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PATENTS AND DIVERSITY IN INNOVATION

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Over the past quarter-century, the patent system has expanded in scope and significance, claiming a central position in a U.S. economy increasingly based on knowledge and intangible assets. This historic expansion has come at the cost of controversy and, within the past five years, growing public scrutiny from outside the system—from the press, business, Congress, and finally the Supreme Court. However, proposed reforms are marked by deepening divisions between sectors of the economy. The information technology (IT) and services industries favor strong reforms while pharmaceutical and biotech industries, as well as the patent bar, favor modest, incremental reforms. This yawning chasm suggests that an ostensibly unitary patent system masks a growing divergence in application and result.

At the same time, innovation has diversified and proliferated, especially within the past 25 years. The United States patent system has embraced new areas by expanding in several distinct directions: basic science (biotechnology), mathematics and logic (software), and the social sciences and liberal arts professions (business methods). This new subject matter is far removed from the 19th Century industrial technologies that the system was designed for. Some read this expansion as an adaptation to the changing trajectory of innovation. In their view, whatever is economically significant merits protection. Others read it as an aggressive, omnivorous assimilation that has proceeded without regard to the insights and views of knowledge workers and business interests in those fields.

Differences in industry perspective on the value and uses of patents have been documented by surveys of R&D managers conducted over the years in Europe, Japan, and the United States.¹ These surveys suggest that patents are critically important to innovation in only a few industries—mainly pharmaceuticals, chemicals, and medical instruments. Divergence in use of patents, which is now playing out in patent reform,

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1. See, e.g., Wesley M. Cohen, Richard Nelson & John P. Walsh, *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)*, (NBER Working Paper No. 7552, Feb. 2000), available at www.nber.org/paper/w7552 (a recent example of this type of study).

reflects the contrast between the discrete-product environment of pharmaceuticals and chemicals and the extreme complex-product environment associated with information technology. In the former, there is a relatively close relationship between a high-value product and the protection of a high-value patent. In the case of complex products, however, an inexpensive product may contain thousands, perhaps tens or hundreds of thousands of potentially patentable functions and components.

In contrast to the classic use of patents to exclude competitors in pharmaceuticals, there is massive trading of nonexclusive rights in IT. This trading is necessary to enable “freedom of action” in the manufacture and marketing of function-rich IT products and services. However, the large volume of patents relative to products imposes a cost burden and makes the IT sector prone to inadvertent infringement and vulnerable to patent trolls. Even worse, while patents are designed to promote public disclosure, a plethora of low-quality patents written by lawyers for lawyers has the opposite effect—undermining the value of the patent record as a source of technical information, as well as making clearance searches more costly and less practical.

Portfolio cross-licensing is only one of the increasingly diverse ways that patents are used across and within sectors. While few uses are completely novel, some have become much more commonplace, such as the use of patents to raise venture capital or to support outsourcing. Patent pools are not new, but the patent pool as a variation on collectively managed standards is new and sometimes strategically important in information and communication technologies. There is growing emphasis on creative “value extraction.” “Being infringed” has become a profitable business model for entities with no products on the market.² Variations on this model include attacking deep-pocketed companies with large sunk investments in products, ambushing widely implemented industry standards (including patent pools, such as JPEG and MPEG), and pursuing licensing fees from small users that lack the resources to litigate.

The result of this diversity of uses is that on-the-ground consequences become diffuse and difficult to monitor. Data on business practices, such as assertions and licensing is nonexistent. Policy development gets bogged down in testimonials and anecdotes. Rhetoric from diverse business and professional interests rises in intensity. Facing a welter of different views, legislators understandably defer to the courts,

2. Markus G. Reitzig et al., *On Sharks, Trolls, and Other Patent Animals—‘Being Infringed’ as a Normatively Induced Innovation Exploitation Strategy*, available at <http://ssrn.com/abstract=885914>.

who at least have the tools to channel and focus disputes between a single pair of contending parties.

From time to time, Congress has in fact inserted a number of technology-specific provisions into the patent laws, but these provisions have proved of limited application and are rarely, if ever, litigated.³ Beyond these few explicit provisions, the diversity in technology and business models has been almost invisible. Dan Burk and Mark Lemley's examination of technology-specific rulings in Federal Circuit jurisprudence is the exception that proves the rule. Burk and Lemley uncover patterns showing that different technologies—in particular the new technology outliers in biotechnology and software—are treated differently in the Federal Circuit's interpretation and application of the law.⁴ They go on to show how these differences and the nature of innovation within these fields reflect different theories of patent law.⁵ They maintain that the Federal Circuit is right to be open to these differences but wrong in its understanding and application of them.

