Utah and Myriad Genetics, a biotechnology firm co-founded by Skolnick, obtained several patents on these genes.²²³ Myriad Genetics has received significant criticism for asserting its patent against medical providers seeking to perform diagnostic tests involving BRCA1 and BRCA2.²²⁴ In particular, public health and women’s advocates have alleged that Myriad’s patents have raised the price and decreased the availability of diagnostic testing. In 2009, various plaintiffs, including the ACLU, filed a lawsuit challenging the validity of Myriad’s patents on patentable subject matter grounds. The case has attracted enormous attention as it has worked up the federal courts, and the Supreme Court has recently agreed to review it.²²⁵

²²⁰ See Rai & Eisenberg, supra note , at 302.
²²¹ See infra notes -.
²²² Robert Dalpe et al., Watching the Race to Find the Breast Cancer Genes, 28 SCI. TECH. & HUMAN VALUES 187, 195-99 (2003); Leaf, supra .
²²³ Dalpe, supra note , at 195-99; see Leaf, supra note. Interestingly, an inventorship dispute with NIH was resolved when the University of Utah and Myriad agreed to add certain NIH researchers to a patent application and share royalties with NIH. Dalpe, supra note , at 196.
Further reflecting their aggressive patent practices, contemporary universities have become active participants in litigation. The University California, the University of Colorado, Cornell University, Columbia University, Harvard University, MIT, the University of Minnesota, and the University of Rochester have all been involved in high-profile cases. Not surprisingly, universities have attracted criticism for exploiting patent litigation for financial gain. For example, in *Eolas Technologies, Inc. and The Regents of the University of California v. Microsoft*, the University of California licensed a patent to a firm that is essentially a nonpracticing entity, then sought to share a jury award of $520.6 million against Microsoft. Commenting on the case, a representative of the University of California simply stated, “The University expects to be fairly compensated for use of its patented technology.” These and other activities have led patent scholars to question whether universities are patent trolls.

Turning to licensing practices, a NIH study “concluded that universities have sought just about every kind of clause in research tool licenses to which they themselves have objected, including publication restrictions, rights in or the option to license future discoveries, and prohibition on transfer to other

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227 See, e.g., Regents of the University of California v. Eli Lilly & Co., 119 F.3d 1559 (Fed. Cir. 1997); Eolas Technologies, Inc. and The Regents of the University of California v. Microsoft, 399 F.3d 1325 (Fed. Cir. 2005).

228 Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1359 (Fed. Cir. 2004) (involving Competitive Technologies, Inc., which represents the University of Colorado and Cornell University).

229 Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1359 (Fed. Cir. 2004).


234 University of Rochester v. G.D. Searle, 375 F.3d 1303 (Fed. Cir. 2004).

235 399 F.3d 1325 (Fed. Cir. 2005).


237 Office of the President, University of California, Questions and Answers about UC/Eolas Patent Infringement Suit against Microsoft, Aug. 11, 2003.

institutions or scientists.” As a general matter, Mark Lemley identifies “a felt sense among a lot of people that universities are not good actors in the patent system.”

The normative landscape of university patenting, however, is quite complicated. While universities have certainly become more aggressive in obtaining and asserting patents, particularly on “foundational” resources, vestiges of academic norms persist. Some technology transfer offices (TTOs) decline to patent fundamental research tools precisely to facilitate their wide availability to the scientific community. At the level of enforcement, universities holding patents often assert far less than their full exclusionary force. While universities have been involved in high-profile litigation against companies, they have generally not sued other universities.

Furthermore, in the licensing realm, universities are utilizing their patents in somewhat publicly-spirited ways to advance noncommercial research and distributive ends. As I have described elsewhere, many TTOs retain “research exemptions” when licensing their technology to others. That is, even when a university exclusively licenses a technology to a private firm, it will retain the right to utilize this invention for nonprofit research and to grant licenses to other nonprofit research institutions to do likewise. In this manner, universities are creating a “contractual” experimental use exception by embedding research safe harbors in patent licenses. Additionally, some universities have expanded access to patented technologies—particularly health-related technologies—for low-income populations.

One example involves Yale University’s


Lemley, Patent Trolls, supra note , at 619.

Merges, Property Rights Theory and the Commons, supra note , at 150; Rai, supra note , at 112 (noting that Harvard and Stanford refuse to patent ESTs).

They have, however, been involved in interferences. See Regents of the Univ. of Calif. v. Iowa Res. Found., 45 F.3d 1371 (Fed. Cir. 2006).


Lee, Open Science, supra note .

See Peter Lee, Toward a Distributive Commons in Patent Law, 2009 WISC. L. REV. 917 [hereinafter Lee, Distributive Commons].
renegotiation of its exclusive license on a patented anti-AIDS medication to allow for lower prices in South Africa.\textsuperscript{247} Furthermore, universities are increasingly including “humanitarian” provisions in licenses to enhance access to patented health technologies for vulnerable populations.\textsuperscript{248} Several years ago, Stanford University convened an influential working group of leading technology transfer officials to identify various licensing best practices, such as research and humanitarian exceptions.\textsuperscript{249} While university patenting is much more explicitly commercial than in past generations, universities are conscientiously using patents to “push” certain noncommercial, academic norms into the marketplace.\textsuperscript{250}

3. Shifts in Policy and Institutional Structure

Universities’ growing openness to commercial imperatives is reflected in changes to patent policy and institutional structure. As in earlier times, official patent policies emphasize universities’ use of intellectual property to advance the public interest. However, asserting exclusivity and obtaining revenues are regarded as legitimate functions of technology transfer.\textsuperscript{251} More broadly, universities have adopted policies encouraging commercial activities by faculty members.\textsuperscript{252} Further illustrating a notable cultural shift,\textsuperscript{253} some universities even credit patents and commercialization activities in tenure and promotion decisions.\textsuperscript{254}

Whereas early forays into patenting were marked by institutional segregation of academic and patenting functions, the guiding theme in recent times is integration.\textsuperscript{255} To begin, universities’ embrace of patenting has resulted in significant infrastructure building, most notably the establishment of hundreds of TTOs on university campuses. Furthermore,

\textsuperscript{247} Lee, Distributive Commons, supra note \textsuperscript{ }, at 980; see Kapczynski et al., supra note \textsuperscript{ }, at .
\textsuperscript{248} Lee, Distributive Commons, supra note \textsuperscript{ }, at 982.
\textsuperscript{250} See Lee, Open Science, supra note ; Lee, Distributive Commons, supra note ; Lee, Interface, supra note.
\textsuperscript{251} See, e.g., Stanford University, Research Policy Handbook, Inventions, Patents and Licensing (RPH 5.1); Harvard University, Statement of Policy in Regard to Intellectual Property (Feb. 4, 2008), http://otd.harvard.edu/resources/policies/IP/IPPolicy.pdf.
\textsuperscript{252} See, e.g., University of California, Guidelines on University-Industry Relations, available at http://www.ucop.edu/ott/genresources/unidrel.html (“In general, faculty members are encouraged to engage in appropriate outside professional relationships with private industry.”).
\textsuperscript{253} See Yong S. Lee, supra note \textsuperscript{ }, at 848; see also BOK, supra note \textsuperscript{ }, at 63.
\textsuperscript{254} See House Innovation Panel Hears Benefits Of Bayh-Dole, Advances in Tech Transfer, 84 PTCJ 344, June 29, 2012 (noting that the Regents of the University System of Maryland have modified tenure criteria to include commercialization).
\textsuperscript{255} Cf. Etzkowitz, Knowledge as Property, supra note \textsuperscript{ }, at 415.
commercialization and revenue generation have become core academic functions: former Duke University President Terry Sanford once noted that “universities should do all that is reasonably possible to earn returns on inventions, and should not be timid in making prudent business arrangements to assure the target fair return.”

Unlike earlier eras when universities sought to distance themselves from actively managing patents and licenses, these days university officials are directly involved in such activities.

Furthermore, patents and commercialization have fostered a wealth of connections between university and industry. The Bayh-Dole Act “revolutionized” university-industry relations; one 1996 survey found that “over 90 percent of life-science companies in the United States had some relationship with academia.” Oftentimes, commercial firms sponsor research at universities in exchange for exclusive licenses or options on any resulting patented inventions. Reflecting more aggressive institution-building, entities like the Whitehead Institute for Biomedical Research at MIT reflect “an attempt to create an inter-penetrating system of public and private research within a university setting.”

Furthermore, universities have created “proof of concept centers” to help bridge the gap between research outputs and commercial products. Indeed, convergence in the organization of academic and industrial research has led to “exchange of personnel, common research projects, and, in some cases, large-scale joint ventures.”

These ties linking faculty inventors, universities, and licensee firms approach vertical integration of universities and commercial partners.

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257 See Mowery & Sampat, University Patents, supra note , at 811; Etzkowitz, Knowledge as Property, supra note , at 420.

