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The challenges facing IP systems: researching for the future

I. INTRODUCTION

The intellectual property (IP) system is facing formidable challenges. Scientific progress, rapid technological change, and new methods of conducting business have altered the ways in which information is generated, utilized, and monetized. Recently introduced technologies (from container shipping to computerization and digitization to the internet, smartphone, and cloud) decrease—or even eliminate—the cost of distributing information and knowledge goods worldwide; spur novel types of creativity and collaboration; and facilitate new methods of information production, utilization, analysis, and storage. On the business side, there has been an increase in specialization, a decline of vertical integration, and alongside that, a rise in value chains that merge the expertise of firms that are widely dispersed geographically. Sales have been replaced by licensing or by “freemium” transactions, which derive revenue from advertising, in-app purchases, or other deferred methods of

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compensation. The customer is now the product: businesses turn information collected from the so-called “Internet of Things” into profit by analyzing, repackaging, and then selling data about their consumers and what they value. The Industrial Revolution has, in short, given way to an Information Age and an economy in which the most important input and output is knowledge.

In some ways, IP law has *enabled* these changes. Traditional forms of intellectual property rights (patents, copyrights, and trademarks) created strong incentives to expend time, effort, and money on producing the advances that gave rise to the Information Age. The multinational intellectual property agreements of the 19th and 20th centuries—the Berne and Paris Conventions, the TRIPS Agreement¹—set the stage for transnational production, distribution, and purchase of knowledge products. IP law has also *responded* to these changes. Domestic legislation and international agreements have created rules of the road for the digital age,² and, in recognition of the new value of information, expanded the scope of IP protection and introduced novel IP rights, such as rights of publicity and rights over databases, designs, and geographical indications.³ Foreign investments in intellectual property are now protected under bilateral investment agreements (BITs) as well as the investment chapters of free trade agreements (FTAs).⁴ But for all the effort to configure IP law for the 21st century, what has not happened is a

¹ Berne Convention for the Protection of Literary and Artistic Works, July 24, 1971, 1161 U.N.T.S. 31 [hereinafter Berne Convention]; Paris Convention for the Protection of Industrial Property, July 14, 1967, 21 U.S.T. 1583, 828 U.N.T.S. 305 [hereinafter Paris Convention]; Agreement on Trade-Related Aspects of Intellectual Property Rights, Marrakesh Agreement Establishing the World Trade Organization, Apr. 15, 1994, 33 I.L.M. 81 (1994) [hereinafter TRIPS Agreement].

² See, e.g., the so-called Internet Treaties, the World Intellectual Property Organization (WIPO) Copyright Treaty, Dec. 20, 1996, 36 I.L.M. 65; WIPO Performances and Phonograms Treaty, Dec. 20, 1996, 36 I.L.M. 76.

³ See, e.g., Frank H. Easterbrook, *Who Decides the Extent of Rights in Intellectual Property?*, in EXPANDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 405 (Rochelle Dreyfuss et al. eds. Oxford University Press 2001).

⁴ See, e.g., Rochelle Dreyfuss & Susy Frankel, *From Incentive to Commodity to Asset: How International Law Is Reconceptualizing Intellectual Property*, 36 MICH. J. INT’L L. 557 (2015).

systematic *assessment* of the new legal order.⁵ Are the changes to the creative environment so extensive that the terms on which traditional IP law operates are no longer functioning effectively? Are the piecemeal legal responses seen to date a first-best solution or are there better ways for the law to support, manage, and structure innovation in this new Age? Are the right parties profiting? What are the distributive effects of these changes and have they been properly taken into account?

In this essay, I consider these “big picture” issues. Of course, I cannot predict the technologies that will arise or foresee their social impact. Nor do I know how the future political landscape will affect the climate for, and the impact of, innovation. However, I can examine the trouble spots that are emerging. I can also consider how they might be handled. But in many cases, I do not know enough to do even that. At best, I can suggest the research that needs to be undertaken to be prepared for whatever future eventuates. In Part II, I discuss substantive concerns and substantive law. Because institutions can be critical to the law’s operation, in Part III, I consider institutional responses to changes wrought by the Knowledge Economy.

II. SUBSTANCE

In this section, I first discuss substantive IP issues that have emerged as fundamental science and other creative forces have pushed forward the frontiers of knowledge, created new technologies and opportunities, and changed global business practices. After considering alternative ways of encouraging innovation, I elaborate on a research agenda appropriate for deciding how the challenges identified might be addressed.

A. The Issues

When thinking about law for the Information Age, it is necessary to first deal with the elephant in the room: will there be a need for IP rights in the future? After all, IP regimes create scarcity. Knowledge, for the most part, is nonrivalrous, but copyrights, patents, and trademarks establish exclusivity. They allow an inventor, an author, a trader to enjoin others from freely using what he or she created. That exclusivity gives rise to

⁵ To be sure, there have been attempts in this direction, *see, e.g.*, GUSTAVO GHIDINI, *RETHINKING INTELLECTUAL PROPERTY: BALANCING CONFLICTS OF INTEREST IN THE CONSTITUTIONAL PARADIGM* (Edward Elgar Publishing 2018).

significant social costs. Without competition, the right holder can diminish output, restrict choice, and charge higher prices. The result is deadweight loss: there are those who might benefit from an innovation but cannot afford it at the right holder's price. Since they do not purchase and the right holder fails to sell, everyone loses. IP rights are however, justified because exclusivity converts consumer surplus into producer surplus. Thus, these rights allow innovators to capture a return roughly commensurate with the value they created. In that way, IP generates incentives—financial reason to invest in costly and risky creative activities, develop manufacturing techniques and distribution channels, devote resources to consumer education, create marks that signify source and quality, and engage in activities that maintain that quality. In the short term, there are higher prices, decreased output, diminished choice, and deadweight loss. But in the long term, the incentives spur socially desirable activity. Society sacrifices static efficiency in the name of fostering dynamic efficiency.

There is, however, a flaw in the “incentives” justification. The fact is, this account of creative production does not always hold. It relies heavily on the assumption that monetary incentives are necessary to spur innovation. While that assumption is deeply rooted, it has never fully reflected reality. In the Information Age, with the advent of new science and technology, the error is becoming increasingly apparent.

As many observers have noted, considerable innovation takes place without IP incentives.⁶ Sometimes, the rewards are intrinsic to the activity itself. A quick look at the internet reveals the diversity of “user generated content”—videos of sleeping kittens, dancing babies, product demonstrations, fan fiction—all posted for the fun and satisfaction of creating and sharing with others.⁷ Another source of reward derives from the pleasure of using the innovation one has created and sharing it with others who can help perfect it. As Eric von Hippel has demonstrated, “user innovation” of this sort accounts for a significant share of the Knowledge Economy.⁸ On the internet, it can be observed in self-help sites: from marriage, parenthood, divorce, disease, to religion, there are

⁶ For an overview of the commentary, see Rochelle Cooper Dreyfuss, *Does IP Need IP? Accommodating Intellectual Production Outside the Intellectual Property Paradigm*, 31 *CARDOZO L. REV.* 1437 (2010).

⁷ See, e.g., YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* (Yale University Press 2006); Rebecca Tushnet, *Legal Fictions: Copyright, Fan Fiction, and a New Common Law*, 17 *LOY. L.A. ENT. L.J.* 651 (1997).

⁸ ERIC VON HIPPEL, *DEMOCRATIZING INNOVATION* (MIT Press 2005).

groups that share advice and provide guidance to their members. Off line, the category includes in-firm know-how and inventions made by hobbyists and specialists, including windsurfing gear, laboratory research tools, and surgical equipment. In addition, some innovators are driven by simple curiosity—university scientists, and DIY biologists are two examples.⁹ They advance knowledge because they want to learn more about how the world works, not because they will earn a profit or personally benefit from what they discover.

In addition to intrinsic rewards as motivators for innovation, there are extrinsic incentives that promote creativity but have little to do with IP protection. University professors, for example, know that publication earns them a reputation; the reputation leads to promotion and allows them to attract better students, command more lab space, enjoy chaired professorships and higher salaries, perhaps even earn a Nobel Prize. Open source innovations—Linux and Wikipedia are two examples—offer opportunities for developing skills and receiving attribution, which, in turn, generate community recognition and ego gratification. Performers can similarly earn acclaim for their work, as well as revenue from ticket sales.

Because IP rights nonetheless attach to the output of much of this activity, even now there are many instances in which prices rise, output decreases, and deadweight loss is incurred for things that might have been invented or created anyway. Technical journals are a poster child: articles are written, edited, and peer-reviewed by scientists at no costs to the journals. Still, the publishers use their copyrights to charge libraries—and often the same scientists—high prices.¹⁰ And that is now, when it is mainly computers and the internet that lower the costs associated with innovation. In the future, the fundamental justification for IP is likely to become even more flawed. Consider, for example, 3D printing, bioprinting, synthetic biology, artificial intelligence (AI), and robotics. These technologies will bring costs down considerably. Society is already familiar with computer-generated music, along with movies

⁹ See, e.g., Katherine J. Strandburg, *Curiosity-Driven Research and University Technology Transfer*, in UNIVERSITY ENTREPRENEURSHIP AND TECHNOLOGY TRANSFER: PROCESS, DESIGN, AND INTELLECTUAL PROPERTY, ADVANCES IN THE STUDY OF ENTREPRENEURSHIP, INNOVATION, AND ECONOMIC GROWTH: VOL. 16 (Gary D. Libecap, ed. Jai Press 2005); Thomas Landrain, Morgan Meyer, et al., *Do-it-yourself Biology: Challenges and Promises for an Open Science and Technology Movement* 7 SYST. SYNTH. BIOL. 115 (2013).

¹⁰ See, e.g., Richard van Noorden, *The True Cost of Science Publishing*, 495 NATURE 426 (2013).

and television shows that use computer-created effects, backgrounds, and even virtual actors.¹¹ In the future, AI will invent; printers, synthetically-created plants or cells, and robots will manufacture. Since these activities will largely happen at home, there will be few distribution costs.

We will in short be entering what commentators have dubbed the post-scarcity society.¹²

That presents a general problem to the social order: will there be enough jobs to go around?¹³ For IP, we must ask other questions. To what extent is IP and the incentives it creates causative of significant unemployment?¹⁴ Is IP protection needed in such a society?¹⁵ What point is a trademark, which is intended to denote the source and quality of goods, if goods are typically made at home? Are patents and copyrights necessary if there is no significant investment and little risk? Creators could be given regular salaries and innovative products put in the public domain where they would be priced competitively. Deadweight loss would be eliminated.

Admittedly, IP rights are sometimes also justified less instrumentally, on a theory of just deserts or to give creators control over the dimensions of their work that are intertwined with their personalities.¹⁶ However, moral theories can be accommodated without exclusivity, for example, through rights of attribution and contractual agreements that cover integrity interests.¹⁷ Moreover, not all these justifications apply to every

¹¹ See, e.g., Samit Sarkar, *Rogue One Filmmakers Explain How They Digitally Recreated Two Characters*, POLYGON (27 Dec. 2016), <https://www.polygon.com/2016/12/27/14092060/rogue-one-star-wars-grand-moff-tarkin-princess-leia> (last accessed 17 October 2019).