Then, there is TRIPS. In 1994, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) was adopted as part of the World Trade Organization's (WTO) charter.⁶ Article 27(1) reads:

[P]atents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application. . . . [P]atents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.⁷

Here a novel mandate of industrial policy is slipped in between two familiar principles of trade policy. One size fits all? Where did this come from?

Article 27(1) was adopted as a political matter to ensure that the pharmaceutical industry, based primarily in the United States and Europe, enjoyed full patent protection for drugs throughout the world. Its adoption shows how the invisible currents of international negotiations

3. See 35 U.S.C. § 156 (Hatch-Waxman patent term extensions for FDA approved pharmaceuticals); 35 U.S.C. § 103(b) (biotechnology process patent provision); 35 U.S.C. § 273 (prior user rights for business method patents).

4. Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific*, 17 BERKELEY TECH. L.J. 1155 (2002).

5. Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575 (2003).

6. Agreement on Trade-Related Aspects of Intellectual Property Rights vol. 31, Apr. 15, 1994, 33 I.L.M. 81 (emphasis added) [hereinafter TRIPS Agreement].

7. *Id.* art. 27(1).

can inhibit legislatures from responding intelligently and creatively to changing conditions. It shows how those with the most at stake can shape patent policy to their benefit, undisciplined by any empirical or institutional framework for evaluating the practical business effects.

Article 27(1) is often cited reflexively as an “international obligation” that curtails meaningful debate about how the patent system can respond flexibly to real differences in different technologies and industries. But what of the explicit technology-specific provisions of U.S. law? Are they simply minor hypocrisies that no member state will care about enough to consider filing a WTO complaint? Are the technology-specific interpretations by the Federal Circuit so intangible, slippery, and invisible to all but a few practitioners and scholars that they can evolve unquestioned from the outside?

In fact, there is little evidence about how Article 27(1) should be interpreted.⁸ As Rochelle Dreyfuss and Graeme Dinwoodie point out, discrimination is not the same as differentiation.⁹ Differentiation need not be explicit or rule-based. Standards can be defined without reference to a particular technology and still operate differently within different industrial contexts. For example, courts may well be wary of granting an injunction when the patented technology is only a small part of a complex product.¹⁰ On its surface this is technology-neutral since the principle holds regardless of the field. But in practice it is likely to apply far more often in IT cases than in pharmaceutical cases.¹¹

There are at least three levels of “technology-specific” tailoring currently available in the United States: (1) direct statutory tailoring, such as 35 U.S.C. § 103(b);¹² (2) specific interpretation, such as the skills accorded to a “person having ordinary skill in the art” in particular fields;¹³ and (3) incidental standards such as the judicial reluctance to grant injunctions for a patent on a small part of a complex product, which are

8. See Graeme B. Dinwoodie & Rochelle C. Dreyfuss, *Diversifying Without Discriminating: Complying with the Mandates of the TRIPS Agreement*, 13 MICH. TELECOMM. TECH. L. REV. 445 (2007) (discussing Report of WTO Dispute Settlement Panel, *Canada—Patent Protection of Pharmaceutical Products*).

9. *Id.*

10. See Michael W. Carroll, *Patent Injunctions and the Problem of Uniformity Cost*, 13 MICH. TELECOMM. TECH. L. REV. 421 (2007) (discussing the role of patent injunctions post *eBay*).

11. *Id.*

12. 35 U.S.C. § 103(b) provides a special rule on nonobviousness for a “biotechnological process using or resulting in a composition of matter.”

13. In principle, the test requires a determination of the relevant as well as the level of “ordinary” skill within the field. In practice, this test seems to be construed not as a requirement for rigorous factfinding but as a reminder to judges to consider obviousness from the perspective of this hypothetical person. Roger E. Schecter and John R. Thomas, *Principles of Patent Law*, Concise Hornbook Series, 159.

facially technology-neutral but affect some fields of technology more than others. Another nondiscriminatory approach might be to allow all fields of technology to establish their own patent rules, or at least advise as to what the rules of engagement should be.

The straw man in the public debate over patent reform is typically the “technology-specific” regime that prescribes an explicit rule for a specific field of technology. In their critique of the U.S. patent system, *Innovation and Its Discontents*, Adam Jaffe and Josh Lerner oppose statutory categories by arguing that such efforts will fall victim to clever patent attorneys.¹⁴ They focus on the notorious cases of software and business methods, where the aspirations of patent seekers and patent lawyers were abetted by the expansionist philosophy of the Federal Circuit.