258 Press & Washburn, supra note , at ; see Etzkowitz, Knowledge as Property, supra note , at 416. Ironically, companies have at times have opposed university patenting and the sharp business practices of university licensors. See id. at 395-96.


260 Argyres & Liebeskind, supra note , at 448; see Stephen Heuser, Harvard Woos Firms to Fund Research, BOSTON GLOBE, Nov. 9, 2005, at 1 (describing Harvard University’s aggressive campaign to increase sponsored research).


262 Louis et al., supra note , at 114.


264 See Peter Lee, Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer, 100 CALIF. L. REV. 1503 (2012) [hereinafter Lee, Transcending the Tacit Dimension]; see also Edwin Mansfield,
As I have described elsewhere, patent-mediated technology transfer necessarily involves a high degree of personal contact between faculty inventors and licensees. The need to transfer patent-related “tacit knowledge,” for example, helps explain the important role of star academic scientists in founding and leading new biotechnology firms (many of which license university patents). Moving beyond personal connections, the very cultures of academia and industry are beginning to converge. Research scientists move frequently between universities and industry, faculty members take sabbaticals at companies, and biotechnology firms are mimicking academic culture by creating postdoctoral fellowships. While not all of these trends are attributable to patenting per se, the profusion of patents has been part and parcel of a general cultural integration of academia and industry.

* * *

As reflected in norms, practice, and policy, universities and their scientists have become much more receptive to patenting and commercialization relative to the pre-Bayh-Dole era. Norms of open science have eroded, universities routinely patent foundational research tools and engage in litigation, and institutional connections between universities and industry have deepened. While vestiges of academic and public interest norms remain the baseline has clearly changed as universities have become “active participants in the business of science.” In addition to important substantive changes, universities have also undergone an important evolution and how they are perceived by the outside public. Universities have long played a rhetorically important role in society as vanguards of disinterested academic inquiry. However, “[a]s universities become more identified with commercial wealth, they also lose their uniqueness in society.” Indeed, universities’ embrace of patenting and commercial ventures has been reflected in patent doctrine, helping to define a new equilibrium between patents and the university.
B. Patent Law Viewing Academic Science: Doctrinal Internalization and the Demise of Exceptionalism

Just as academic science has internalized patents, patent doctrine has internalized academic science. Academic inventions, inventors, and practices are now frequently subjects of patent doctrine. Furthermore, courts increasingly view universities as integrated into the mainstream commercial narrative of the patent system. Since 1980—the year of the Bayh-Dole Act—patent courts have engaged in a project of rejecting distinctions between universities and other, typically commercial, actors. Importantly, the evolving normative status of universities has played a significant role in the erosion of academic exceptionalism. Whereas uniquely “academic” norms, practices, and policies justified exceptional treatment of universities in earlier generations, modern courts view universities as much more akin to commercial entities.

1. Eroding Doctrinal Hedges

As mentioned above, doctrine played a key role in erasing distinctions between academic science and other types of technological work. In particular, the Supreme Court’s 1980 decision in *Diamond v. Chakrabarty* marks a turning point in relations between patents and the university. Although *Chakrabarty* did not deal with an academic invention, its holding that genetically-modified living organisms comprise patentable subject matter, and its generally expansive approach to patent eligibility, significantly impacted universities. Among other effects, *Chakrabarty* helped “galvaniz[e] the rush into biotechnology.”

Its famous (though, perhaps flawed) conception of patentable subject matter as covering “anything under the sun that is made by man” encompassed many university discoveries in fields as diverse as biotechnology and computer science.

Other patentable subject matter decisions establishing the patent-eligibility of software-related inventions and plants further widened the door for university patents.

In addition, case law of the Federal Circuit also helped usher universities into the patent system. In earlier eras, the doctrine of utility had operated as a significant bulwark separating “embryonic” academic

makes them look even more commercial—and even less sympathetic to the Federal Circuit.”).

273 KENNEY, supra note , at 190.
277 Ex parte Hibberd, 227 U.S.P.Q. 443, 444 (1985);
discoveries from patentable technologies.\textsuperscript{278} In \textit{In re Brana}, however, the Federal Circuit held that compounds showing therapeutic effects in artificial, nonhuman “tumor models” satisfied the utility requirement,\textsuperscript{279} thus widening the door for patenting “upstream” biomedical inventions quite removed from human application. Furthermore, the Federal Circuit adopted a rather lax approach to the nonobviousness requirement for DNA inventions, holding that a claimed DNA may be nonobvious even when the protein that it codes for as well as methods of gene cloning are in the prior art.\textsuperscript{280} Such doctrine further facilitated patenting the fruits of biotechnology, a particularly active area of university research. These doctrinal developments have played a key role in integrating university discoveries within the patent system.\textsuperscript{281}

As universities entered the patent system en masse, the question arose as to whether patent doctrine should treat them differently than other actors, as it did in certain contexts in earlier times. Not surprisingly, universities have often argued for preferential treatment within the patent system, sometimes based on the perceived policy goals of the Bayh-Dole Act. However, contemporary courts have routinely rejected academic exceptionalism. In so doing, courts have relied on (and reinforced) a conception of universities as integrated into the traditional commercial narrative of patents.\textsuperscript{282}

2. Rejecting Academic Exceptionalism

i. Novelty

For example, the Federal Circuit has refused to extend special treatment to university researchers in the context of the novelty requirement. In the 1987 case of \textit{Griffith v. Kanamaru}, the court considered a priority dispute between Griffith, an Associate Professor at Cornell University Medical College, and Kanamaru, an employee of Takeda Chemical Industries.\textsuperscript{283} Both parties claimed to have been the first inventor of the technology at issue. The key question was whether Griffith,

\textsuperscript{278} See supra notes – and accompanying text.
\textsuperscript{279} 51 F.3d 1560, 1565 (Fed. Cir. 1995).
\textsuperscript{280} See \textit{In re Bell}, 991 F.2d 781, 785 (Fed. Cir. 1559); \textit{In re Deuel}, 51 F.3d 1552 (Fed. Cir. 1995).
\textsuperscript{281} In many respects, the treatment of university science in the patent system follows broader structural trends, such as the Federal Circuit’s early enthusiasm for patents. This remains true of more recent trends, such as the recent narrowing of patentability in Federal Circuit and Supreme Court jurisprudence.
\textsuperscript{282} This commercial characterization has also arisen in determining whether public universities can enjoy sovereign immunity from patent suits. \textit{See} Genentech, Inc. \textit{v. Regents of the Univ. of Cal.}, 143 F.3d 1446, 1453 (Fed. Cir. 1998) (“It is also a factor to be considered that the university’s [technology transfer] actions are not at the core of the educational/research purposes for which the university was chartered as an arm of the state.”
\textsuperscript{283} 816 F.2d 624 (Fed. Cir. 1987).
who had conceived of the invention first, had been “diligent” over an appropriate period of time before reducing the invention to practice.\textsuperscript{284} Griffith justified his delay by claiming that he needed to obtain additional research funds as well as wait to employ a particular graduate student.\textsuperscript{285} In doing so, he implicitly argued that the particularities of university research warranted relaxed application of the diligence requirement. Interpreted by the court, Griffith “suggests that, as a policy matter, universities should not be treated as businesses, which ultimately would detract from scholarly inquiry.”\textsuperscript{286} The Federal Circuit, however, rejected this argument and refused to draw distinctions between academic and commercial enterprises. It held that Griffith had not been diligent in reducing the invention to practice and that he could not claim priority.\textsuperscript{287}

The opinion takes the unusual step of commenting on an article by Derek Bok, former president of Harvard University, upon which Griffith had relied in his arguments. Contrary to Griffith’s interpretation, the Federal Circuit observes that “Bok does not ask that the patent laws or other intellectual property law be skewed or slanted to enable the university to have its cake and eat it too, \textit{i.e.}, to act in a noncommercial manner and yet preserve the pecuniary rewards of commercial exploitation for itself.”\textsuperscript{288} The court’s implicit message is that if universities are going to avail themselves of the benefits of the patent system, they will be held to the same standards as any other entity. Indeed, in applying strict standards of diligence to universities, the court acknowledges that it may encourage university scientists to act more like commercial actors in prioritizing certain lines of research.\textsuperscript{289}