¹² See Salil K. Mehra, *Competition Law for A Post-Scarcity World*, 4 TEX. A&M L. REV. 1 (2016).

¹³ BARRY JONES, *SLEEPERS, WAKE! TECHNOLOGY AND THE FUTURE OF WORK* (Oxford University Press 1982). See also Paul Krugman, *How Are These Times Different?*, N.Y. TIMES (19 June 2013), <https://krugman.blogs.nytimes.com/2013/06/19/how-are-these-times-different/> (last accessed 17 October 2019).

¹⁴ Camilla A. Hrdy, *Intellectual Property and the End of Work*, 71 FLA. L. REV. 303 (2019).

¹⁵ Mark A. Lemley, *IP in a World Without Scarcity*, 90 N.Y.U. L. REV. 460 (2015).

¹⁶ See, e.g., Wendy J. Gordon, *A Property Right in Self-Expression: Equality and Individualism in the Natural Law of Intellectual Property*, 102 YALE L.J. 1533 (1993); Wendy J. Gordon, *An Inquiry into the Merits of Copyright: The Challenges of Consistency, Consent, and Encouragement Theory*, 41 STAN. L. REV. 1343 (1989).

¹⁷ See, e.g., Cyrill P. Rigamonti, *Deconstructing Moral Rights*, 47 HARV. INT'L L.J. 353 (2006). See also REPORT OF THE SPECIAL RAPPORTEUR IN THE

IP right. For example, there is little about a mechanical invention that implicates the personality of the creator. In addition, these rights are not fully recognized in large parts of the world. The US, for instance, has been slow to recognize moral rights.¹⁸ Indeed, it is the only obligation of the Berne Convention that was not incorporated into the TRIPS Agreement.¹⁹ And given their potential to interfere with creative reuse and comment, there is controversy over these rights even within the creative sector.²⁰

In contrast, many right holders are very interested in expanding their monetary rewards. Thus, instead of embracing new technologies, they often try to limit their use in the name of maintaining profits. For example, those holding copyrights in music and videos, along with trademark holders, have asserted theories of secondary liability against intermediaries—websites or internet service providers that enable unauthorized uploading, downloading, sharing, streaming, and marketing of protected material.²¹ It is easy to understand why: suing the intermediary is much more efficient than suing all the end users. But principles of secondary liability can undermine the power of modern technologies to enhance creative production. Moreover, they create distribution costs that would not otherwise exist. Furthermore, because intermediaries are risk-averse, the threat of liability can lead them to remove material from their platforms even when under the law, the use is considered fair and not compensable. Take, for instance, one of the internet's dancing babies. The video was taken down because the baby was dancing to a copyrighted song. Yet the use of the song was later considered fair.²² Indeed, intermediaries may themselves benefit from this system in that the prospect of secondary liability may chill others from developing superseding technologies.²³

FIELD OF CULTURAL RIGHTS: COPYRIGHT, ¶¶ 34–39, U.N. Doc. A/HRC/28/57 (2014) [hereinafter REPORT ON COPYRIGHT].

¹⁸ See, e.g., Jane C. Ginsburg, *The Right to Claim Authorship in U.S. Copyright and Trademarks Law*, 41 HOUS. L. REV. 263 (2004); Peter Jaszi, *Toward A Theory of Copyright: The Metamorphoses of "Authorship"*, 1991 DUKE L.J. 455 (1991).

¹⁹ TRIPS Agreement, art. 9.1.

²⁰ See Amy M. Adler, *Against Moral Rights*, 97 CAL. L. REV. 263 (2009).

²¹ See Lital Helman, *Pull Too Hard and the Rope May Break: On the Secondary Liability of Technology Providers for Copyright Infringement*, 19 TEX. INTELL. PROP. L.J. 111 (2010).

²² *Lenz v. Universal Music Corp.*, 801 F.3d 1126 (2015).

²³ *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd.*, 545 U.S. 913, 960 (2005) (Breyer, J., concurring).

Newly introduced technologies challenge the core justification for IP rights in an even more troubling way: they enable creators to earn a return that greatly exceeds the value of their contributions. And that is true even when the hefty profits needed to compensate for risk-taking are considered. That can happen in several ways. First, the line between upstream discoveries (basic, fundamental science) and downstream (commercial) applications is blurring. At one time, the temporal and technical gap between the two made it clear what was a scientific principle (say, Boyle's law), which would stay in the public domain, and what was the application (a steam engine), which could be the subject of an IP right.²⁴ However, in the modern era, many inventions are "dual use" in that they are fundamental advances, but they also have immediate commercial application. The IP right may motivate research and commercialization, but to the extent that it also covers the basic science, inventors gain control not only of what they discovered, but over follow-on prospects as well.

Myriad Genetic's patents on the gene sequences associated with early-onset breast cancer furnish an example. The patents on these genes enabled Myriad to recoup the costs of developing and perfecting tests to diagnose early vulnerability to breast cancer, maintaining the quality of the tests, and educating doctors and patients about the benefits of testing. However, the patents also allowed Myriad to stop others from conducting research on better diagnostic tests and other causes of breast cancer.²⁵ As such, they demonstrate a concern that Justice Breyer expressed in another patent case: these rights can "impede rather than 'promote the Progress of Science and useful Arts.'"²⁶ They give the first right holder something of a lock on future innovation.

Network effects create a second way in which rewards can expand far beyond the social contributions made by the innovation. Consider Facebook. Those who use it are unlikely to switch to another social network

²⁴ See Edwin Layton, *Mirror-Image Twins: The Communities of Science and Technology in 19th-Century America*, 12 *TECH. & CULTURE* 562 (1971).

²⁵ See REPORT OF THE SECRETARY'S ADVISORY COMMITTEE ON GENETICS, HEALTH, AND SOCIETY, *GENE PATENTS AND LICENSING PRACTICES AND THEIR IMPACT ON PATIENT ACCESS TO GENETIC TESTS* (2010), <https://osp.od.nih.gov/sacghsdocs/gene-patents-and-licensing-practices-and-their-impact-on-patient-access-to-genetic-tests-report-of-the-secretarys-advisory-committee-on-genetics-health-and-society/> (last accessed 17 October 2019).

²⁶ *Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.*, 548 U.S. 124, 127 (2006) (Breyer, J., dissenting from the denial of certiorari, quoting U.S. CONST., art. I, § 8, cl.8).

site because much of the value they enjoy lies in the circle of family and friends who also use it. Thus, while Facebook may have started off with IP—rights arguably justified by Mark Zuckerberg’s inventive contributions—it is not (or no longer) the IP that makes it so powerful. Once network effects set in, no one can easily compete, even after the IP rights expire. A similar story of entrenchment can be told about many other firms in the Knowledge Economy, including Google, Microsoft, Apple, Samsung, and eBay.²⁷

Firms like Facebook and Google also demonstrate a third way to capture added value: many high tech firms use a freemium model to earn revenue. That is, access to the product is free for users because profits are made, in part, through advertising and in part, by collecting information from users, and then repackaging that information to sell to others. These activities are synergistic. Facebook’s ads are effective because Facebook is in a position to know what its users are interested in buying.²⁸ At Google’s YouTube, the ads run alongside content that may be posted (at no cost to Google) by third parties.²⁹ And Google’s maps are embellished—and made more valuable—by photographs and other information supplied by users.³⁰ In other words, these technologies allow the innovators to earn income not only from their own intellectual contributions, but from information generated by all their users as well. In some cases, revenue might be shared with the actual creators, but that is not always the case.³¹

A fourth technique revolves around how transactions are structured. As Aaron Perzanowski and Jason Schultz put it, they “End Ownership”.³²

²⁷ See generally, CARL SHAPIRO & HAL. R. VARIAN, *INFORMATION RULES: A STRATEGIC GUIDE TO THE NETWORK ECONOMY* (Harvard Business Review Press 1998); Kristine Laudadio Devine, *Preserving Competition in Multi-Sided Innovative Markets: How Do You Solve a Problem Like Google?*, 10 N.C. J. L. & TECH. 59 (2008).

²⁸ FACEBOOK BUSINESS, <https://www.facebook.com/business/learn/facebook-create-ad-basics> (last accessed 17 October 2019).

²⁹ HOW TO PROPERLY UPLOAD VIDEOS TO YOUTUBE, <https://www.youtube.com/watch?v=Hlxqk0iHp5w> (last accessed 17 October 2019).

³⁰ GOOGLE MAPS HELP, <https://support.google.com/maps/answer/2622947?co=GENIE.Platform%3DDesktop&hl=en/> (last accessed 17 October 2019).

³¹ See Eduardo Porter, *Your Data is Crucial to a Robotic Age. Shouldn’t you be Paid for It?*, N.Y. TIMES (6 March 2018), <https://www.nytimes.com/2018/03/06/business/economy/user-data-pay.html> (last accessed 17 October 2019); JARON LANIER, *WHO OWNS THE FUTURE?* (Simon & Schuster 2013).

³² AARON PERZANOWSKI & JASON SCHULTZ, *THE END OF OWNERSHIP: PERSONAL PROPERTY IN THE DIGITAL AGE* (MIT Press 2016).

When a physical copy of a protected work (say, a book) is sold, the first sale doctrine of IP law is triggered. The owner may keep the copy or destroy it. She can also give it away or sell it.³³ But in the Information Age, that is not the only way works can be distributed: with some products (say, e-books), there is no sale; digital copies are licensed and placed on a technological tether. The publisher can prevent the “buyer” from selling the copy (at least, not without the accompanying reading device), limit the number of devices on which the book can be read, or even make the book disappear. The elimination of a secondary market in used merchandise means the right holder can sell more units. And because there are no cheap used copies selling in competition, it can raise prices. Of course, it is understandable that digital publishers wish to maintain control. Because copying digital material is costless, the first sale could lead to a vast number of pirated copies. But right holders can easily abuse the licensing model. It would, for example, be possible for electric car manufacturers to limit the distance the “buyer” can drive and where he can drive to, or require maintenance and repair only at their own dealerships.³⁴ Indeed, there are products that work in a similar way right now. For example, old smartphones may slow down upon the introduction of new models; as electronic applications are updated, users can be required to pay for the privilege of keeping them current.³⁵

A fifth possibility is the acquisition of portfolios of rights. Portfolios of closely related patents discourage competition by making it difficult to invent around the protection and increasing the litigation risks associated with offering rival technologies.³⁶ Right holders can also use a portfolio strategy to extend the period of exclusivity. In the pharmaceutical arena, for example, evergreening and product hopping are common: a primary

³³ See, e.g., *Impression Prod., Inc. v. Lexmark Int'l, Inc.*, 137 S. Ct. 1523 (2017); *Kirtsaeng v. John Wiley & Sons, Inc.*, 136 S. Ct. 1979 (2016).

³⁴ See, e.g., *Take Back Control: How Digital Devices Challenge the Nature of Ownership*, *ECONOMIST* (30 Sept. 2017), <https://www.economist.com/news/leaders/21729745-and-threaten-property-rights-digital-age-how-digital-devices-challenge-nature> (last accessed 17 October 2019).