Jaffe and Lerner also argue that Congress will be subject to special interest lobbying from industries seeking special treatment—an argument that assumes they do not do so now (or that this is not business as usual in a democracy). When their book appeared in 2004, the political fault lines were far less apparent than they are today. It now appears that the extraordinary difficulty of trying to reform a monolithic system means that legislative reform will be unable to keep pace with problems as they develop. Even worse, as the TRIPS non-discrimination provision shows, highly motivated lobbying to change the entire fabric of the law can have far-reaching consequences and implications that lawmakers are unlikely to understand. Ambitious judges may be all too willing to read their own ideologies into the simple words of the legislature—as the Federal Circuit did in *State Street Bank*¹⁶ in a decision by a judge whose personal experience and paper trail shows that he knew better.¹⁷

Indeed, *State Street* illuminates the very heart of the paradox. The Federal Circuit’s decision to allow patents on business methods and remove limits on the patentability of software did two things. First, it radically broadened the scope of patentable subject matter, placing new strains on the notion that “one size fits all.” By abolishing restrictions on software and business method patents, it imposed the patent system on

14. ADAM B. JAFFE & JOSH LERNER, *INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT* 204–05 (2004).

16. *State St. Bank & Trust Co. v. Signature Fin. Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998).

17. Brief for Computer & Communications Industry Association as Amicus Curiae Supporting Petitioner, *Lab. Corp. of Am. v. Metabolite Labs., Inc.*, 543 U.S. 1185 (2005) (No. 04-607), 4–10 (Dec 23, 2005), available at <http://www.ccianet.org/modules/patentPDFs/CCIALabCorpMeritsAmicus%5B04-607%5D.pdf>.

sectors where patents were never part of the business fabric. Although touted as evidence of the adaptability of the patent system, in reality it may be straight-jacketing the many forms of knowledge and human ingenuity into the same costly legal framework.

Secondly, software and business methods of general application permeate business activities throughout the economy, greatly increasing the odds of patents being asserted from outside an alleged infringer's field of business. Thus, the speculative value of patents for use against innocent infringers with no reason to be aware of the patent is increased dramatically. There is increased vulnerability for parties who otherwise have no experience with patents, such as retail websites.¹⁸ Such broadly asserted patents are often of dubious quality. They have the potential to attack unsuspecting users of technology, but do so only rarely and unpredictably. Because the impact is so diffuse and random, it has not generated a political constituency. Yet this is essentially the problem of "algorithm preemption" that the Supreme Court identified in *Gottschalk v. Benson*¹⁹ in 1972.

The lack of subject matter limitations in the U.S. patent system means that the infinite diversity of innovation, whether technology or business method, must conform to the same unforgiving rules. In Europe, patentable subject matter is explicitly limited by Article 52 of the European Patent Convention, albeit with an ambivalent limitation to the limitation.²⁰ Concern about quality and abuses, which appear to be less problematic than in the United States,²¹ have been overshadowed by a landmark debate about the extent to which software belongs within the patent system. A directive on "Computer-Implemented Inventions" that would have validated rulings of the European Patent Office favoring patentability was proposed in early 2002 but finally rejected by the

18. See Lisa M. Bowman, *SBC Stakes Claim on Web Frames Patent*, CNET NEWS.COM, Jan. 21, 2003, <http://news.com.com/2100-1023-981446.html> (discussing patent with wide ranging application to the Web); *Retail e-Commerce Lawsuits Are Settled, But More May Be in The Works*, INTERNET RETAILER, May 1, 2004, <http://www.internetretailer.com/internet-marketing-conference/81025-retail-e-commerce-lawsuits-are-settled-but-may-be-works.html> (discussing suit by Pangea Intellectual Property LLC against web retailers).

19. 409 U.S. 63 (1972).

20. Convention on the Grant of European Patents art. 52, Oct. 5, 1973, 13 I.L.M. 270, paragraph (2) limited by paragraph (3).

21. Although patent quality is an issue in Europe as well, see Allison Abbott, *Pressured Staff 'Lose Faith' in Patent Quality*, 429 NATURE 493 (2004), it is widely believed that the EPO does a more thorough job of examining patents than the USPTO, and the EPO also administers a post-grant opposition system that serves as an additional filter. A recent study on patent litigation insurance shows aggregate damages and litigation costs far lower than in the United States. See http://ec.europa.eu/internal_market/indprop/docs/patent/studies/pli_report_en.pdf, especially Appendix 3, which is at page 46 of separate Appendices: http://ec.europa.eu/internal_market/indprop/docs/patent/studies/pli_appendices_en.pdf.