\section*{ii. Statutory Bars}

The Federal Circuit reluctance to make exceptions for university research even extends to an activity that rests at the heart of academia:

\begin{quote}
\textsuperscript{284} Conception refers to the mental aspects of invention. \textit{See} Technitrol, Inc. v. U.S., 440 F.2d 1362, 1369 (Ct. Cl. 1971). Reduction to practice refers to the physical aspects of invention, for instance building a physical embodiment of an invention. \textit{See} DSL Dynamic Sciences Ltd. v. Union Switch & Signal, 928 F.2d 1122, 1125 (Fed. Cir. 1991). In the case where one party was the first to conceive but the second to reduce an invention to practice, that party will prevail if she was diligent from a time prior to the other party’s conception through to her own reduction to practice. \textit{See} 35 U.S.C. § 102(g).
\end{quote}

\begin{quote}
\textsuperscript{285} 816 F.2d at 626.
\textsuperscript{286} 816 F.2d at 627.
\textsuperscript{287} 816 F.2d at 629.
\textsuperscript{288} 816 F.2d at 628.
\textsuperscript{289} \textit{See} 816 F.2d at 628 (“Cornell has consciously chosen to assume the risk that priority in the invention might be lost to an outside inventor, yet, having chosen a noncommercial policy, it asks us to save it the property that would have inured to it if it had acted in single-minded pursuit of gain.”).
\end{quote}
scientific presentations. In *In re Klopfenstein*, the Federal Circuit considered whether a scientist’s presentations at two academic meetings constituted “printed publications” that would statutorily bar a later filed patent application. These presentations comprised oral commentary as well as slides pasted onto poster board that were displayed for at most two and a half days. Considering multiple factors, the Federal Circuit held that the slides constituted printed publications that statutorily barred Klopfenstein’s patent. The Federal Circuit did, however, exhibit some sensitivity to the unique norms of academic presentations. It noted, for example, that an entirely oral presentation would not constitute a printed publication and that a transient display of slides on a screen would not necessarily constitute a printed publication. Furthermore, the opinion states, “Where professional and behavioral norms entitle a party to a reasonable expectation that the information displayed will not be copied, we are more reluctant to find something a ‘printed publication.’” This reluctance helps preserve the incentive for inventors to participate in academic presentations or discussions. Nonetheless, Klopfenstein’s temporary poster displays statutorily barred his patent.

Notwithstanding the Federal Circuit’s nod to academic norms, commentators have warned that the court’s expansive conception of printed publications may chill academic presentations and force scientists to delay sharing research results. Noting that “patent rules too often are dictating the pace, form, and scope of discourse and sometimes even the direction of the research itself,” Margo Bagley advocates altering the novelty rules of both U.S. and foreign patent systems to better accommodate academic practices. Existing patent doctrine, however, has been less solicitous of such academic exceptionalism.

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290 Under pre-AIA law, printed publications describing an invention that arise more than one year before an inventor files a patent application will “statutorily bar” a patent. 35 U.S.C. § 102(b). Notably, under the first-inventor-to-file regime of the AIA, statutory bars are essentially subsumed into novelty analysis.
291 380 F.3d 1345 (Fed. Cir. 2004).
293 380 F.3d at 1347.
294 Factors include “the length of time the display was exhibited, the expertise of the target audience, the existence (or lack thereof) of reasonable expectations that the material displayed would not be copied, and the simplicity or ease with which the material displayed could have been copied.” 380 F.3d at 1350.
295 380 F.3d at 1352.
296 380 F.3d at 1349 n.4.
297 380 F.3d 1350-51; see also Cordis Corp. v. Boston Scientific Corp., 561 F.3d 1319, 1334 (Fed. Cir. 2009) (citing Klopfenstein and noting that academic norms created an expectation of confidentiality regarding the review of a scientific manuscript).
298 Bagley, supra note , at 221.
299 Bagley, supra note , at 223-24; see id. at 269.
iii. The Written Description Requirement

In a series of cases, the Federal Circuit rejected preferential treatment for university inventions in establishing a high written description requirement for biomedical technologies. Under prevailing law, patent claims must correspond to the “written description” of an invention appearing in the patent specification. In 1997, the Federal Circuit established a high bar for the written description requirement for DNA-based inventions. In *Regents of the University of California v. Eli Lilly & Co.*, the court invalidated several UC patent claims related to genetically engineered plasmids and microorganisms that produce insulin. Noting that UC’s patent described complementary DNA (cDNA) that produced rat insulin, the Federal Circuit invalidated UC’s broader claims covering cDNA that produced vertebrate and mammal insulin. In addition to spurring significant doctrinal controversy, *Regents of the University of California* is notable for imposing constraints on DNA-related inventions, an area of significant university patenting.

In another case involving the written description requirement, the Federal Circuit expressly rejected special treatment for university inventions. In *University of Rochester v. G.D. Searle & Co.*, the Federal Circuit invalidated Rochester’s patent on COX-2 inhibitors, an important class of anti-inflammatory medications, on written description grounds. While the patent claimed a process for inhibiting COX-2 (an enzyme related to inflammation), it did not disclose an actual COX-2 inhibitor that could perform this function. Notably, the Federal Circuit rejected Rochester’s calls to interpret the written description requirement leniently for university inventions. According to Rochester, an unduly strict written description would “vitiate[] universities’ ability to bring pioneering innovations to the public,” thus undermining the Bayh-Dole Act’s objective of commercializing academic inventions. The University of California and the University of Texas joined this argument as *amici*, asserting that a high written description requirement would jeopardize

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301 119 F.3d 1559 (Fed. Cir. 1997).
302 119 F.3d at 1562.
303 Complementary DNA is comprised of only the DNA sequences of a gene that actually code for a particular protein, with noncoding DNA (introns) removed.
304 In particular, it sparked a robust debate regarding whether the written description requirement should apply to original claims (as the Federal Circuit so construed) or whether it should only apply to amended claims. See Peter Lee, *Antiformalism at the Federal Circuit: The Jurisprudence of Chief Judge Rader*, 7 WASH. J.L. TECH. & ARTS 405 (2012).
305 358 F.3d 916, 917 (Fed. Cir. 2004).
306 358 F.3d at 930.
307 358 F.3d at 929.
308 358 F.3d at 929.
university technology transfer.\textsuperscript{309} The Federal Circuit, however, refused to bend the rules for university inventions. It flatly noted that the Bayh-Dole Act “was not intended to relax statutory requirements for patentability” to benefit university patentees.\textsuperscript{310} Notwithstanding the burdens on university patentees,\textsuperscript{311} the Federal Circuit has insisted on a high written description standard for biomedical inventions.\textsuperscript{312}

The Federal Circuit continued to reject academic exceptionalism in a recent en banc case, *Ariad Pharmaceuticals, Inc. v. Eli Lilly & Co.*\textsuperscript{313} As noted, Harvard, the Massachusetts Institute of Technology, and the Whitehead Institute for Biomedical Research obtained a broad patent on a basic biochemical pathway known as the NF-kB cell-signaling pathway, then exclusively licensed it to Ariad.\textsuperscript{314} Ariad and the universities sued Eli Lilly and others for infringement, but the district court held that certain claims in Ariad’s patent were invalid for failing the written description requirement. On appeal, the Federal Circuit affirmed, clarifying (against the universities’ arguments) that the written description requirement exists as an independent criterion of patentability alongside enablement.\textsuperscript{315} Furthermore, the Federal Circuit rejected the patentees’ policy argument that a stringent written description requirement would disfavor universities, whose scientists often discover “upstream,” basic inventions for which providing an adequate written description is particularly difficult:

Much university research relates to basic research, including research into scientific principles and mechanisms of action, and universities may not have the resources or inclination to work out the practical implications of all such research, i.e., finding and identifying compounds able to affect the mechanisms discovered. That is no failure of the law’s interpretation, but its intention.\textsuperscript{316}

Notwithstanding the somewhat unique nature of academic research, the Federal Circuit has frequently maintained that it will treat university patentees no differently than other players in the patent system regarding the strictures of the written description requirement.

\textsuperscript{309} 358 F.3d at 929.
\textsuperscript{310} 358 F.3d at 929.
\textsuperscript{311} Univ. of Rochester v. G.D. Searle & Co., Inc., 375 F.3d 1303, 1313 (Fed. Cir. 2004) (Rader, J., dissenting from decision not to hear case en banc) (“Must a university or small biotech company expend scarce resources to produce every potential nucleotide sequence that exhibits their inventive functions?”).
\textsuperscript{313} 598 F.3d 1336 (Fed. Cir. 2010) (en banc)
\textsuperscript{314} See supra notes – and accompanying text.
\textsuperscript{315} 598 F.3d at 1343.
\textsuperscript{316} 598 F.3d at 1353.
iv. The Common Law Experimental Use Exception

Turning from patentability to infringement, a particularly visible example of contemporary patent doctrine’s rejection of academic exceptionalism is the Federal Circuit’s narrow conception of the experimental use exception. As discussed above, courts have traditionally exempted noncommercial, experimental uses of patented inventions from infringement. In at least one case, this exemption appeared to apply to university research involving patented inventions. Whether or not true as a doctrinal matter, many academic scientists believed that their noncommercial research qualified as noninfringing experimental use. In more recent times, however, courts have articulated a rather narrow conception of the exception. In 1984, the Federal Circuit characterized the exception as “truly narrow” and cautioned against construing it “so broadly as to allow a violation of the patent laws in the guise of ‘scientific inquiry,’ when that inquiry has definite, cognizable, and not insubstantial commercial purposes.” In a 2000 concurrence, Judge Rader even declared that “the Patent Act leaves no room for any de minimis or experimental use excuses for infringement.”