³⁵ See, e.g., Margi Murphy, *Apple Does Slow Down Older iPhones*, *THE TELEGRAPH* (9 Dec. 2017), <http://www.telegraph.co.uk/technology/2017/12/19/apple-does-slow-older-iphones-not-reason-think/> (last accessed 17 October 2019); Brett Burney, *iANNOTATE, APPS IN LAW* (25 May 2016), <http://appsinlaw.com/iannotate-superb-annotation-tools-for-pdf-files/> (“If you have an older version of iAnnotate, [iannotate 4] is NOT a free update – you must purchase iAnnotate all over again.”) (last accessed 17 October 2019).

³⁶ See, e.g., Fiona M. Scott Morton & Carl Shapiro, *Strategic Patent Acquisitions*, 79 *ANTITRUST L.J.* 463 (2014).

patent on an active ingredient is surrounded by patents on various forms of tableting, packaging, and delivering the medicine. Until all those patents expire, it is difficult to introduce generic equivalents. Or just as the patent expires, a variant formulation is patented and the original product withdrawn from the market. The result is two (or more) successive patent terms.³⁷ Mixed portfolios are another possibility. When copyrighted materials (such as Mickey Mouse) are also claimed as trademarks, protection endures for as long as the material is used as a signal to consumers—which can be long after the copyright expires. Because many IP rights (especially novel IP rights) overlap with one another, there are many other variations on this tactic.³⁸

The growing importance of knowledge products in the Information Age has also exacerbated social injustice, both from the standpoint of individuals and nation states. In some situations, distributive concerns are stark: for some technologies, the winner takes all. For example, Google and Facebook have essentially vanquished all their rivals, allowing each to earn most of the profits available for search and social networking, respectively. But even when outcomes are not so dramatic, the returns to innovation (which are often strongly correlated with increased productivity) outpace returns in other areas and contribute significantly to income inequality. Thus, the income of the creative class has outstripped incomes in other sectors of the economy.³⁹ Indeed, 20 percent of the people on Forbes 2015 list of wealthiest individuals in the US are patent holders; since the 1980s the number of patents held by the top 1 percent has grown steeply.⁴⁰

Income inequality clearly has many socially destabilizing effects. In the innovation realm, problems include the possibility that many consumers will not have the means to enjoy modern discoveries, including advances in sensitive areas, such as health, education, and culture.⁴¹

³⁷ See EUROPEAN COMMISSION, PHARMACEUTICAL SECTOR INQUIRY (Final Report 8 July 2009), https://ec.europa.eu/competition/sectors/pharmaceuticals/inquiry/staff_working_paper_part1.pdf (last accessed 17 October 2019).

³⁸ See, e.g., Viva R. Moffat, *Mutant Copyrights and Backdoor Patents: The Problem of Overlapping Intellectual Property Protection*, 19 BERKELEY TECH. L.J. 1473 (2004).

³⁹ See, e.g., Justin Hughes & Robert P. Merges, *Copyright and Distributive Justice*, 92 NOTRE DAME L. REV. 513, 529 (2017).

⁴⁰ Philippe Aghion, et al. *Innovation and Top Income Inequality*, 86 REV. ECON. STUD. 1 (2019).

⁴¹ See Ellen F.M. 't Hoen, *The Responsibility of Research Universities to Promote Access to Essential Medicines*, 3 YALE J. HEALTH POL'Y, L. & ETHICS 293 (2003).

Equally troubling is the fact that, despite all the effort directed at innovation, there are advances that could be of enormous social significance but that nonetheless never come to fruition. As education becomes the province of the wealthy, “lost Einsteins”—individuals who had the potential to invent but never become positioned to do so—become a distinct possibility.⁴² And those who are so positioned may lack knowledge about the needs of those who are less well off. In large part, however, the problem lies in a system that relies on financial incentives: in such a regime, products consumers cannot afford to purchase, or refuse to purchase, will not be produced. Examples of the former include cures for neglected diseases, like dengue fever, which uniquely afflict poor populations, and sustainable agriculture for impoverished environments.⁴³ In the latter category are technologies that abate the sources of climate change, which everyone regards as desirable, but no one wishes to pay for,⁴⁴ and antibiotics, where there is no need for innovation immediately, but it is anticipated that antimicrobial resistance will create demand in the near future.⁴⁵

At the international level, social justice concerns derive largely from the one-size-fits-all nature of international IP law. Aside from least developed countries, multinational agreements require every country to offer nearly the same IP protection. However, the impact of these obligations on member states is dramatically different. Developed countries, operating at the technological frontier, are net exporters of IP and earn worldwide profits that offset the local costs associated with supra-competitive pricing. In contrast, developing countries, which can barely

⁴² Alexander M. Bell, Raj Chetty, et al., *Who Becomes an Inventor in America? The Importance of Exposure to Innovation*, 134 Q. J. ECON. 647 (2019); David Leonhardt, *Lost Einsteins: The Innovations We're Missing*, N.Y. TIMES (3 Dec. 2017), <https://www.nytimes.com/2017/12/03/opinion/lost-einsteins-innovation-inequality.html> (last accessed 17 October 2019).

⁴³ See, e.g., F.T. Akinsolu et al., *Patent Landscape of Neglected Tropical Diseases: An Analysis of Worldwide Patent Families*, 13 GLOBAL HEALTH 82 (2017), Stanley P. Kowalski & R. David Kryde, *Golden Rice: A Case Study in Intellectual Property Management and International Capacity Building*, 13 RISK: HEALTH SAFETY & ENV'T 47 (2002).

⁴⁴ Jonathan H. Adler, *Eyes on a Climate Prize: Rewarding Energy Innovation to Achieve Climate Stabilization*, 35 HARV. ENVTL. L. REV. 1 (2011).

⁴⁵ Elizabeth Sukkar, *Why Are There So Few Antibiotics in the Research and Development Pipeline?*, THE PHARM. J. (13 Nov. 2013), <https://www.pharmaceutical-journal.com/news-and-analysis/features/why-are-there-so-few-antibiotics-in-the-research-and-development-pipeline/11130209.article> (last accessed 17 October 2019).

afford competitive prices, must pay a premium. Yet they are rarely in a position to export creative materials and earn IP profits for themselves. Even when these countries produce authors, scientists, and technologists of international caliber, they lose because such individuals can be lured away by the greater resources of the developed world. The resulting brain drain depletes the capacity of developing countries to innovate products that their citizens need. Additionally, migration can make it difficult to educate and train the populace or—ironically—to staff the administrative positions that international agreements require. For example, Amy Kapczynski has shown that the Indian patent office is so overwhelmed by applications, examination can be ineffective and lead to a plethora of low quality patents that further raise the cost of knowledge goods within India.⁴⁶

B. Alternative Legal Strategies

What is the right approach to these new problems? One possibility is to invalidate IP rights that threaten follow-on innovation or have a severely adverse impact on social welfare, including on health. That was the US Supreme Court's solution in *AMP v. Myriad* and the Australia High Court's in *D'Arcy v. Myriad*: both tribunals held that genetic sequences are not patentable subject matter.⁴⁷ In the US, that approach has also led to the denial of patents on diagnostic tests, algorithms, software, and other abstractions.⁴⁸ On the copyright side, the US Supreme Court refused to protect databases.⁴⁹ Other ideas include the adoption of a higher threshold of inventiveness or a reduced scope of protection. The former approach is exemplified by the decision of the India Supreme Court to invalidate a patent on the variant of a previously known pharmaceutical on the ground that the variant was insufficiently inventive

⁴⁶ Amy Kapczynski, *Harmonization and its Discontents: A Case Study of TRIPS Implementation in India's Pharmaceutical Sector*, 97 CALIF. L. REV. 1571 (2009).

⁴⁷ *Association for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013); *D'Arcy v Myriad Genetics Inc.* [2015] HCA 35.

⁴⁸ See, e.g., *Alice Corp. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014); *Mayo Collaborative Services v. Prometheus*, 566 U.S. 66 (2012); *Bilski v. Kappos*, 561 U.S. 593 (2010); *In re Nuijten*, 500 F.3d 1346 (Fed. Cir. 2007). See also Jeffrey A. Lefstin, *The Three Faces of Prometheus: A Post-Alice Jurisprudence of Abstractions*, 16 N.C. J. L. & TECH. 647 (2015).

⁴⁹ *Feist Publications, Inc., v. Rural Telephone Service Co.*, 499 U.S. 340 (1991).

to merit its own term of protection.⁵⁰ The latter idea is demonstrated by the decision of the Court of Justice of the European Union (CJEU) narrowing the ambit of gene patent infringement.⁵¹ Additionally, through theories of preemption and election, strict limits can be placed on overlapping rights.⁵²

But is raising the standards for protection the best way to prevent right holders from overreaching? Will there be adequate incentives if protection is barred in important emerging areas? Not all innovations generate enough intrinsic satisfaction (or non-IP extrinsic rewards) to motivate creation. Some advances call for costly facilities (as in many sciences), specialized equipment (for instance, to create special effects in the film industry), expensive training (as for medical research), extensive testing (as is the case for pharmaceuticals), or the investment of considerable time (as with investigative journalism). Without an IP mechanism to recoup costs, there is significant danger of insufficient investment. Even some of the activities that do not appear to rely on IP rights may be at risk because they benefit from IP indirectly. For example, the programmers who participate in open innovation projects (such as Linux) may be using their enhanced reputations to secure positions at firms (like IBM) that do rely on IP rights. Similarly, stardom on the internet or in performance can translate into movie and television projects protected by IP law.⁵³ In some cases, IP rights may not be needed to motivate innovation, but they may be important from a distributive perspective, to protect knowledge workers from exploitation. Indigenous communities; sewing, knitting, and quilting circles; and fledgling scholars and artists, are among those who have found that without IP protection their work can be taken and profitably sold by others.⁵⁴ Thus, a strong argument can be made that, despite doubts about the continuing relationship between innovation and IP protection, IP (or more properly, a financial incentive) is, at least sometimes, necessary to support creative production.

⁵⁰ *Novartis AG v. Union of India & Others*, AIR 2013 SC 1 (India).

⁵¹ CJEU, Case C-428/08, *Monsanto Tech. LLC v. Cefetra BV* [2010] E.C.R. 7.

⁵² See, e.g., *Dastar Corp. v. Twentieth Century Fox Film Corp.*, 539 U.S. 23 (2003).

⁵³ See, e.g., Dotan Oliar & Christopher Sprigman, *There's No Free Laugh (Anymore): The Emergence of Intellectual Property Norms and the Transformation of Stand-Up Comedy*, 94 VA. L. REV. 1787 (2008).

⁵⁴ See Dreyfuss, *supra* note 6, at 1463-65; PETER DRAHOS & SUSY FRANKEL, *INDIGENOUS PEOPLE'S INNOVATION* (ANU Press 2012).