European Parliament in 2005. As for TRIPS 27(1), members of the European Parliament felt that since “technology” was not defined in TRIPS, it was their prerogative to do so.²² Accordingly, proposed amendments sought to root the definition of “technology” in applications of natural science, a limitation that would have accommodated the rubber-curing process in *Diamond v. Diehr*²³ but not office software.

In the United States, the greater dysfunctionalities in software and business method patents have provided much of the impetus for patent reform.²⁴ This push was foreshadowed in the 2003 Federal Trade Commission (FTC) report, *To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy*, which depicts how four critical sectors use and experience the patent system in different ways.²⁵ These perspectives range from a full embrace of today’s patent system by the pharmaceutical sector, to a more qualified appreciation in biotechnology, to the mixed views of the computer and semiconductor industries, to the negative views of software developers and Internet services.

While the 2004 National Academies study advocated a unitary patent system “open to new technologies,”²⁶ another National Academies report the following year advocated reducing “barriers to innovation in specific industries with specialized patent needs.”²⁷ In early 2006, thirty Senators introduced a resolution echoing this language. That April, a report from the Committee for Economic Development urged Congress to “reexamine the premise that today’s unitary system continues to serve all industrial sectors well, especially given the proliferation of problems regarding software patents.”²⁸

22. Reinier Bakels & P. Bernt Hugenholtz, *The Patentability of Computer Programmes: Discussion of European-level Legislation in the Field of Patent Software* 17, (European Parliament Directorate-General for Research, Working Paper, Apr. 2002), available at <http://www.europarl.europa.eu/meetdocs/committees/juri/20020619/SoftwarePatent.pub.pdf>.

23. 450 U.S. 175 (1981).

24. The Business Software Alliance took the lead in formulating the IT sector’s reform agenda in early 2005.

25. FED. TRADE COMM’N, *TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY* ch. 3 (2003) (discussing experience with patents in pharmaceuticals, biotechnology, computers and semiconductors, and software and Internet services).

26. NAT’L RESEARCH COUNCIL, NAT’L ACADS. OF SCI., *A PATENT SYSTEM FOR THE 21ST CENTURY* 83-84 (Stephen Merrill et al. eds., 2004), available at <http://www.nap.edu/html/patentsystem>.

27. NAT’L RESEARCH COUNCIL, NAT’L ACAD. OF SCIS., NAT’L ACAD. OF ENG’G & INST. OF MED., *RISE ABOVE THE GATHERING STORM—ENERGIZING AND EMPLOYING AMERICA FOR A BRIGHTER ECONOMIC FUTURE* (2005).

28. DIGITAL CONNECTIONS COUNCIL, COMM. FOR ECON. DEV., *OPEN STANDARDS, OPEN SOURCE, AND OPEN INNOVATION: HARNESSING THE BENEFITS OF OPENNESS* 32 (2006), available at http://www.ced.org/docs/report/report_econ_openstandards.pdf.

A conference recently held by the University of Michigan at the University's Law School in September 2006 examined the problem in depth for the first time.²⁹ Given a world of radically increasing technological and economic diversity, how should the patent system respond to differences in innovation environments? Does judicial decision-making provide needed flexibility in the application of the patent law? And if so, do the decisions correctly comprehend the technology and the business context? Judge Michel candidly explained the limitations of the Federal Circuit in an address at the Berkeley Patent Reform conference in 2002:

We just keep replicating the old results based on the old precedents, whether they have kept pace with changes in business, changes in technology, or changes of a different sort. . . . [W]e just get the Federal Circuit talking to itself, with the brief writer just being the echo of what we wrote in all those prior cases. And then we write some more cases, and the cycle just goes on and on and on. And it certainly lacks the benefit of being tightly wired to the evolving reality.³⁰

We might look instead to expanding the functions of the U.S. Patent and Trademark Office (PTO) so that it looks more like a traditional regulatory agency, gathering information on the business effects of patents and engaging in substantive rulemaking to optimize the performance of the system. The PTO is narrowly focused on its own internal processes and rarely comes in contact with those adversely affected by its decisions. The mission of the late 1990s, "to help customers get patents," was the highwater mark of this narrow institutional vision. The expansion of reexamination may have helped to give the PTO a sense that it is the functioning of the system as a whole that counts.

But taking on responsibility for results would entail a major shift in PTO operations and culture. Multiple advisory committees would be needed to reflect the concerns of different industries. It would need help in gathering the data necessary to inform policy development, and it would have to hire economists!