This trend came to a head in 2002, when the Federal Circuit directly addressed the experimental use exception’s application to university research. In Madey v. Duke University, the court rejected Duke’s invocation of the experimental use defense in a patent infringement suit brought by a former faculty member. The Federal Circuit noted that Duke’s ongoing research projects involving Madey’s patented laser “unmistakably further [Duke’s] legitimate business objectives, including educating and enlightening students and faculty participating in these projects.” The court’s language is striking in highlighting the “business objectives” of a nonprofit research university. The Federal Circuit further notes that “Duke . . . like other major research institutions of higher learning, is not shy in pursuing an aggressive patent licensing program from which it derives a not insubstantial revenue

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317 See infra Part I.
318 See infra Part I.
319 See, e.g., Pitcairn v. United States, 547 F.2d 1106, 1125 (Ct. Ct. 1976) (holding defendant liable for patent infringement even when it used the invention for “testing, evaluational, demonstrational or experimental purposes”).
322 216 F.3d at 1352 (Fed. Cir. 2000) (Rader, J., concurring).
323 307 F.3d 1351 (Fed. Cir. 2002).
324 307 F.3d at 1363.
Indeed, Duke’s status as a nonprofit institution was immaterial to resolving this case. 326

Among other implications, Madey is notable for reflecting a new normative vision of universities as commercial entities. As Madison and colleagues note, “Perhaps because of their increasing commercial entanglements, universities were no longer seen by the court as inhabiting a distinctive, noncommercial realm.” 327 The Federal Circuit’s conception of the modern research university diverges sharply from “Justice Story’s early-19th century picture of a gentleman scientist driven by idle curiosity.” 328 In contemporary times, universities have “shed their noncommercial innocence to reach deeper into the pockets of commercial firms.” 329 After Madey, universities and their scientists largely lost whatever privileged normative status they may have enjoyed, 330 particularly their claim to “disinterested stewardship of knowledge in the public interest.” 331 In the context of infringement, universities’ embrace of patenting and commercialization has helped courts reject academic exceptionalism.

v. Remedies

Moving beyond the Federal Circuit, other courts—notably the Supreme Court—have also rejected academic exceptionalism. In determining remedies for patent infringement, the Supreme Court has recently stated that universities should be treated just as any other actors in the patent system. The Court articulated these views in the 2006 case of eBay v. MercExchange, which established a four-factor equitable test to determine the appropriateness of injunctive relief following a finding of patent infringement. 332 Notably, it states that

some patent holders, such as university researchers or self-made inventors, might reasonably prefer to license their patents, rather than undertake efforts to secure the financing necessary to bring their works to market. Such patent holders may be able to satisfy the traditional four-factor test, and we see no basis for categorically denying them the opportunity to do so. 333

325 307 F.3d at 1362 n.7.
326 Rowe, supra note, at 931.
327 Madison et al., supra note, at 395.
328 Eisenberg, Patent Swords and Shields, supra note , at 1018.
329 Eisenberg, Patent Swords and Shields, supra note , at 1018.
330 Greenbaum, supra note , at 377 (noting that after the decision, “no one, not even academics, are above the intellectual property laws.”).
331 Eisenberg, Patent Swords and Shields, supra note , at 1019.
333 547 U.S. at 393.
Thus, even though universities do not produce any products, they may still be eligible to receive injunctions against parties infringing their patents. While a per se rule prohibiting injunctions for university patentees would have been rather surprising, the Court’s lumping together of universities and other inventive entities tends to elide any historical distinctiveness of universities in the patent system. Indeed, the Court’s statement that university patentees may obtain injunctive relief actually facilitates their status as “nonpracticing entities” that has attracted so much criticism.

In applying *eBay* to academic patentees, lower courts have also highlighted the commercial nature of academic institutions. In *Commonwealth Scientific and Industrial Research Organisation (CSIRO) v. Buffalo Technologies*, the Eastern District of Texas granted a permanent injunction to CSIRO, a nonprofit scientific research foundation established by the Australian government, after finding that Buffalo Technologies had infringed one of CSIRO’s patents. Applying *eBay*, the court ruled that CSIRO would be irreparably harmed by Buffalo’s continued infringement in the form of delayed funding and lost opportunities to advance technological projects. The court noted that CSIRO faces competitive pressures to obtain resources, ideas, and personnel, and that infringement of its patent may place CSIRO at a competitive disadvantage. In ruling that monetary damages were inadequate, the court explicitly compared CSIRO to a commercial enterprise, noting that CSIRO’s “reputation as a research institution has been impugned just as another company’s brand recognition or goodwill may be damaged.” The case is notable both for demonstrating that nonpracticing academic patentees may obtain injunctive relief and for the markedly commercial characterization of such institutions.

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334 Not surprisingly, academic representatives argued in congressional testimony that universities should be eligible to receive injunctive relief even though universities do not manufacture any products. *See Injunctions and Damages, June 14, 2006, at 41-42* (statement of Carl Gulbrandsen, Executive Director, WARF).

335 The Supreme Court has also rejected academic exceptionalism regarding the ownership of inventions arising from federal funding. *Board of Trustees of the Leland Stanford Junior University v. Roche Molecular Systems, Inc., et al.*, 131 S. Ct. 2188 (2011) (holding, contrary to universities’ arguments, that title to inventions subject to the Bayh-Dole Act vests initially in faculty inventors, not in universities).

336 492 F. Supp. 2d 600, 608 (E.D. Tex. 2007). CSIRO is not a university, but is analogous to the United States National Science Foundation or the National Institutes of Health. *Id. See* Rai et al., 1559-60.

337 492 F. Supp. 2d at 604.

338 492 F. Supp. 2d at 604.

339 492 F. Supp. 2d at 605.

340 Andrew Beckerman-Rodau, *The Aftermath of eBay v. MercExchange*, 89 J. PAT. & TRADEMARK OFF SOC’Y 631, 655 (2007). Interestingly, universities have achieved higher-than-average injunction-grant rates among NPEs. Colleen V. Chien & Mark A. Lemley, *Patent Holdup, the ITC, and the Public Interest*, 98 CORNELL L. REV. 1, 10 (2012). While this may represent a kind of academic exceptionalism, it may also reflect courts’ conception of universities as commercial (i.e., productive, innovative) entities.
3. Analysis

In several ways, patent decisions over the past three decades reflect the internalization of academic science within patent doctrine. Expansive approaches to patentability and the changing nature of university research mean that many outputs of academic research fall within the patent system’s regulatory grasp. Academic science—previously peripheral to the patent system—is now a frequent subject of litigation and doctrine. Indeed, academic science has played a key role in shaping cutting-edge patent doctrine. To be sure, courts have used doctrines governing novelty, statutory bars, and the written description requirement to invalidate university patents. However, courts have applied these doctrines not based on a principled stance that academic discoveries are categorically inappropriate for patenting, but to rebuff overreaching behavior by zealous university-patentees.

During this period, courts have largely rejected academic exceptionalism. In some cases, this rejection has been based on a more commercially oriented conception of universities. Earlier doctrinal hedges separating the patent system from academic science were often predicated on conceptions of academic entities as nonpecuniary stewards of the public interest. In recent decades, however, court opinions have reflected a new reality, lumping universities and scientists together with commercial, revenue-seeking entities. In a variety of doctrinal contexts—perhaps most notably the common law experimental use exception—courts have treated universities as just another set of commercial actors in the patent system. Here again, patent law has struck an equilibrium between norms and doctrine: to the extent that universities have shed traditional academic norms and embraced commercialism, patent courts will not treat them any differently from other parties.

Of course, one must place these developments within the context of broader trends in patent law. In many ways, universities’ “integration” into the patent system was part and parcel of the patent-friendly doctrine of the Supreme Court and especially the Federal Circuit in the 1980s and 90s. \(^{341}\) Expansive interpretations of patentable subject matter, utility, and nonobviousness helped extend patent protection to more university discoveries, thus fueling the institutional changes to which courts later responded. Interestingly, universities have also been caught up in the more recent trend of both the Supreme Court and the Federal Circuit narrowing patentability since the late 1990s. Decisions constraining patentable subject matter,\(^{342}\) utility,\(^{343}\) nonobviousness,\(^{344}\) and (as discussed above)

\(^{341}\) See supra notes – and accompanying text.

the written description requirement have made it more difficult to obtain patents. In some respects, these changes have disproportionately impacted university inventions, which tend to be rather “upstream” and embryonic, thus perhaps defining a new kind of academic exceptionalism.

Viewed from one angle, courts’ “flattening” of the academic/commercial distinction and the rejection of preferential treatment for universities is not surprising. Historically, opportunities for universities to argue for (and courts to reject) academic exceptionalism were limited simply because universities were not active players in the patent system. It is somewhat predictable that as universities have become more active in litigation, they have argued for special treatment and that courts have been skeptical of such claims. After all, the United States is committed to a unitary patent system that at least nominally treats all inventors and inventions equally. Given this state of affairs, however, it is quite curious that while academic exceptionalism has largely died in the courts, it has adopted new life in the legislative sphere, a development to which we will now turn.