Besides, when innovators are deprived of patents or copyrights, they may respond in ways that are even more problematic in terms of social impact. For example, Myriad, in anticipation of losing its patents, began to keep information about genetic mutations as trade secrets.⁵⁵ Modern technologies make reliance on trade secrecy especially easy, as much of the information that allows these technologies to create value—the computer software and algorithms that are embedded in them, the analytical techniques used to repackage data, the data used to train the algorithm—is not publicly revealed when the technologies are used. As important, modern technologies and business methods can make the ability to enforce secrecy more crucial. Without protection, it would be risky to store information in the cloud, where it can be accessed remotely, or to use value chain production methods, which require developers to supply confidential product information to manufacturers, distributors, sellers, and maintenance organizations. The rising global demand for trade secrecy protection is indicative of how ubiquitous this form of protection is becoming.⁵⁶

But it is important to recognize that trade secrecy is significantly different from other forms of IP. With patents, disclosure is required and most copyrighted works are disclosed upon commercialization. For both, the period of protection eventually expires. In contrast, trade secrets are (by definition) secret and, equally important, there is no assurance that the information will be reverse engineered or independently invented. Accordingly, rights can last far longer than do patents or even copyrights. *Bénédictine*, for example, was invented in 1510 and remains secret.⁵⁷ During that time, others cannot build upon the work (and may, indeed, waste resources reinventing it). Employees, concerned that they will be

⁵⁵ See John M. Conley, Robert Cook-Deegan & Gabriel Lázaro-Muñoz, *Myriad After Myriad: The Proprietary Data Dilemma*, 15 N.C. J. L. & TECH. 597 (2014); Robert Cook-Deegan, John M. Conley, James P. Evans & Daniel Vorhaus, *The Next Controversy in Genetic Testing: Clinical Data as Trade Secrets?*, 21 EUR. J. HUM. GENETICS 585 (2013).

⁵⁶ See, e.g., Directive (EU) 2016/943 of the European Parliament and the Council on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure, 2016 O.J. (L 157,1) [hereinafter Trade Secrecy Directive]. The US has been demanding that its trading partners enhance protection since 2012, see OFFICE OF THE UNITED STATES TRADE REPRESENTATIVE, 2012 SPECIAL 301 REPORT 17–18, <https://ustr.gov/sites/default/files/2012%20Special%20301%20Report.pdf> (last accessed 17 October 2019).

⁵⁷ See *BÉNÉDICTINE*, <https://www.liquor.com/brands/benedictine/#gs.3szL3gI> (last accessed 17 October 2019).

accused of stealing trade secrets, may have a difficult time changing jobs. That stagnation can result in lower salaries and depress interest in acquiring the human capital necessary to be employed in the high tech sector.⁵⁸ Trade secrecy also reduces the government's ability to regulate, including to regulate the use of secret chemicals that could pollute the environment or harm employees.⁵⁹

Modern technologies can exacerbate the social costs of secrecy. Because many collect information (Google, Facebook, smartphones, dating apps, household and personal appliances, toys—the entire Internet of Things), trade secrecy protection can complicate efforts to protect privacy.⁶⁰ Furthermore, algorithms, software, and AI now make decisions with significant personal impact, including on hiring, credit, bail, sentencing, and immigration.⁶¹ They control voting machines, the ads Facebook and Google display, the newsfeed subscribers to Facebook see. At many platforms, algorithms monitor infringement and automatically take down material they classify as unauthorized.⁶² Yet the trade secrets

⁵⁸ See ORLY LOBEL, *TALENT WANTS TO BE FREE: WHY WE SHOULD LEARN TO LOVE LEAKS, RAIDS, AND FREE-RIDING* (Yale Univ. Press 2013); Rochelle Cooper Dreyfuss & Orly Lobel, *Economic Espionage as Reality or Rhetoric: Equating Trade Secrecy with National Security*, 20 LEWIS & CLARK L. REV. 419 (2016).

⁵⁹ Mary L. Lyndon, *Secrecy and Innovation in Tort Law and Regulation*, 23 N.M. L. REV. 1 (1993).

⁶⁰ See, e.g., Judith Duportail, *I Asked Tinder for My Data. It Sent Me 800 Pages of My Deepest, Darkest Secrets*, THE GUARDIAN (26 Sept. 2017), <https://www.theguardian.com/technology/2017/sep/26/tinder-personal-data-dating-app-messages-hacked-sold> (last accessed 17 October 2019); Janet Burns, *The 'Spying Vibrator' Suit is Over, But Sex Toys Are Still Talking Data*, FORBES (14 Dec. 2016), <https://www.forbes.com/sites/janetwburns/2016/12/14/the-spying-vibrator-suit-is-over-but-sex-toys-are-still-talking-data/#519e29864417> (last accessed 17 October 2019).

⁶¹ See, e.g., Natalie Ram, *Innovating Criminal Justice*, 112 Nw. U. L. REV. 659 (2018).

⁶² Cade Metz, *How Facebook's Ad System Works*, N.Y. TIMES (12 Oct. 2017), <https://www.nytimes.com/2017/10/12/technology/how-facebook-ads-work.html>; Harry Guinness, *How Facebook's News Feed Sorting Algorithm Works*, HOW-TO GEEK (28 Feb. 2017), <https://www.howtogeek.com/290919/how-facebooks-news-feed-sorting-algorithm-works/>; Burt Helm, *How Facebook's Oracular Algorithm Determines the Fates of Start-Ups*, N.Y. TIMES (2 Nov. 2017), https://www.nytimes.com/2017/11/02/magazine/how-facebooks-oracular-algorithm-determines-the-fates-of-start-ups.html?_r=0. See also FACEBOOK TRANSPARENCY REPORT (January 2017), https://transparency.facebook.com/intellectual_property/ (all sites last accessed 17 October 2019).

protecting these advances can make it impossible to examine them to ensure accountability: to determine whether they are accurate, unbiased, and not distorting commercial outcomes or exerting improper political influence.⁶³

To be sure, trade secrecy is not the only alternative to traditional IP protection. Innovators could be subsidized by private organizations interested in specific work; the government could award research grants to promising projects or researchers or provide tax breaks to firms that engage in research. Government or private parties could offer prizes to those who fulfill important needs. In all these cases, the output of the work could then be placed in the public domain and offered at competitive prices, thereby eliminating deadweight loss and ameliorating distributive problems. To some extent, such systems are already in use.⁶⁴ Patient advocacy groups sponsor research;⁶⁵ the governments of many developed countries support fundamental science and have established R&D tax credits and other tax incentive schemes;⁶⁶ famously, the British government tackled the problem of determining a ship's longitude by offering a prize. It was won by John Harrison, who solved the problem with a chronometer.⁶⁷

However, as with trade secrecy, these alternatives raise many questions.⁶⁸ Private funders may not have the knowledge, experience, or clout

⁶³ See, e.g., Sonia K. Katyal, *Private Accountability in the Age of Artificial Intelligence*, 66 UCLA L. REV. 54 (2019); Robert Brauneis & Ellen P. Goodman, *Algorithmic Transparency for the Smart City*, 20 YALE J. L. & TECH. 103 (2018).

⁶⁴ See, e.g., Daniel J. Hemel & Lisa Larrimore Ouellette, *Beyond the Patents-Prizes Debate*, 92 TEX. L. REV. 303 (2013); Michael Abramowicz, *Perfecting Patent Prizes*, 56 VAND. L. REV. 115 (2003); Steven Shavell & Tanguy van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525 (2001).

⁶⁵ See, e.g., David Landy, et al., *How Disease Advocacy Organizations Participate in Clinical Research: A Survey of Genetic Organizations*, 14 GENETICS IN MED. 223 (2012).

⁶⁶ ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD), SCIENCE TECHNOLOGY AND INDUSTRY SCOREBOARD 2015: INNOVATION FOR GROWTH AND SOCIETY (2015), http://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-industry-scoreboard-2015_sti_scoreboard-2015-en (last accessed 17 October 2019).

⁶⁷ DAVA SOBEL, *LONGITUDE* (Bloomsbury USA 1995).

⁶⁸ Rochelle Cooper Dreyfuss, *Tailoring Incentives: A Comment on Hemel and Ouellette's Beyond the Patents-Prizes Debate*, 92 TEX. L. REV. SEE ALSO 131 (2014).

to make the best use of their money.⁶⁹ Both prizes and grants rely on the proper identification of appropriate grantees. They also require a central authority to anticipate social needs and to know enough to recognize when these needs have, in fact, been met (this was a problem for Mr. Harrison, who could not initially convince the authorities that clocks could be used to measure longitude). And as the OECD has found, when countries compete to offer tax breaks by expanding the activities that can be regarded as generating local profits, the global tax base can rapidly erode.⁷⁰ Finally, private funding, grants, tax incentives, and prizes can solve distributive concerns, but only if the funders—private parties or governments—are sufficiently worried about the emerging wealth and health gap that they are willing to devote their own resources to creative outputs that primarily (or exclusively) benefit others.

Problems with IP protection have led some to suggest the adoption of *sui generis* legislation—exclusive rights crafted to deal with the problems of specific creative sectors. For example, a consortium of US law professors and computer scientists proposed a *sui generis* regime for software, tailored to the perceived needs of that industry.⁷¹ While that proposal was never adopted, a few such laws have been enacted. In 1985, the US passed the Semiconductor Chip Protection Act.⁷² However, it was so closely tied to the industrial practices of its day, changes in the technology made it irrelevant.⁷³ The EU has had more success, at least on the legislative front. After the US Supreme Court decided databases were not copyrightable, the EU saw an opportunity to cultivate its own database industry. In 1996, it enacted a Directive requiring each member

⁶⁹ See Jennifer Girod & Katherine Drabiak, *A Proposal for Comprehensive Biobank Research Laws to Promote Translational Medicine in Indiana*, 5 IND. HEALTH L. REV. 217 (2008).

⁷⁰ OECD, MEASURING AND MONITORING BEPS, ACTION 11-2015 FINAL REPORT 85 (25 Oct. 2015), <http://dx.doi.org/10.1787/9789264241343-en> (last accessed 17 October 2019).

⁷¹ Pamela Samuelson, Randall Davis, Mitchell D. Kapor & J.H. Reichman, *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308 (1994).

⁷² 17 U.S.C. §§ 901-914 (2017).

⁷³ Leon Radomsky, *Sixteen Years After the Passage of the U.S. Semiconductor Chip Protection Act: Is International Protection Working?*, 15 BERKELEY TECH. L.J. 1049 (2000).

state to protect databases that involve substantial investment from unauthorized extraction.⁷⁴ Rights expire 15 years after the database is “complete.”⁷⁵

But even here, significant problems have surfaced. The EU Commission conducted a review of the Directive in 2005.⁷⁶ It concluded that “the production of databases within the EU has not significantly increased since the Directive’s adoption, and that the economic impact of the *sui generis* right on database production is unproven.”⁷⁷ Significantly, the database industry has certainly not shifted to Europe. Moreover, courts have had trouble deciding what constitutes a substantial investment. After all, businesses often compile databases for their own internal operations; the databases are essentially user innovations, which, as we saw, are undertaken irrespective of the availability of IP incentives.⁷⁸ Furthermore, unlike with copyrights and patents, database rights can be perpetual. The drafters of the Database Directive were clearly not thinking of modern dynamic databases, which continuously update and are thus never “complete” enough to trigger the running of a 15-year term.