What would it need to know? Some of the most salient factors bearing on the patent system performance include:

- *Discrete versus complex products*: The product context is clearly relevant in determining whether injunctive relief is appropriate. Raising the threshold standard (inventive step)

29. See Patentsanddiversity.com, Patents and Diversity in Innovation, <http://patentsanddiversity.com> (website of the conference, held September 29–30, 2006).

30. Greg Aharonian, *Patnews* [electronic newsletter], July 31, 2002 (reproducing transcription by Gerald Peters).

could reduce patent congestion, inadvertent infringement, holdup, and ambush in complex products.

- *Costs of invention and commercialization:* Since patents are intended to encourage and protect investment, increased investment requirements either pre- or post-invention will justify more protection. Conversely, a low investment requirement suggests that strong patents are not needed to an incentive to entry.
- *Pace of innovation:* A fast-moving field suggests a higher inventive step standard to reduce problems associated with congestion, thickets, blocking, double marginalization, transaction costs, and rent dissipation. A related factor, the *cumulative nature of innovation* requires efficient flow of knowledge about innovation that builds directly on other knowledge.³¹ If the pace is fast enough, however, simultaneous independent invention may be commonplace and the slow cycles of the patent system (especially the 18 months between filing and publication) may promote unwitting conflict. Raising the inventive step will reduce this problem. (A fast pace of innovation may also justify a shorter term of protection since patented technology will become obsolete sooner.)
- *Public goods characteristics: non-excludability and non-rivalry:* Non-excludability provides the conventional rationale for patents. First mover advantages diminish the need for patents, as do copyright protection (software) and trade secrecy (manufacturing processes) where they apply. Non-rivalry at the product level, e.g. an especially low cost for manufacturing and distribution (as is the case for software) argues for lesser protection on the grounds that requirements for post-invention investment in commercialization are reduced.
- *Network characteristics:* Network effects can enhance the leverage of patent holders so as to inhibit competition from substitutes and interoperating complements. Patents could be limited or weakened to adjust for the added market powers and the potential danger to competition.³²

31 See Robert M. Hunt, *Patentability, Industry Structure, and Innovation*, 52 J. INDUS. ECON. 401 (2004), available at <http://ssrn.com/abstract=595100>.

32. Joseph Farrell, *Arguments for Weaker Intellectual Property Protection in Network Industries*, 3 STANDARDVIEW, 46–49 (1995).

- *Transaction costs:* The cost of seeking, navigating, negotiating, and contesting patents vary from field to field—especially costs related to problems of quality and uncertainty. If transaction costs (including the dangers of strategic behavior capitalizing on high costs) are high relative to patent value it may be desirable to raise the inventive step requirement. How well is prior art documented? Applying the novelty requirement in a field that depends on tacit knowledge rather than documentation is costly and inconclusive. Patents on abstract subject matter tend to have claims with ambiguous terminology and are more difficult (costly) to search, read, and interpret.

Peter Menell suggests a similar but fuller set of criteria directed at the scope of patent-eligible subject matter.³³ It is not a coincidence that many of the factors that argue for higher standards, fewer patents, and less potent patents are associated with software. If the system cannot adapt successfully to a field of innovation with such distinctive characteristics, the arguments for leaving it outside the patent system are compelling.

CONCLUSION

The irony of a strictly unitary system is that it leads to divergent and ultimately discriminatory results. If “open to new technologies” means that the patent system simply swallows them alive rather than openly adapting to their business or institutional particularities, we end up glorifying legal process at the expense of innovation in all its creative diversity—and sacrificing economic results for ideology. If “non-discriminatory” means mechanically applied and blind to consequence, this in fact favors some industries at the expense of others. The politics of patent reform make this clear. Investors will take note and move scarce capital away from fields least benefited and most taxed by the costs and risks of the patent system.

Recent economic research has given us a better understanding of patents, but research needs to dig deeper to how patents work in practice. Though the practice of innovation has itself become remarkably innovative, the law still clings instinctively to precedent and established ways. Focusing on harmonization and uniformity in the interests of marginally reducing legal costs and legal uncertainty, the patent system blinds itself to the growing diversity of innovation. Its pursuit of uniformity on its

33 Peter S. Menell, *A Method for Reforming the Patent System*, 13 MICH. TELECOMM. TECH. L. REV. 487, 495, Fig. 1 (2007).

own terms leads it to function as a de facto industrial policy, creating winners and losers among fields of innovation, with no means of calibrating how well—or poorly—it is performing.