PART IV STATUTORY INTERNALIZATION AND THE REVIVAL OF ACADEMIC EXCEPTIONALISM

Turning from doctrine to statute, the twin themes of academic internalization and exceptionalism take interesting turns in the context of legislative patent reform. In significant part, the “internalization” of academic science within patent law, which started in doctrine, has reached its apex in new patent legislation. The interests of academic science, formerly peripheral to the patent system, are now “hardwired” in the patent statute. Within this project of “statutory internalization,” academic exceptionalism has evolved in interesting ways. On one hand, academic exceptionalism has been completely erased to the extent that the interests of academic science help shape general rules of patentability that apply to all inventions. Such internalization suggests that there is nothing “exceptional” about academic science at all. On the other hand, academic exceptionalism has intensified in the guise of specific statutory carve-outs for universities, thus illustrating classic legislative rent-seeking. The

343 In re Fisher, 421 F.3d 1365 (Fed. Cir. 2005) (rejecting an application claiming expressed sequence tags (ESTs) because of a lack of specific and substantial utility).
345 See supra notes – and accompanying text.
346 As Dan Burk and Mark Lemley have demonstrated, however, the patent system subtly distinguishes between different inventive fields. See Dan L. Burk & Mark A. Lemley, Is Patent Law Technology-Specific?, 17 BERKELEY TECH. L.J. 1155 (2002).
curious result is that while courts have rejected academic exceptionalism, it has achieved new life in Congress.

A. The Bayh-Dole Act

Of course, the primary legislation that brought universities into the patent system is the Bayh-Dole Act. As noted above, myriad political and economic factors motivated the act, which accelerated the rise in university patenting already underway in 1980. This Section extends the earlier discussion by highlighting the significant involvement of university representatives in securing the legislation’s passage.

University officials were involved throughout the Act’s genesis and passage. Early in the bill’s drafting, Ralph Davis (patent administrator from Purdue University), Howard Bremer (a WARF administrator), and Norman Latker (NIH’s first patent counsel) met with Sen. Birch Bayh and an aid to convince them of the worthiness of proposed legislation that would become the Bayh-Dole Act. In significant part, universities officials were motivated to support the bill because of their positive experiences with patenting federally-funded inventions under IPAs. According to Elizabeth Popp Berman, the “proto-institution” of IPAs helped establish university patenting as a legitimate activity and galvanized a professional community of technology transfer administrators around protecting and expanding university patent rights. Among other actions, advocates for the Bayh-Dole Act employed an effective political strategy of framing the Act in terms of enhancing U.S. economic competitiveness, thus connecting the legislation to important national imperatives.

Throughout legislative hearings, university representatives extolled the benefits of vesting title to federally funded patents in universities. For instance, representatives argued that universities were better conduits for technology transfer than government agencies because they were more
familiar with the inventions at issue and had direct access to faculty inventors.\textsuperscript{355} In particular, universities could facilitate the direct interaction between inventors and licensees that is often critical to technology transfer.\textsuperscript{356} Summarizing the involvement of universities in the bill’s passage, Bremer notes, “finally universities were speaking with a loud single voice in this arena. I think that is ultimately what carried the day.”\textsuperscript{357}

The Bayh-Dole Act represents an important instance of the “statutory internalization” of academic science within the patent system. In large part, the Bayh-Dole Act brought universities within the patent system. At a meta-level, it also represented a political awakening for universities, thus integrating them within a legislative system of lobbying Congress for favorable patent legislation, a practice they have continued with fervor.

B. The CREATE Act

While the Bayh-Dole Act changed federal policy governing the ownership of publicly-funded patents, it did not change the general rules of patentability. However, more recent legislation has done just that to favor the interests of academic research, further illustrating the statutory internalization of academic science within the patent system.

For example, university influence in shaping general rules of patentability is evident in the Cooperative Research and Technology Enhancement (“CREATE”) Act of 2004.\textsuperscript{358} Because the CREATE act is rather technical, some context is in order. Before the CREATE Act, Congress had enacted a particular provision, 35 U.S.C. § 103(c), to foster research and development within large corporate enterprises. In particular, § 103(c) prevented certain types of nonpublic subject matter from serving as “prior art” that could render a later claimed invention obvious when the subject matter and the invention were “owned by the same person or subject to an obligation of assignment to the same person.”\textsuperscript{359} In the absence of such a safe harbor, certain nonpublic information generated by


\textsuperscript{356} CIS NO: 77-S721-31, May 22, 23, June 20, 21, and 26, 1978, at 309 (statement of Thomas F. Jones, Vice President, Research, MIT); CIS NO: 77-S721-31, May 22, 23, June 20, 21, and 26, 1978, at 311 (statement of Thomas F. Jones, Vice President, Research, MIT); CIS NO: 78-S721-31, May 22, 23, June 20, 21, and 26, at 255 (statement of Charles H. Herz, General Counsel, National Science Foundation).

\textsuperscript{357} See Popp Berman, supra note , at 856.


\textsuperscript{359} 35 U.S.C § 103(c)(1) (formerly 35 U.S.C. § 103(c)) (emphasis added).
one research team within an organization (such as Merck) might constitute prior art that would render obvious the claimed inventions of other research teams within the same organization. In 1995, however, the Federal Circuit held that the § 103(c) safe harbor did not apply to researchers from different organizations working pursuant to a joint research agreement. Among other implications, this denied the benefit of the § 103(c) safe harbor to university scientists and corporate scientists who worked together under a joint research agreement with no obligation to assign their inventions to a common entity.

To ameliorate this situation, Congress enacted the CREATE Act, which extended the prior art safe harbor to joint research agreements. The CREATE thus changed the law of nonobviousness by establishing that certain forms of nonpublic information would not count as prior art for nonobviousness in the context of a joint research agreement. Significantly, Congress enacted the CREATE Act in large part to facilitate university-industry research collaborations. In introducing the CREATE Act, Senator Orrin Hatch, stated:

This bill makes a narrow but important change in our patent laws to ensure that the American public will benefit from the results of collaborative research efforts to combine the erudition of great public universities with the entrepreneurial savvy of private enterprises . . . . [W]e must encourage—not discourage—public institutions and private entrepreneurs to combine their respective talents in joint research efforts.

Similarly, Senator Patrick Leahy specifically linked the CREATE Act to the objectives of the Bayh-Dole Act: “When Congress passed the [Act] in 1980, the law encouraged private entities and not-for-profits such as universities to form collaborative partnerships in order to spur innovation.” Evidence suggests that the act has indeed enhanced the importance of joint research agreements between universities and industry. Members of Congress intended the CREATE Act to facilitate even more of these partnerships (thus further integrating universities and commercial interests) by altering the rules of nonobviousness. Far from being on the periphery of the patent system, interests related to academic

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360 OddzOn v. Just Toys, 122 F.3d 1396 (Fed. Cir. 1997).
361 35 U.S.C § 103(c)(2) (emphases added).
365 Greenbaum, supra note , at 364.
science are now helping to determine general rules of patentability. As we will see, this trend finds even greater expression in the America Invents Act.

C. The America Invents Act

The statutory internalization of academic science within patent law has reached its zenith with the American Invents Act (AIA). In 2011, after six years of debate, Congress enacted the AIA, the most sweeping patent reform since the modern patent act of 1952 and arguably the most significant reform since the establishment of an examination system in 1836. The AIA covers an enormous amount of subject matter, and the interests of academic science arise in several provisions. In some sense, the formative influence of academic interests within the AIA represents a complete inversion of academic exceptionalism. Such internalization suggests that the interests of the university community are no longer “exceptional” and that they may legitimately inform general rules of patentability that apply to all inventions.

1. First-Inventor-to-File-or-Publish

The influence of academic science is greatest in the most prominent reform of the AIA, the shift from first-to-invent to first-inventor-to-file. Nominally, the AIA shifts the United States from a “first-to-invent” jurisdiction, in which priority is based on the date of invention, to a “first-to-file” jurisdiction, in which priority is based on the date of filing a patent application. Congress made this move to reduce administrative costs, which are lower in a first-to-file jurisdiction, as well as to harmonize the United States with international norms (virtually all other countries have first-to-file regimes). The AIA, however, does not create a pure first-to-file system. Rather, it retains vestiges of the older statutory bar system by integrating a one-year grace period within a first-to-file system. Because of this grace period, certain public disclosures of an invention within one year before filing a patent application will not destroy that invention’s novelty. The retention of a one-year grace period is rather unique to the United States; most other countries have an “absolute novelty” regime where any public disclosure of an invention prior to filing a patent application destroys novelty.