The EU measure has also encountered difficulties at the international level. Rather than seek to include database protection in TRIPS or negotiate a new international agreement, the EU attempted to motivate other countries to enact parallel legislation through a reciprocity provision: the database of a non-EU national is protected in the EU only if that compiler’s country has enacted similar legislation.⁷⁹ Tellingly, other countries have not reciprocated. On the whole, the view elsewhere is that data—facts about the world—should be available to everyone; that rights over data create too much control over follow-on innovation; that compilers should compete not on what facts they own, but rather on how

⁷⁴ Directive 96/9/EC of the European Parliament and the Council on the legal protection of databases, 1996 O.J. (L77,20), art. 7 (1) [hereinafter Database Directive].

⁷⁵ *Id.*, art. 10(1).

⁷⁶ EU COMMISSION, FIRST EVALUATION OF DIRECTIVE 96/9/EC ON THE LEGAL PROTECTION OF DATABASES (12 Dec. 2005). The Report is no longer on line at any EU website, however, its conclusions are described in ANNEMARIE CHRISTIANE BEUNEN, PROTECTION FOR DATABASE: THE EUROPEAN DATABASE DIRECTIVE AND ITS EFFECTS IN THE NETHERLANDS, FRANCE AND THE UNITED KINGDOM (Wolf Legal Publishers 2007), <https://openaccess.leidenuniv.nl/handle/1887/12038> (last accessed 18 October 2019).

⁷⁷ *Id.*, at 266, citing the 2005 Evaluation Report at 20 & 24.

⁷⁸ See, e.g., CJEU, Case C-203/02, *British Horseracing Bd. Ltd. v. William Hill Org. Ltd.* [2004] E.C.R. I-10415.

⁷⁹ Database Directive, art. 11.2.

well they update, configure and annotate their databases to meet the needs of their customers.⁸⁰ As important, there are other techniques to ensure a return on investment. Electronic compilations are protected technologically and by laws against computer hacking;⁸¹ costs and profits are captured through contractual arrangements between the compiler and its customers.⁸² Indeed, in its final report, the European Commission found that “most stakeholders ... experienced low, if any benefits from the Database Directive” and suggested that other options should be considered to improve competitiveness of the database industry.⁸³ But there is a cautionary tale here. Were the EU ultimately to decide that database protection is ineffective, it may well find that it is stuck: that these rights may not be easily clawed back now that investments have been made.

C. A Research Agenda

These observations suggest the many areas where research is needed to prepare for the future, when new technologies and business practices become increasingly disruptive of the current IP landscape. Most important are techniques for determining the situations where IP rights are necessary to promote innovation and when advances can be safely placed into the public domain. The case law and literature on patentable subject matter include “clues” to where patents should be made available⁸⁴ and there is also much written about the drivers of innovation in what Christopher Sprigman and Kal Raustiala have denominated “IP’s negative

⁸⁰ Miriam Bitton, *A New Outlook on the Economic Dimension of the Database Protection Debate*, 47 IDEA 93 (2006); J.H. Reichman & Pamela Samuelson, *Intellectual Property Rights in Data?*, 50 VAND. L. REV. 51 (1997).

⁸¹ Jane C. Ginsburg, *A Marriage of Convenience? A Comment on the Protection of Databases*, 82 CHI.-KENT L. REV. 1171, 1172 & 1174 (2007) (giving examples of protection under the Computer Fraud and Abuse Act, 18 U.S.C. § 1030(a)(4)(2015), and through tort actions for trespass to chattels).

⁸² Daniel J. Gervais, *The Protection of Databases*, 82 CHI.-KENT L. REV. 1109 (2007).

⁸³ EU COMMISSION, STUDY IN SUPPORT OF THE EVALUATION OF DIRECTIVE 96/9/EC ON THE LEGAL PROTECTION OF DATABASES: FINAL REPORT iii, vi (2018), <https://ec.europa.eu/digital-single-market/en/news/study-support-evaluation-data-base-directive> (last accessed 16 October 2019).

⁸⁴ See Rochelle C. Dreyfuss & James P. Evans, *From Bilski Back to Benson: Preemption, Inventing Around, and the Case of Genetic Diagnostics*, 63 STAN. L. REV. 1349 (2011).

space.”⁸⁵ But much of this literature is based on intuitions; empirical and experimental studies are only beginning to determine how investment decisions are made, where high costs are incurred, and what innovators actually need in terms of monetary (or other) incentives.⁸⁶ In the near term, this research is especially crucial for genomics and proteomics, where it is becoming vital to know whether there are enough incentives available downstream on advances in personalized medicine—such as diagnostics that allow patients to know whether they will benefit from a medicine, or a gene-altering therapy⁸⁷—to spur upstream, fundamental discoveries. Because the laws of developed countries differ sharply in the protection offered to biotechnological advances, comparative studies could shed light on this issue.⁸⁸

Given the probability that there will be fields where financial incentives are required to promote innovation, there is likewise a growing need to scrutinize the alternatives. Because, as noted earlier, these approaches have weaknesses of their own, it is important to consider the sectors where each strategy effectively promotes investment and then to compare its social impact with other possibilities. As important is work to fine tune the strategies that appear to be feasible. For trade secrecy, the EU Trade Secrecy Directive provides a useful starting point.⁸⁹ Although it adopts the same framework as US trade secrecy laws (which is reflected in the TRIPS Agreement⁹⁰), it includes explicit provisions to deal with

⁸⁵ Kal Raustiala & Christopher Jon Sprigman, *The Piracy Paradox: Innovation and Intellectual Property in Fashion Design*, 92 VA. L. REV. 1687 (2006).

⁸⁶ See, e.g., Kal Raustiala & Christopher Jon Sprigman, *When are IP Rights Necessary? Evidence from Innovation in IP's Negative Space*, in RESEARCH HANDBOOK ON THE ECONOMICS OF INTELLECTUAL PROPERTY LAW, VOL. I – THEORY (Peter Menell & Ben Depoorter, eds. Edward Elgar Publishing 2016).

⁸⁷ See, e.g., Laurie McGinley & Carolyn Y. Johnson, *FDA Clears First Gene-Altering Therapy—a “Living Drug”—for Childhood Leukemia*, WASHINGTON POST (30 August 2017).

⁸⁸ Compare, for example, the fate of a patent on a method for testing fetal DNA in the UK, where the patent was upheld and found infringed, *Illumina, Inc. v. Premaitha Health plc*, [2017] EWHC 2930 (Pat), and the US, where the parallel patent was held invalid, *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371 (Fed. Cir. 2015).

⁸⁹ See Trade Secrecy Directive, *supra*, note 56.

⁹⁰ TRIPS Agreement, art. 39. See Rochelle Dreyfuss & Linda Silberman, *Misappropriation on a Global Scale: Extraterritoriality and Applicable Law in Transborder Trade Secrecy Cases*, 8 CYBARIS INTEL. PROP. L. REV. 265 (2017).

employee mobility and state regulatory interests.⁹¹ Since US law does not, comparing experience in the US with the EU could yield valuable insights. Because this protection is new to several EU member states, the Directive also presents an opportunity to learn whether the availability of trade secret protection increases creativity or simply draws inventors away from the patent system and its disclosure requirement.

Work on prizes, grants, and tax incentives is especially important because these alternatives hold considerable promise for motivating innovation without incurring the costs of IP protection. They are also critical for situations when IP incentives are unavailable or unavailing. These alternatives have been heavily debated as a matter of theory,⁹² but there is not as much information available about outcomes. There has been some empirical analysis by Petra Moser and others of the impact of historically important prizes.⁹³ Fiona Murray and Michael Burstein have researched prize systems that solve the “Harrison” problem with a method for reevaluating projected endpoints.⁹⁴ In addition, recent efforts to create prizes, including a new Longitude Prize to promote research on antibiotics,⁹⁵ a Health Impact Fund to address neglected diseases,⁹⁶ and government schemes that enlist private parties to offer ideas and oversee operations,⁹⁷ create new opportunities to study both the benefits and costs of the prize-like systems. For government financing, there are proposals to ensure fuller utilization of the output generated by grants,⁹⁸ but

⁹¹ Trade Secrecy Directive, arts. 1.3 & 5.

⁹² See, e.g., Ian Ayres & Lisa Larrimore Ouellette, *A Market Test for Bayh-Dole Patents*, 102 CORNELL L. REV. 271 (2017); Michael J. Graetz & Rachael Doud, *Technological Innovation, International Competition, and the Challenges of International Income Taxation*, 113 COLUM. L. REV. 347 (2013).

⁹³ See, e.g., Petra Moser & Tom Nicolas, *Prizes, Publicity and Patents: Non-Monetary Awards as a Mechanism to Encourage Innovation*, 61 J. INDUS. ECON. 763 (2013).

⁹⁴ Michael J. Burstein & Fiona E. Murray, *Innovation Prizes in Practice and Theory*, 29 HARV. J.L. & TECH. 401 (2016).

⁹⁵ THE LONGITUDE PRIZE, <https://longitudeprize.org/challenge> (last accessed 17 October 2019).

⁹⁶ AIDAN HOLLIS & THOMAS POGGE, THE HEALTH IMPACT FUND: MAKING NEW MEDICINES ACCESSIBLE FOR ALL (Incentives for Global Health 2008).

⁹⁷ RAYMOND TONG & KARIM R. LAKHANI, PUBLIC-PRIVATE PARTNERSHIPS FOR ORGANIZING AND EXECUTING PRIZE-BASED COMPETITIONS (Berkman Center 2012).

⁹⁸ See, e.g., ASSOCIATION OF UNIVERSITY TECHNOLOGY MANAGERS, NINE POINTS TO CONSIDER IN LICENSING UNIVERSITY TECHNOLOGY (6 March 2007),

systematic research on the effectiveness of these subsidies is in its infancy.⁹⁹ The effect of tax incentives on innovation has received some attention,¹⁰⁰ but as countries compete to offer the best deal, more is necessary, particularly on the impact of diverting public resources away from other important national objectives.

As discussed above, the EU Database Directive has already generated useful information on sui generis legislation, much of it tending to suggest that proliferating IP regimes is not ideal. In addition to creating opportunities for rent seeking, legislation tailored to a specific industry can have unintended consequences (such as perpetual protection), require new international negotiations (when reciprocity does not produce the desired effect), and raise interpretive difficulties (for example, on what counts as a substantial investment). Continuing unsuccessful attempts to protect traditional knowledge and cultural expression suggest that similar problems plague other sui generis efforts.¹⁰¹

There is, however, considerable room for research leading to adjustments to the current regimes. Thus, while William Nordhaus famously suggested that the term of patent protection could be adjusted to balance static and dynamic efficiencies,¹⁰² that approach is thought to be administratively unfeasible. Similarly, Esteban Donoso proposed setting a term of patent protection that reflects each nation's capacity to pay supracompetitive prices.¹⁰³ Such a scheme would reduce the costs developing countries must incur to enjoy the fruits of innovation; in effect, it would require each country to pay only its proportionate share of the costs of innovation. Unfortunately, implementing that idea would

<https://autm.net/about-tech-transfer/principles-and-guidelines/nine-points-to-consider-when-licensing-university> (last accessed 17 October 2019); W. Nicholson Price II, *Grants*, 34 BERKELEY TECH. L.J. 1 (2019). See also text at notes 145–153, *infra*.