This one-year grace period particularly accommodates academic inventors. Faculty inventors often seek to publish articles describing

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367 See Matal, supra note , at 449.
368 This is one reason why the U.S. system is often called a “first-inventor-to-file system.” A first inventor who publicly discloses an invention and then files a patent application within one year will prevail against an earlier filer (but later inventor) who, for example, simply copied the invention from the prior inventor.
patentable inventions as soon as possible, even prior to filing a patent application. In an absolute novelty regime, such publications would destroy the novelty of that invention. However, the one-year grace period helps accommodate the academic norm of speedy publication. Thus, for example, if a faculty inventor publishes an article describing some new technology, then files a patent application within one year of publication, she would not defeat her own novelty. 

Publication offers a particularly important benefit, for it even protects a patent applicant against disclosures by independent inventors. Unlike a pure first-to-file system, the AIA creates a “first-inventor-to-file-or-disclose” regime that heavily benefits academic inventors.

Not surprisingly, universities played an important role in crafting the “first-inventor-to-file-or-disclose” regime. While other stakeholders also advocated for retaining the grace period, universities represented a particularly vocal and influential group. In hearings from 2005, Charles Phelps, provost of the University of Rochester, shared his thoughts on behalf of the Association of American Universities, American Council on Education, Association of American Medical Colleges, and Council on Governmental Relations. Phelps explained the importance of maintaining a grace period for academic inventors, who often publish their findings immediately and need time to assess whether to patent them. According to Phelps, university groups would only support the transition to first-inventor-to-file upon retaining a twelve-month grace period. Also in 2005, the managing director of WARF, Carl Gulbrandsen, argued in favor of a grace period, testifying that “[t]he first-inventor-to-file proposal

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370 See, e.g., Injunctions and Damages Hearing, supra note, at 7-9, 19, 37-43, 89-105 (statements and testimony of Carl Gulbrandsen, Managing Director, WARF). In general, universities have developed a very significant presence on Capitol Hill; between 1998 and 2007, lobby expenditures on the part of universities increased from $30.8 million to $90.2 million. Jay P. Kesan & Andres A. Gallo, The Political Economy of the Patent System, 87 N.C. L. REV. 1342, 1359 tbl. 3 (2009). However, the percentage of expenditures devoted to intellectual property laws is unknown and likely relatively low. Id. at 1359.
371 See 157 CONG. REC. S1098 (daily ed. Mar 2, 2011) (“[W]e have heard from stakeholders from across the spectrum—from high tech and life sciences to universities and small inventors—in support of the transition to the first-to-file system.”) (statement of Sen. Klobuchar).
373 Perspectives on Patents: Harmonization and Other Matters, Hearing Before the S. Subcomm. on Intellectual Property of the Comm. on the Judiciary, 109th Cong. 75 (“[T]he broad grace period of current law operating in a first inventor to file system would encourage open communication of research discoveries and preserve a broad opportunity for the filing of patent applications.”) (statement of Charles Phelps, provost, University of Rochester) [hereinafter Perspectives on Patents Hearing].
would be a hardship for a vast majority of universities.” Maintaining a grace period had long been on the academic legislative agenda. As far back as 2004, the National Research Council recommended that the United States retain and persuade other countries to adopt a grace period, particularly to accommodate academic patentees.

Official legislative history of the AIA reveals the importance of university interests in retaining the grace period. Senator Patrick Leahy, one of the sponsors of the bill, stated that “the first-inventor-to-file provisions that are included in the America Invents Act were drafted with careful attention to the needs of universities and small inventors.” A House committee report similarly notes that “[t]he Committee heard from universities and small inventors, in particular, about the importance of maintaining that grace period in our system,” and goes on to cite testimony from Phelps and Gulbrandsen, among others.

The adoption of a grace period in the new first-inventor-to-file regime reflects a significant stage in the statutory “internalization” of academic science within patent law. As the AIA’s grace period provisions reveal, however, the interests of academic science have journeyed to the center of patent law; a once-marginal activity is now helping to define general rules of novelty that apply to all inventions. Other legislative reforms further illustrate the “internalization” of academic interests within patent law, though they offer a new twist in the theme of academic exceptionalism

2. Preferential Treatment for Universities in the Prior Use Rights Defense

In other areas of the AIA, academic interests are manifested not in altering the general rules of patent law, but in establishing specific carve-outs for academic entities. In this sense, academic exceptionalism, which courts have largely rejected, has been resurrected in statute.

For example, universities preferentially benefit from the newly-expanded “prior user rights” defense to patent infringement. In the American Inventor’s Protection Act of 1999, Congress established a relatively narrow defense to infringement based on one’s prior use of an invention before another party patented it. Thus, for example, if A reduced

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374 *Injunctions and Damages Hearing*, supra note, at 102 (statement of Carl Gulbrandsen, managing director, WARF). See id. at 103.
378 *Id.*
to practice a process and (secretly) used it for over a year before B filed a patent application on it, A could invoke its prior use as a defense if B sued A for patent infringement. While this prior use defense covered parties who engaged in prior “commercial” use of a patented invention,\(^3\) the statute clarified that it extended to “activities performed by a nonprofit research laboratory or nonprofit entity such as a university, research center, or hospital” as long as these activities aimed to benefit the public.\(^4\) The prior user rights defense thus applied to a university that used an invention for a year before it was patented by another party, thereby representing an instance of academic exceptionalism in statute. However, this defense was rather narrow, as it only applied to certain patented business methods.\(^5\)

In the AIA, Congress expanded the prior user rights defense beyond business methods to patented processes more generally. Universities accused of infringement fully benefit from this expanded defense, for the AIA preserves the notion that prior “[n]onprofit laboratory use” constitutes a prior commercial use that relieves a defendant of infringement liability.\(^6\) Thus, even though laboratory use by an academic institution seems to be the opposite of “commercial use,” it still qualifies for the prior commercial use defense to patent infringement.

More importantly, under the AIA, university patentees receive special treatment when infringers attempt to assert the prior user rights defense against them. In a provision entitled “University Exception,” the new law states that a defendant may not invoke the “prior user rights defense” if the patent in suit “was, at the time the invention was made, owned or subject to an obligation of assignment to either an institution of higher education . . . or a technology transfer organization . . . .”\(^7\) In other words, a defendant may not invoke the prior use rights defense when sued by a university for patent infringement.\(^8\) This, of course, greatly and asymmetrically benefits university patentees.

Not surprisingly, university representatives were quite influential in securing this preferential treatment.\(^9\) Originally, university representatives argued against expanding the prior user rights exception

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\(^8\) See H.R. REP. No. 112-98 pt. 1, at 71 (2011) (“H.R. 1249 would prohibit public and private entities from using the prior-use defense to patent infringement claims for business processes brought by a university or technology-transfer organization.”).  

\(^9\) See H.R. REP. No. 112-98 pt. 1, at 43 (2011) (“This narrow expansion of prior-user rights balances the interests of patent holders, including universities, against the legitimate concerns of businesses that want to avoid infringement suits relating to processes that they developed and used prior to another party acquiring related patents.”) (emphasis added).
because of the belief that such a defense would encourage protecting patentable inventions as trade secrets, which would negatively impact academic institutions.\textsuperscript{386} Academic representatives would only support expanding the prior use rights defense if it contained special accommodations for university patentees.\textsuperscript{387} Exercising their political muscle, universities helped secure exceptional treatment in the AIA.\textsuperscript{388}

3. Micro entity Status

Finally, the AIA exhibits a rather blatant example of academic exceptionalism by lowering fees for patent applicants under an obligation to assign or license their applications to universities.\textsuperscript{389} These applicants qualify for “micro entity” status and are thus eligible for a 75\% reduction in fees. While the name suggests that “micro entities” are individuals or small firms, this is a misnomer, as this categorization also encompasses inventors at institutions of higher education. Not surprisingly, universities,\textsuperscript{390} research institutions,\textsuperscript{391} TTOs,\textsuperscript{392} and organizations such as the Association of American Universities, the Association of Public and Land-grant Universities, the Association of American Medical Colleges, and the Council on Governmental Relations\textsuperscript{393} all actively contributed to rulemaking governing this preferential treatment for universities. The political horse-trading at the heart of this provision is rather apparent in its legislative history. In March 2011, Senator Harry Reid offered an amendment to the micro entity provision that would have extended such status to public universities participating in a program aimed at benefitting institutions deemed to be receiving an inadequate share of federal R&D


\textsuperscript{387} See Injunctions and Damages, June 14, 2005, at 101 (“Prior user rights establish a general defense against infringement. WARF opposed the proposed expansion.”) (statement of Carl Gulbrandsen, Executive Director, WARF).


\textsuperscript{389} Pub. L. No. 112-29, 125 Stat. 283 § 10(g)(d)(2011).

\textsuperscript{390} The Rockefeller University, available at http://www.uspto.gov/patents/law/comments/me_rockefeller_03jul2012.pdf.


funds.\textsuperscript{394} Senators from states with universities \textit{not} participating in this program objected, and eventually the Senate voted to extend micro entity status to all public universities.\textsuperscript{395} In the House of Representatives, objections from \textit{private} universities led members of Congress to expand micro entity status to all institutions of higher education, both public and private.\textsuperscript{396} In this manner, university interests won a significant reduction of patent fees in the AIA.\textsuperscript{397} Ultimately, preferential treatment for universities—previously peripheral players in the patent system—is now hardwired in the patent statute.

\textit{PART V \ ANALYSIS, ASSESSMENTS, AND PRESCRIPTIONS}

\textit{A. Analysis}

Historically segregated, academic science and patent law have over the past several decades engaged in a process of mutual internalization. Along the way, academic exceptionalism has evolved considerably. In the early- to mid-twentieth century, academic researchers largely adhered to scientific norms that eschewed patents, and universities’ early forays into the patent system were marked by uniquely academic, noncommercial values. For its part, patent law exhibited academic exceptionalism by excluding the fruits of academic science and sometimes treating academic entities differently than ordinary commercial actors. However, due to a host of developments culminating in the late twentieth century, patents began to permeate academic culture.\textsuperscript{398} Contemporary universities have internalized patents, and the patent system has “internalized” university science. Nowadays, university inventors and inventions are frequent subjects of patent doctrine, and courts perceive little difference between universities and profit-oriented actors in the patent system. Based in part on the increasingly commercial tenor of university patenting, courts have systematically rejected academic exceptionalism. The “internalization” of academic science has reached its zenith with legislative patent reform, where the interests of academic science held much sway. On one hand, academic exceptionalism has vanished to the extent that the interests of

\textsuperscript{394} See Matal, \textit{supra} note , at 495.
\textsuperscript{395} See Matal, \textit{supra} note , at 495.
\textsuperscript{396} See Matal, \textit{supra} note , at 496.
\textsuperscript{397} Universities won preferential treatment in other areas of the AIA as well. See 35 U.S.C. § 202 (c)(7)(E)(i) (increasing royalties that universities can retain from licensing inventions at government-owned, contractor-operated research facilities); H.R. REP. NO. 112-98 pt. 1, at 43 (2011) (preserving the intent of the CREATE Act to promote joint research activities and subtly expanding its reach); Leahy-Smith America Invents Act, sec. 4(a)(1), §115(d), 125 Stat. at 294 (allowing patent applicants (such as universities) to file a substitute statement when an inventor does not execute the ordinarily-required oath).
\textsuperscript{398} This transformation has been particularly stark in the life sciences; whereas universities were historically wary of profiting from health technologies, biomedical research has been a site of intensive patenting in the contemporary era. Mowery & Sampat, \textit{University Patents}, \textit{supra} note , at 786.
academic science now inform general rules of patentability. On the other hand, academic exceptionalism has been reborn in statute, the product of legislative rent-seeking by universities.

While the shifting normative status of universities has helped drive these developments, it is important to acknowledge other motivations as well. Focusing on patent doctrine, contemporary courts’ rejection of academic exceptionalism is part and parcel of broader structural trends in patent law. As a historical matter, the sharp rise in university patenting—and courts’ rejection of academic exceptionalism—has coincided with the tenure of the Federal Circuit. Given this court’s mission to unify patent law and make it more consistent, a project of eliminating preferential treatment for a particular set of institutions is not be surprising. While this unifying tendency may contribute to the Federal Circuit’s rejection of academic exceptionalism, however, the changing normative status of universities is quite relevant. The Federal Circuit has frequently referenced the commercial nature of modern university patenting. Furthermore, the rejection of academic exceptionalism is not unique to the Federal Circuit; the Supreme Court and district courts have also rejected preferential treatment of universities as well.

In many ways, the developments described here reflect increased aggressiveness on the part of universities in multiple contexts. First, university research has become more scientifically aggressive, shifting from the passive observation of nature to the active manipulation of the building blocks of life. The development of monoclonal antibodies and recombinant DNA technology, and the concomitant rise of biotechnology, ushered in an era in which the fruits of academic research increasingly cross the threshold to qualify as patentable inventions. Second, universities became more commercially aggressive as they sought to realize (and enlarge) profits from intellectual property. Third, universities became more politically aggressive as they turned to legislative process to consolidate their gains from technology transfer. Now that universities have become entrenched within the patent system, they have wielded their political might to help regulate the legal framework that regulates them.

Ultimately, these developments define a narrative of reciprocity between norms and law. Historically, relations between universities and the patent system were marked by a stable equilibrium in which university scientists rarely patented their discoveries and the patent system regarded universities—in their limited interactions—through a lens of academic exceptionalism. Later, legal changes such as the Bayh-Dole Act and Chakrabarty helped usher universities more deeply into the patent system.

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399 See Dreyfuss, The Federal Circuit, supra note , at .
400 See Rai, supra note , at 84 (describing the dynamic relationship between norms and law).
Once there, universities began to behave more like commercial entities, thus losing their special normative status. In an iterative fashion, the patent system responded to its own creation by highlighting the increased commercial nature of universities and rejecting academic exceptionalism. And in strictly construing rules regarding diligence and prior art, such doctrine actually pushed universities to act more like commercial entities. Universities, eager to consolidate their newfound gains, turned to the political sphere to shape patent reform, thus fully integrating academic science into the fabric of patent law.

B. Assessments and Prescriptions

Turning from the descriptive to the normative, this Article returns to the question of whether and how the patent system should treat universities differently than other actors. Given the patent system’s historical commitment to a unitary system that treats all parties the same, the burden of persuasion rests on those who would extend special treatment to academic entities. In theory, however, social welfare concerns may justify such exceptionalism; as Margo Bagley notes, “Some may question whether university inventors should receive special treatment in the patent system. The answer is they should not, unless special treatment will inure to the public good.”401 This Article argues that universities are sufficiently unique actors in the patent system that they warrant differential treatment in some, but not all, contexts.

The question of how the patent system should regulate university science is complicated in several ways. First, the “patent system” is not a monolithic entity but comprises a constellation of regulatory forces including courts, Congress, the PTO, funding agencies, and civil society. Second and relatedly, regulation can take the form of hard law as well as more informal quid pro quos or even public pressure. Third, universities intersect with the patent system in different ways, for example as patentees, licensors, and infringers. As an overarching principle, this Article argues that the right regulatory approach will vary based on context. It argues that universities should not receive preferential treatment regarding the general rules of patentability, that funding agencies should use “soft regulation” to influence university patenting and licensing decisions, and that a robust experimental use exception should safeguard unauthorized use of patented inventions in academic research.

1. Patentability

As we have seen, academic patentees have occasionally argued to relax various requirements of patentability, such as diligence and the

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401 See Bagley, supra note , at 265.
written description requirement,\textsuperscript{402} for university inventions. They have sometimes supported their arguments by citing the Bayh-Dole Act, which (they contend) demonstrates Congress’s endorsement of university patenting and technology transfer. For a variety of reasons, however, courts have been correct in refusing to relax the requirements of patentability for academic inventions.

First, while selectively relaxing patentability requirements would increase academic patenting, there is no evidence that the number of patents owned by universities is suboptimal. If anything, commentators suggest that universities are obtaining too many patents, thus creating potentially deleterious anticommons regimes and patent thickets.\textsuperscript{403} Many university inventions, such as some research tools, can achieve widespread dissemination and commercialization without patents. Approached from a different angle, if universities were particularly good “stewards” of inventions, there might be a plausible policy argument for increasing the number of university patents by relaxing patentability requirements. However, there is little indication that universities are particularly effective or enlightened stewards of technology. As seen in cases involving human embryonic stem cells, cotransformation, and genes related to breast cancer, universities have exhibited many of the same rent-seeking, self-interested tendencies as commercial entities.\textsuperscript{404} And in the cases of COX-2 inhibitors and NF-kB, patents did not facilitate “technology transfer” so much as allow universities and their licensees to sue manufacturers who were already developing useful products.

Second, relaxing patentability for requirements for universities would have deleterious effects on the kind of inventions patented by academic institutions. In particular, relaxing utility, enablement, or written description requirements would permit more “embryonic,” “upstream” technologies to qualify for patenting. This would not be a welcome development. To be sure, Kitch’s “prospect theory” famously defends broad patents on early-stage technological prospects.\textsuperscript{405} According to this view, allowing a single patentee to coordinate technological development prevents wasteful racing and duplicative effort.\textsuperscript{406} There are indeed conceptual parallels between prospect theory and the Bayh-Dole Act, both of which contemplate a single entity (e.g., a university) managing the

\textsuperscript{402} See supra.
\textsuperscript{403} See Michael A. Heller & Rebecca S. Eisenberg, Can Patents Deter Innovation? The Anticommons in Biomedical Research, 280 SCIENCE 698 (1998).
\textsuperscript{404} As noted, however, universities have sometimes made patented inventions widely available to the research community. See infra notes – and accompanying text. However, this does not necessarily distinguish universities from commercial firms, which often do similarly.
\textsuperscript{406} See supra notes – and accompanying text.
development of an early-stage technology. Commentators, however, have challenged the propriety of early, broad patents on technological prospects, particularly when rivalry and competition in innovation markets has been extremely effective in driving invention and commercialization.\(^{407}\) Ultimately, allowing patents on overly “embryonic” inventions would be counterproductive both because of the significant effort that would still be required to create commercial products and because of the potential for broad patents to stymie multiple avenues of technological development.\(^{408}\)

Third, strategic considerations also weigh against relaxing the standards of patentability for academic inventions. If universities qualified for special treatment, commercial entities could easily game this distinction by sponsoring research at universities and then exclusively licensing any resulting patented inventions. Such gamesmanship would erode whatever social value that preferential treatment for academic inventions was intended to generate.