⁹⁹ See, e.g., Sabrina T. Howell, *Financing Innovation: Evidence from R&D Grants*, 107 AM. ECON. REV. 1136 (2017).

¹⁰⁰ See, e.g., Dirk Czarnitzki, Petr Hanel & Julio Miguel Rosa., *Evaluating the Impact of R&D Tax Credits on Innovation: A Microeconomic Study on Canadian Firms*. 40 RES. POL'Y 217 (2011); Lisa Evers, Helen Miller & Christoph Spengel, *Intellectual Property Box Regimes: Effective Tax Rates and Tax Policy Considerations*, 22 INT'L TAX AND PUB. FIN. 502 (2015).

¹⁰¹ See WIPO, TRADITIONAL KNOWLEDGE, <https://www.wipo.int/tk/en/> (last accessed 17 October 2019); DRAHOS & FRANKEL, *supra* note 54.

¹⁰² See F.M. Scherer, *Nordhaus' Theory of the Optimal Patent Life: A Geometric Reinterpretation*, 62 AM. ECON. REV. 422 (1972).

¹⁰³ ESTABAN DONOSO, *A GLOBAL SOLUTION FOR THE PROTECTION OF INVENTIONS* (Archway Publishing 2014).

require several changes in the TRIPS Agreement.¹⁰⁴ However, other approaches are more amenable to experimentation. Where the main cost lies in commercialization, rather than discovery, Ted Sichelman has suggested that weaker and shorter commercialization patents would provide sufficient encouragement.¹⁰⁵ And when the principal costs lie essentially in obtaining regulatory approval (a scenario for pharmaceuticals), that work could be compensated through a liability rule, which, as J.H. Reichman has pointed out, would let others use the data as long as they pay a fair share of the cost.¹⁰⁶

Research on other changes to the system would also be desirable. The TRIPS Agreement includes a set of exceptions and flexibilities that many countries use to protect the public interest.¹⁰⁷ For example, fair use and experimental use defenses clear the way for follow-on innovation. Compulsory licensing and crown use exceptions can be deployed to deal with important public welfare interests, such as access to affordable medicines. Compulsory licenses, coupled with local working requirements, can ensure that, in exchange for paying supracompetitive prices, countries obtain new jobs and training opportunities. Of course, these flexibilities also reduce the incentives available under the IP system. Thus, there are many countries that take a much harder line on their use (and would alter international law to require other nations to do the same¹⁰⁸). Comparing the propensity to innovate under these differing regimes would provide insights into how strong intellectual property rights need to be to encourage optimal levels of investment.¹⁰⁹ Greater knowledge about these flexibilities would furnish useful guidance for

¹⁰⁴ TRIPS, art. 33 mandates a 20-year term. Furthermore, the system would work best if parallel importation were barred, but TRIPS leaves that issue to member states, *id.*, art. 6.

¹⁰⁵ Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341 (2010).

¹⁰⁶ J.H. Reichman, *Of Green Tulips and Legal Kudzu: Repackaging Rights in Subpatentable Innovation*, 53 VAND. L. REV. 1743 (2000). Another possibility is a limited period in which the data cannot be the basis of another application, see Henry Grabowski, *Data Exclusivity for Biologics*, 10 NAT. REV. DRUG DISCOVERY 15 (2011).

¹⁰⁷ TRIPS Agreement, arts 13, 15, 26.2, 27.2, 27.3, 30 & 31.

¹⁰⁸ See, e.g., Kimberlee Weatherall, *ACTA as a New Kind of International IP Lawmaking*, 26 AM. U. INT'L L. REV. 839, 843 (2011) (referring to "the global one-way IP ratchet").

¹⁰⁹ See, e.g., Rochelle C. Dreyfuss, Jane Nielsen, & Dianne Nicol, *Patenting Nature—A Comparative Perspective*, 5 J. LAW. BIOSCI. 550 (2018).

countries drafting new IP laws. Moreover, a comprehensive understanding of the impact of flexibilities could inform decisions on how far international law should go in requiring countries to recognize exclusive rights.¹¹⁰

It is also worth exploring the possibility of conditioning aspects of IP protection on right holders' furthering specified public objectives. There are a few examples of this approach in existing law. For example, the US Bayh Dole Act,¹¹¹ which allows universities to own patents on their faculty research output, mandates that they license to firms that manufacture substantially in the US and give first preference on exclusive licenses to small businesses.¹¹² Under the US Patent Act, small entities are charged reduced fees for filing and maintaining their patents.¹¹³ Since the Patent Office is self-funded, this provision essentially requires larger entities to subsidize smaller ones. The US has also experimented with prioritizing the examination of patent applications on inventions in socially important areas.¹¹⁴ Jean Lanjouw would go even further: she suggested that patent applicants be given a choice between patenting in the US or in a developing market, thereby leaving important advances in the public domain in countries that cannot afford patent prices.¹¹⁵ Although not all of these schemes have proved successful,¹¹⁶ there is considerable promise in these approaches.

More work on ownership is especially important. As Perzanowski and Schultz have noted, there is a substantial question as to whether people understand what they are acquiring when they spend money on digital products, such as e-books. It is also important to learn more about what consumers think they are giving up when they acquire technologies upon

¹¹⁰ See GRAEME B. DINWOODIE & ROCHELLE C. DREYFUSS, *A NEOFEDERALIST VISION OF TRIPS: THE RESILIENCE OF THE INTERNATIONAL INTELLECTUAL PROPERTY REGIME* 175-203 (Oxford University Press 2012).

¹¹¹ 35 U.S.C. §§ 200-212 (2014).

¹¹² 35 U.S.C. §§ 204; 209(b) & (c) (2014).

¹¹³ 35 U.S.C. § 41 (h)(2014).

¹¹⁴ See UNITED STATES PATENT AND TRADEMARK OFFICE (USPTO), *ACCELERATED EXAMINATION*, <https://www.uspto.gov/patent/initiatives/accelerated-examination> (last accessed 18 October 2019); Scott E. Yackey, *To the Front of the Line: Spurring Biotech Collaboration Through Patent Fast-Track Examination Vouchers*, 5 ST. LOUIS U.J. HEALTH L. & POL'Y 341 (2012).

¹¹⁵ Jean O. Lanjouw, *A New Global Patent Regime for Diseases: U.S. and International Legal Issues*, 16 HARV. J.L. & TECH. 85 (2002).

¹¹⁶ See, e.g., USPTO, *GREEN TECHNOLOGY PILOT PROGRAM*, <https://www.uspto.gov/patent/initiatives/green-technology-pilot-program-closed> (last accessed 18 October 2019).

consent to the capture of personal data (or, for that matter, send saliva samples that include their entire genetic heritage to direct-to-consumer DNA sequencers).¹¹⁷ Do they know how much private information is gathered, or the uses to which the information can be put? By the same token, do they realize, when they post material themselves, that others may be profiting from work that IP laws regard as theirs? Or that these others may be using the materials in ways that IP rights would give the consumer the right to control?¹¹⁸ If they do not, the law needs to develop an approach to regulating licensing practices (including so-called EULAs, end user licensing agreements) or mandate better notice.¹¹⁹ Modern technologies also raise a new ownership question: who should be deemed the author or inventor of machine-generated content?¹²⁰

It is not only IP scholars and innovation economists who have their work cut out for them. In this new era, at least two other areas of law deserve scrutiny: competition (antitrust) law and human rights law. Because competition law has long viewed exclusivity with suspicion, much ink has been spilled on its relationship to IP and innovation.¹²¹

¹¹⁷ Cf. MARGARET JANE RADIN, *BOILERPLATE* (Princeton University Press 2012); Michael Schulson, *Spit and Take: Genetic Testing Data can be Subpoenaed, Stolen, and Sold as a Commodity. So Why is the Industry Booming?*, SLATE (29 Dec. 2017), <https://slate.com/technology/2017/12/direct-to-consumer-genetic-testing-has-tons-of-privacy-issues-why-is-the-industry-booming.html> (last accessed 18 October 2019).

¹¹⁸ Kevin Granville, *Facebook and Cambridge Analytica: What You Need to Know as Fallout Widens*, N.Y. TIMES (19 March 2018), <https://www.nytimes.com/2018/03/19/technology/facebook-cambridge-analytica-explained.html> (last accessed 18 October 2019).

¹¹⁹ For a discussion of the problem of interpreting the effect of EULAs, see Christina Mulligan, *Licenses and the Property/Contract Interface*, 93 IND. L.J. 1073 (2018).

¹²⁰ See, e.g., Robert C. Denicola, *Ex Machina: Copyright Protection for Computer-Generated Works*, 69 RUTGERS L. REV. 251 (2016); Ben Hattenbach & Joshua Glucoft, *Patents in an Era of Infinite Monkeys and Artificial Intelligence*, 19 STAN. TECH. L. REV. 32 (2015); Sam Ricketson, *People or Machines: The Berne Convention and the Changing Concept of Authorship*, 16 COLUM.-VLA J.L. & ARTS 1 (1991).

¹²¹ See, e.g., GUSTAVO GHIDINI, *INTELLECTUAL PROPERTY AND COMPETITION LAW: THE INNOVATION NEXUS* (Edward Elgar Publishing 2006); Mark A. Lemley, *A New Balance Between IP and Antitrust*, 13 SW. J. L. & TRADE AM. 237 (2007); Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV. 1813 (1984); WARD BOWMAN JR., *PATENT AND ANTITRUST LAW: A LEGAL AND ECONOMIC APPRAISAL* (University of Chicago Press 1973).

However, modern technologies present many new challenges. In particular, work must be undertaken on the impact of network effects and internet practices, including how they affect barriers to entry and whether they should be considered in determining when a right holder has market power.¹²² Since many of these technologies are distributed on a freemium model, the standard method of determining market power (the ability to raise prices) is not applicable. Yet once established, these networks appear difficult to break. Accordingly, consideration should also be given to the question of when the law should intervene. As noted earlier, patent law is encountering difficult questions regarding dual use technologies because rights over them create exclusivity in fundamental discoveries. Perhaps competition law could mitigate the effect by considering these discoveries to be essential facilities, which a right holder can protect, but is obliged to license.¹²³ US antitrust law has experimented with ways to control pharmaceutical evergreening, but work is needed to determine whether that is the best way to handle sequential or overlapping rights.¹²⁴ Many modern products, particularly in the communications and IT sectors, encompass a multiplicity of rights. These are associated with valuation problems, attempts by each right holder to seek a disproportionate share of the profit, and risks of holdups and double-marginalization (royalty stacking).¹²⁵ Work is therefore needed on how to properly allocate royalties among multiple right holders.

The application of human rights to IP issues is relatively recent. However, as Amy Kapczynski has argued, it offers a mechanism for

¹²² See, e.g., David McGowan, *Networks and Intention in Antitrust and Intellectual Property*, 24 J. CORP. L. 485 (1999); Aaron S. Edlin & Daniel L. Rubinfeld, *Exclusion or Efficient Pricing? The “Big Deal” Bundling of Academic Journals*, 72 ANTITRUST L.J. 119 (2004). See also Charles Duhigg, *The Case Against Google*, N.Y. TIMES (20 Feb. 2018), <https://www.nytimes.com/2018/02/20/magazine/the-case-against-google.html> (last accessed 18 October 2019).

¹²³ See, e.g., CJEU, Joined Cases C-241/91 P & C-242/91 P, *Radio Telefis Eireann & Independent Television Publications Ltd v. Comm’n* [1995] E.C.R. I-808.

¹²⁴ *New York ex rel. Schneiderman v. Actavis plc*, 787 F.3d 638, 658-60 (2d Cir. 2015). See Dmitry Karshtedt, *The More Things Change: Improvement Patents, Drug Modifications, and the FDA*, 104 IOWA L. REV. 1129 (2019).

¹²⁵ See, e.g., William F. Lee & Douglas A. Melamed, *Breaking the Vicious Cycle of Patent Damages*, 101 CORNELL L. REV. 385 (2016); Einer Elhauge, *Do Patent Holdup and Royalty Stacking Lead to Systematically Excessive Royalties*, 4 J. COMPETITION L. & ECON. 535-570 (2008); Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991 (2007).

developing innovation policy in ways that do not depend exclusively on arguments about economic efficiency.¹²⁶ And as Laurence Helfer and Graeme Austin have shown, human rights approaches hold great promise for dealing with many of the issues discussed above.¹²⁷ For example, principles of human rights could address distributive issues, give data subjects more control over personal information, and provide avenues for demanding algorithmic accountability of technologies that make decisions with an impact on fundamental values, such as free speech, liberty, and equal treatment.

One problem with the human rights approach is that these regimes tend to protect both the rights of authors and inventors in the moral and material interests in their work as well as the right of the public to participate in cultural life and share in the benefits of scientific advancement.¹²⁸ Thus, human rights law can be read to simply mirror the balance between static and dynamic efficiency that is inherent in IP law. However, Farida Shaheed, UN Special Rapporteur in the field of cultural rights, made an important move when she noted that the right to material benefits does not require that authors and inventors capture *all* the surplus generated by their creativity. It can be enough that they enjoy an adequate standard of living.¹²⁹ Her view suggests that practices such as compulsory licenses, limitations and exceptions to IP rights, a relaxed approach to secondary liability, and bans on evergreening are justifiable so long as right holders enjoy “enough.”¹³⁰ The rub lies in determining what constitutes enough. Much of the research suggested earlier is relevant to the inquiry.

¹²⁶ Amy Kapczynski, *Intellectual Property's Leviathan*, 77 LAW & CONTEMP. PROBS. 131 (2015).

¹²⁷ LAURENCE R. HELFER & GRAEME W. AUSTIN, HUMAN RIGHTS AND INTELLECTUAL PROPERTY: MAPPING THE GLOBAL INTERFACE (Cambridge Univ. Press 2011).

¹²⁸ See, e.g., G.A. RES. 217 (III)A, UNIVERSAL DECLARATION OF HUMAN RIGHTS, art. 27 (10 Dec. 1948); G.A. Res. 2200A (XXI), International Covenant on Economic, Social and Cultural Rights, art. 15, 21 U.N. GAOR, Supp. (No. 16), U.N. Doc. A/6316 (1966) (entered into force Mar. 23, 1976), 993 U.N.T.S. See also Charter of Fundamental Rights of the European Union, 2000 O.J. (C 364,1), arts. 17, 11 & 13 [hereinafter Charter of Fundamental Rights].

¹²⁹ REPORT OF THE SPECIAL RAPPORTEUR IN THE FIELD OF CULTURAL RIGHTS: PATENTS, ¶ 10, U.N. Doc. A/70/279 (2015) [hereinafter REPORT ON PATENTS]; REPORT ON COPYRIGHT, *supra* note 17, ¶ 12.

¹³⁰ REPORT ON PATENTS, *supra* note 129, at ¶¶ 47 & 27.

III. INSTITUTIONS

Innovation is heavily dependent not only on the laws affecting incentives to create and the flexibility to copy, but also on the institutions that administer these laws and that are regulated by them. As noted earlier, when government institutions are not up to the task of implementing the law accurately, even the best set of measures can produce problematic outcomes. In those circumstances—when the needs of the creative sector are not met—then a variety of other institutions may step in to take up the slack. In this section, I examine the fit between institutions and the demands of the Knowledge Economy and the Information Age, looking at a few of the public, private, and supranational institutions that exist or are emerging. Institutional research should be of particular interest to social scientists because the proliferation of these entities creates many opportunities for comparative study.

A. Existing Institutions

There are too many IP institutions to cover in this essay. For these purposes, I outline some of the issues that surround one public institution, the courts that adjudicate IP cases, and one institution that includes both private and public actors, the universities where many of the discoveries that undergird the Information Age originate.

1. Specialized courts

Among the most intriguing features on the contemporary IP landscape are specialized courts, which have been established to adjudicate IP (especially patent) disputes. This trend began in earnest with the creation of the United States Court of Appeals for the Federal Circuit to hear all patent appeals from regional US trial courts and from the United States Patent and Trademark Office.¹³¹ The court, which was established in 1982, was mainly designed to reduce the overloaded dockets of the regional appellate courts. Congress, however, also considered concentrating patent cases in a single tribunal a desirable way to create uniform law across the country, limit forum shopping, and develop a cadre of judges with special expertise in understanding technical information and applying complicated, esoteric legal rules. This, it was thought, would

¹³¹ See, e.g., Rochelle Cooper Dreyfuss, *The Federal Circuit: A Case Study in Specialized Courts*, 64 N.Y.U. L. REV. 1 (1989); Rochelle Cooper Dreyfuss, *The Federal Circuit: A Continuing Experiment in Specialization*, 54 CASE W. RES. L. REV. 769 (2004).

stabilize patent law, prevent a race to trade secrecy, and encourage investments in innovation. The EU is endeavoring to follow suit with the Unified Patent Court Agreement (UPCA).¹³² The UPCA would create a new patent right, the Unitary Patent, which would protect the right holder in all UPCA countries. Applications would be examined by the existing European Patent Office (EPO) under the criteria set out in the European Patent Convention (EPC).¹³³ Important here is that the UPCA would also create a new set of tribunals (trial and appellate courts), collectively known as the Unitary Patent Court (UPC), to entertain disputes involving the new patents.¹³⁴ The EU is far from alone in establishing such a system: a 2012 report found over 90 specialized IP courts around the world.¹³⁵

While there have been several studies of these courts, it remains unclear how they affect the environment for innovation. The US patent bar appears to believe that the Federal Circuit has improved patent practice;¹³⁶ some would even strip the Supreme Court of its appellate authority to review the Federal Circuit's jurisprudence. However, other observers have deduced from the frequency with which the Supreme Court intervenes to reverse the Federal Circuit that specialization is detrimental to the sound administration of the law.¹³⁷ They see it as creating tunnel vision and reducing opportunities for jurisprudential development through inter-court dialogue. The result, they say, is that patents are overvalued at the expense of other important interests, decisions are biased in favor of patent holders, and—as Justice Breyer

¹³² Council Regulation 1257/2012 implementing enhanced cooperation in the area of the creation of unitary patent protection, 2012 O.J. (L 361/1); Agreement on a Unified Patent Court, 2013 O.J. (C 175,1), signed 19 Feb. 2013.

¹³³ European Patent Convention, 5 Oct. 1973, 13 I.L.M. 268.

¹³⁴ See EUROPEAN PATENT OFFICE, UNITARY PATENT AND UNIFIED PATENT COURT, <https://www.epo.org/law-practice/unitary.html> (last accessed 18 October 2019).

¹³⁵ USPTO & INTERNATIONAL INTELLECTUAL PROPERTY INSTITUTE, STUDY ON SPECIALIZED INTELLECTUAL PROPERTY COURTS 2 (2012), <http://iipi.org/wp-content/uploads/2012/05/Study-on-Specialized-IPR-Courts.pdf> (last accessed 18 October 2019).

¹³⁶ See, e.g., Donald R. Dunner, *2014 Friedman Appellate Advocacy Lecture*, 24 FED. CIRCUIT B.J. 381 (2015).

¹³⁷ See, e.g., Timothy B. Lee, *Specialist Courts are Part of the Problem*, FORBES (19 Aug. 2011), <https://www.forbes.com/sites/timothylee/2011/08/19/specialist-patent-courts-are-part-of-the-problem/#6b805e7e4d21> (last accessed 18 October 2019).

put it—there are patents that issue which impede progress.¹³⁸ At the same time, there is evidence that specialization can breed contempt. Thus, Mark Lemley found that the more patent cases a trial judge sees (the more often claims of startling unanticipated results are heard), the less often that judge is likely to decide that a particular advance is inventive enough to protect.¹³⁹

While the conditions that produce a pro- or anti-patent disposition remain unclear, it may be that the structure of the court matters a great deal.¹⁴⁰ In the US, specialization comes between adjudication by two courts of general jurisdiction—regional trial courts and the Supreme Court. Furthermore, while the Federal Circuit hears all patent appeals, it entertains other cases as well. The UPC offers another model, one of total specialization—the courts will hear no other cases—and specialization at both the first and second instance. However, unlike the Federal Circuit, where all the judges are lawyers from a single highly developed county, UPC judges will sit with technically-trained jurists and the judiciary will be chosen to represent all of the members of the UPC system, including states that are net importers of technology. Thus, if it comes into being, the UPC court will create an ideal opportunity to tease out the factors that empower a tribunal to contribute in a positive way to the climate for innovation.

2. Universities

Universities play a particularly important role in technological progress. Most academic scholarship lies in the realm of fundamental science; much of it is supported by the government. Thus, these institutions raise questions about how well academic research reflects society's interests

¹³⁸ See, e.g., Hon. Diane P. Wood, *Keynote Address: Is It Time to Abolish the Federal Circuit's Exclusive Jurisdiction in Patent Cases?*, 13 CHI.-KENT J. INTELL. PROP. 1 (2014); Rochelle C. Dreyfuss, *Percolation, Uniformity, and Coherent Adjudication: The Federal Circuit Experience*, 66 SMU L. REV. 505 (2013).

¹³⁹ Mark A. Lemley, *Does Familiarity Breed Contempt Among Judges Deciding Patent Cases*, 66 STAN. L. REV. 1121 (2014). There is also a question as to whether specialized trial courts are reversed less often on appeal, see Amy Semet, *Specialized Trial Courts in Patent Litigation: A Review of the Patent Pilot Program's Impact on Appellate Reversal Rates at the Five-Year Mark*, 60 B.C. L. REV. 519 (2019).

¹⁴⁰ See INTERNATIONAL CHAMBER OF COMMERCE, *ADJUDICATING INTELLECTUAL PROPERTY DISPUTES* (2016), <https://iccwbo.org/publication/adjudicating-intellectual-property-disputes-an-icc-report-on-specialised-ip-jurisdictions/> (last accessed 18 October 2019).

and whether taxpayers obtain a sufficient return on their investment. Until the early 1980s, the US espoused a linear model of innovation, one that assumed that the mere existence of upstream scientific output would induce firms to develop downstream commercial products.¹⁴¹ Accordingly, it left federally-funded university work in the public domain or patented and licensed it out on a nonexclusive basis—university work was, in short, essentially free for commercializers to adopt and translate into products.