Turning from the rules of patentability to patent fees, the AIA’s extension of micro entity status to universities, which qualifies academic patentees for lower fees, is also unwarranted. First, while university scientists are the named inventors on patent applications, they typically do not pay patent fees; that responsibility falls to universities (more specifically, TTOs), many of which are rather macro, well-heeled institutions. Second, many sophisticated TTOs identify a prospective licensee to cover patent fees \textit{before} initiating prosecution. In such cases, subsidizing university patent applications seems quite unnecessary and might actually chill this favorable screening practice. There appears to be little principled reason for extending lower fees to academic patentees, which reflects blatant legislative rent-seeking on the part of universities.\(^{409}\)

While courts and Congress should resist favoring universities in the requirements of patentability, general reforms to patent law informed by the unique needs of academic research are not necessarily problematic. First, the CREATE Act’s extension of the § 103(c) safe harbor to joint research agreements fosters partnerships between university and industrial scientists while helping to preserve the patentability of resulting inventions. While such collaborations give rise to concerns over the commercialization of academia, they also serve as valuable conduits for transferring academic technical knowledge to the private sector (and vice


versa).\textsuperscript{410} Second, the AIA’s establishment of a first-inventor-to-file-or-disclose system rather than a true first-inventor-to-file system represents good policy. Maintaining a one-year grace period is particularly congruent with academic norms of rapid publication and may decrease the chilling effects that patenting would otherwise exert on academic discourse. The rub here, however, arises not from academic exceptionalism, but from American exceptionalism. The value of the United States’ one-year grace period is severely limited to the extent that most other jurisdictions maintain systems much closer to “pure” first-inventor-to-file regimes.

2. Obtaining and Licensing Patents

While courts and Congress should resist academic exceptionalism in the standards of patentability, “soft” regulation can bear valuable fruit in shaping university patenting and licensing practices. Much of the costs and benefits of patents depend on the discretion of inventors to seek (or not seek) patents and whether and how they license them. As we have seen, some universities have exploited this discretion in publicly-spirited ways, declining to patent technologies that do not require additional private investment for exploitation or licensing patents at different rates for commercial and noncommercial applications. Government intervention can help encourage and expand these practices. In particular, while doctrine and statute are rather blunt instruments for guiding patenting and licensing decisions, funding agencies can utilize the power of the purse to influence academic grantees.

Indeed, agencies like NIH have put strings on government money to influence universities’ patenting and licensing practices.\textsuperscript{411} For instance, NIH has discouraged grant recipients from patenting DNA sequences within the Human Genome Project and encouraged (if not required) grantees to widely license patented research tools for academic investigation.\textsuperscript{412} Furthermore, it has issued guidance for licensing research tools and genomic inventions\textsuperscript{413} and offered recommendations regarding

\textsuperscript{410} See Lee, Transcending the Tacit Dimension, supra note .

\textsuperscript{411} Indeed, the Supreme Court has tacitly recognized that funding agencies may influence the behavior of grantees. See Roche, 131 S. Ct. at 2199 (“Agencies that grant funds to federal contractors typically expect those contractors to obtain assignments [of patents from inventors].”).


corporate sponsors’ control over academic scientists.\footnote{414} Funding agencies, which possess technical expertise and do not directly profit from government-financed patents, should continue to inform patenting and licensing decisions to serve the public interest.

Agencies, however, can do more. In particular, NIH has been notoriously reluctant to exercise rights under the Bayh-Dole Act to enhance access to federally-funded inventions.\footnote{415} These mechanisms—particularly march-in rights—have great potential to enhance access to federally-funded inventions for research and healthcare purposes, but NIH has rarely exploited them. Part of the difficulty lies in the Act’s relatively high standards for instituting these mechanisms. In this regard, I am sympathetic to Rai and Eisenberg’s proposal to modify the Bayh-Dole Act to allow funding agencies more flexibility to determine whether and how universities patent and license federally-funded inventions.\footnote{416}

3. Infringement

Turning to infringement, here is one context where social welfare concerns favor academic exceptionalism. In this regard, this Article joins others in arguing for an experimental use exception to patent infringement for nonprofit university researchers.\footnote{417} While universities increasingly behave like commercial entities, there is still much social value to academic research unfettered by patent constraints.\footnote{418} While early fears of a tragedy of the anticommons\footnote{419} in biomedical research have not materialized (particularly toward the “upstream” end of scientific research), the potential for exclusive rights to inhibit productive activity persists.\footnote{420} In some ways, an experimental use exception would simply safeguard the current state of affairs in which patentees almost never sue university researchers for infringement, and university researchers rarely attempt to clear patents.\footnote{421} Not surprisingly, university representatives\footnote{422}
as well as organizations supporting academic research, such as the National Research Council,\textsuperscript{423} have called for an experimental use exception.

A thorny question, however, is the precise mechanism by which such an experimental use exception would arise, an issue upon which scholars have offered detailed proposals.\textsuperscript{424} The most promising approach would take the form of a statutory amendment to the patent act. In this regard, it bears mentioning that many other countries have formally codified an experimental use exception.\textsuperscript{425} As Katherine Strandburg argues, such a statute should distinguish between “experimenting on” and “experimenting with” patented technologies;\textsuperscript{426} the former certainly appears to be well-qualified for a research exception. Given the Federal Circuit’s recent decision in \textit{Madey}, an ex ante experimental use exception is unlikely to arise in doctrine. However, an intermediate, ex post approach may emerge from remedies analysis. As I have argued elsewhere, courts should utilize eBay’s equitable flexibility to consider denying injunctive relief when a university scientist infringes an “infrastructural” patent the exploitation of which promises significant social benefits relative to costs.\textsuperscript{427} While this approach would provide less ex ante certainty to would-be infringers, it may be a more palatable intervention for patentees, as it provides compensation and thus maintains incentives to invent and commercialize.

\textbf{CONCLUSION}

Patents and the university, once operating at each other’s peripheries, have moved into each other’s cores. This Article has traced the twin trends of academic internalization and exceptionalism within patent law. Before the late twentieth century, academic science was largely peripheral to the patent system. However, as academic science became more aggressive and universities began patenting more scientific discoveries, academic research and practices have frequently become the subject of patent doctrine. Drawing from the increasingly commercial nature of universities, courts have “internalized” academic science within the patent system. Academic science is a frequent subject of patent doctrine and falls solidly within the patent system’s regulatory grasp. This internalization has reached its zenith in legislative patent reform, as the interests of university research are now hardwired in statute.

\textsuperscript{422} See, e.g., Testimony of Charles E. Phelps, July 26, 2005, at , available at http://www.judiciary.senate.gov/hearings/testimony.cfm?id=e655f9e2809e5476862f735da1095839&wit_id=e655f9e2809e5476862f735da1095839-1-5.
\textsuperscript{423} NATIONAL RESEARCH COUNCIL, supra note , at 82.
\textsuperscript{424} See supra notes – and accompanying text.
\textsuperscript{425} See Strandburg, What Does the Public Get?, supra note , at 89.
\textsuperscript{426} Strandburg, What Does the Public Get?, supra note , at 88-89.
\textsuperscript{427} Lee, Intellectual Infrastructure, supra note , at .
Along the way, academic exceptionalism has evolved considerably. Up until the late twentieth century, patent courts, citing traditional academic norms, erected barriers between universities and the patent system and occasionally extended differential treatment to academic institutions. As universities began to embrace commercial norms, practices, and policies, however, contemporary patent courts have rejected academic exceptionalism. While academic exceptionalism died in the courts, it has been resurrected in statute, as universities have wielded their political power to secure preferential treatment in recent patent reform legislation.

Turning from the descriptive to the normative, this Article has argued that in certain contexts, university research does indeed warrant special treatment in the patent system. Courts have been correct to reject universities’ attempts to relax standards of patentability. Federal funding agencies, however, should utilize soft regulation to guide universities patenting and licensing decisions to serve the public interest. One area where academic exceptionalism is warranted is infringement, where an experimental use exception can ensure that valuable scientific research proceeds uninhibited by patents. Through combining various hard and soft regulatory mechanisms, the patent system can better regulate and unleash the enormous innovative potential of the modern research university.