At around the same time that establishing the Federal Circuit was under debate, there was also considerable dissatisfaction with the uptake of research efforts financed by the government. The linear model of innovation was rejected in favor of a more collaborative picture, in which theoretical and applied science were thought to influence one another.¹⁴² Enacted in 1980, the Bayh Dole Act allows universities to claim patent rights in federally funded work and make their own licensing decisions.¹⁴³ Under Bayh Dole, universities can use exclusive licenses in ways somewhat similar to Sichelman's commercialization patents: some of the expected supracompetitive profit can be allocated to commercial actors to interest them in investing in the work necessary to take academic science from the lab bench to the market place. A portion can also be awarded to faculty in order to encourage them to become more involved in commercialization activity and to develop a better sense of social needs. As with the Federal Circuit, this approach has spread around the world; now virtually all research universities have technology transfer offices (TTOs) and faculty who are involved in spin-offs or sit on the scientific advisory boards of commercial firms.¹⁴⁴

Considerable attention has been given to this new model, with much of the literature questioning whether universities are, in fact, the best

¹⁴¹ Vannevar Bush, when Director of the Office of Scientific Research and Development after World War II, was an exponent of this view, see VANNEVAR BUSH, *SCIENCE: THE ENDLESS FRONTIER* (US Government Printing Office 1945).

¹⁴² See Rochelle Dreyfuss, *Double or Nothing: Technology Transfer under the Bayh-Dole Act*, in *BUSINESS INNOVATION AND THE LAW: PERSPECTIVES FROM INTELLECTUAL PROPERTY, LABOUR, COMPETITION AND CORPORATE LAW* (Marilyn Pittard, et al., eds. Edward Elgar Publishing 2013).

¹⁴³ 35 U.S.C. §§ 200–212 (2014).

¹⁴⁴ See, e.g., SHIRI M. BREZNITZ & HENRY ETZKOWITZ, *UNIVERSITY TECHNOLOGY TRANSFER: THE GLOBALIZATION OF ACADEMIC INNOVATION* (Routledge 2017).

stewards of translational activities.¹⁴⁵ Most TTOs lose money and it is not hard to understand why. Because the work at large universities is so varied, it is difficult for a single TTO to exploit all of it wisely; some of the work is so far upstream, it can be hard to attract commercial partners; and many TTOs are too poorly funded to protect all of the advances made within their institutions. There are now other approaches under consideration,¹⁴⁶ including Australia's CSIRO,¹⁴⁷ the US National Center for Advancing Translational Sciences,¹⁴⁸ the University of Southern California's Alfred E. Mann Institute,¹⁴⁹ the California Institute for Quantitative Biosciences (QB3),¹⁵⁰ MIT's Deshpande Center,¹⁵¹ and Oxford University Innovation.¹⁵² These organizations use a variety of strategies to support innovation. Some engage in research directly but most are designed to help launch new firms, supply seed money and advice, and assist in commercialization activities. Some concentrate in a particular sector, rather than serve the university as a whole. There is also debate on whether academic scientists should be given a larger role in decisions on commercialization issues, such as on whether to patent, how to license, and whether the university TTO or some other organization should handle the exploitation of their inventions. Now that academics are better attuned to commercialization, some argue that individual

¹⁴⁵ See, e.g., Liza Vertinsky, *Universities as Guardians of their Inventions*, 2012 UTAH L. REV. 1949 (2012); Arti Rai & Rebecca S. Eisenberg, *Bayh-Dole Reform and the Progress of Biomedicine*, 66 LAW & CONTEMP. PROBS. 289 (2003).

¹⁴⁶ See, e.g., Mike Alvarez Cohen, *Strategies for Developing University Innovation Ecosystems: An Analysis, Segmentation and Frame-Work Based on Somewhat Non-Intuitive and Slightly Controversial Findings*, 51 LES NOUVELLES 184 (2016). See also NATIONAL RESEARCH COUNCIL, *MANAGING UNIVERSITY INTELLECTUAL PROPERTY IN THE PUBLIC INTEREST* (National Academies Press 2010).

¹⁴⁷ See COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION, <https://www.csiro.au/> (last accessed 18 October 2019).

¹⁴⁸ See NATIONAL CENTER FOR ADVANCING TRANSLATIONAL SCIENCES, <https://ncats.nih.gov/> (last accessed 18 October 2019).

¹⁴⁹ See ALFRED E. MANN INSTITUTE FOR BIOMEDICAL ENGINEERING, <http://ami.usc.edu/> (last accessed 18 October 2019).

¹⁵⁰ See UNIVERSITY OF CALIFORNIA, QB3, <https://qb3.org/> (last accessed 18 October 2019).

¹⁵¹ See MASSACHUSETTS INSTITUTE OF TECHNOLOGY, DESHPANDE CENTER FOR TECHNOLOGICAL INNOVATION, <http://deshpande.mit.edu/> (last accessed 18 October 2019).

¹⁵² See OXFORD UNIVERSITY INNOVATION, <https://innovation.ox.ac.uk/> (last accessed 18 October 2019).

faculty members should hold the IP rights associated with their own research efforts.¹⁵³

B. Emerging Institutions

The Information Age has also precipitated the creation of new institutional arrangements. In some cases, interest is triggered by the differential speeds at which changes occur. Innovation is largely forward-looking and can develop rapidly; law is inherently conservative and moves slowly. The disparity can create a gap between the support the creative community needs and what the law supplies. Fissures can also occur when familiar institutions break down, as they may be doing at the international level though the exit of the UK from the EU, and because of Trumpian antipathy to pluri- and multi-lateralism (including the Trans-Pacific Partnership Agreement (TPP; renamed the Comprehensive and Progressive Trans-Pacific Partnership Agreement (CPTPP) after the United States exited),¹⁵⁴ the World Trade Organization (WTO), and the United Nations).¹⁵⁵ This section considers a few of the private and supranational institutions that are emerging to deal with these issues.

1. Private ordering regimes: MOUs, SSOs, knowledge commonses, and other self-help measures

The secondary liability issue discussed in Part II exemplifies the problems caused when the law lags behind technological development. Theories of liability taken from the physical world and adapted to the internet have created a great deal of uncertainty about the scope of infringement liability. Worse, they have not provided adequate protection to either platforms or rights holders.¹⁵⁶ When a series of cases in the

¹⁵³ See Dreyfuss, *supra* note 142. See also ANN LOUISE MONOTTI & SAM RICKETSON, *UNIVERSITIES AND INTELLECTUAL PROPERTY OWNERSHIP AND EXPLOITATION* (Oxford University Press 2003); Paul Jensen & Elizabeth Webster, *Funding Research in Universities: The Watt Report 2015*, 49 AUSTRALIAN ECON. REV. 184 (2016).

¹⁵⁴ For information on both the TPP and the CPTPP, see <https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-in-force/cptpp/comprehensive-and-progressive-agreement-for-trans-pacific-partnership-text-and-resources/> (last accessed 17 October 2019).

¹⁵⁵ Daniel W. Drezner, *Why the Trump Administration Hates Multilateral Trade Agreements the Most*, WASHINGTON POST (9 March 2017), <https://www.washingtonpost.com/posteverything/wp/2017/03/09/why-the-trump-administration-hates-multilateral-trade-agreements-the-most/> (last accessed 18 October 2019).

¹⁵⁶ See, e.g., *Tiffany (NJ) Inc. v. eBay Inc.*, 600 F.3d 93 (2d Cir. 2010).

CJEU involving auction sites that allegedly facilitated the sale of counterfeit trademark goods failed to resolve the problem,¹⁵⁷ EU stakeholders in the e-commerce space developed a private memorandum of understanding (MOU) to create a more certain environment in which to conduct business.¹⁵⁸ The MOU forestalls litigation through an agreement on the proactive and preventive measures that trademark holders and internet platforms must take. It also includes commitments to cooperate and share information about primary infringers.

There is much to recommend an approach of this type. Because private agreements are made by those intimately acquainted with the technology, the challenges it presents, and the costs of both infringement and preventing infringement, they are likely superior to any arrangement devised by a court. Moreover, in so far as they bind all potential litigants across a geographical region, they avoid the instability caused by successive suits in national courts with overlapping authority over the relevant actors. Private ordering is also better than *sui generis* measures developed by legislators who are unfamiliar with the needs of the industry and who may not realize how fast the sector can change. While the EU MOU is limited to trademark infringement and binds only parties in the member states, analogous MOUs could be developed for the online infringement of other IP rights. Significantly, they could also be extended across national boundaries without the need for high-level international negotiations. Indeed, somewhat similar arrangements are in more general use. For example, standard setting organizations (SSOs; also called standards developing organizations, SDOs) solve the problem of ensuring that competing products can interoperate with one another. Experts in the sector agree on standards and identify standard essential IP rights (mainly patents). The participants then usually promise to license these out on fair, reasonable, and nondiscriminatory (FRAND) terms.¹⁵⁹

¹⁵⁷ CJEU, Case C-324/09, *L'Oréal SA v. eBay Int'l AG* [2011] E.C.R. I-6011; Joined Cases C-236/08–C-238/08, *Google France SARL v. Louis Vuitton Malletier SA*, [2010] E.C.R. I-2417.

¹⁵⁸ MEMORANDUM OF UNDERSTANDING [ON THE SALE OF COUNTERFEIT GOODS VIA THE INTERNET] (21 June 2016), https://ec.europa.eu/growth/industry/intellectual-property/enforcement/memorandum-understanding-sale-counterfeit-goods-internet_en (last accessed 18 October 2019). See Graeme B. Dinwoodie, *Secondary Liability for Online Trademark Infringement: The International Landscape*, 37 COLUM. J.L. & ARTS 463 (2014).

¹⁵⁹ See, e.g., Jorge L. Contreras, *From Private Ordering to Public Law: The Legal Frameworks Governing Standards-Essential Patents*, 30 HARV. J.L. & TECH. 211 (2017).

While the EU MOU and SSOs both deal with legal problems facing existing technologies, private ordering can also be used to expedite the development of new products or solve scarcity and distributive problems. As we saw, the IP system does not deal well with the needs of those who cannot afford (or refuse to pay) supracompetitive prices. Private arrangements can help by coordinating the efforts of groups motivated by diverse goals. For example, they can manage relationships between a nonprofit patient advocacy group and a university or a commercial firm, between researchers in developed and less developed countries, or among for-profit organizations with similar research interests but with different plans for exploitation.¹⁶⁰ The participants may share information, develop platforms to facilitate collaboration, invent new products, and work to commercialize them.¹⁶¹ The arrangements—so called “knowledge commonses”—usually include rules on the responsibilities of each participant; regulate their access to intermediate outputs (such as experimental data); and allocate rights in, and profits from, the resulting projects.¹⁶² Some also establish boundary rules to ensure that the internal integrity of each type of contributor (be it public, private, commercial, or nonprofit) is preserved.¹⁶³ More prosaically, in cases where existing products are in short supply or available only at very high prices, those who need the products may create a new entity to produce them. Examples include an effort by US hospitals to create enough generic pharmaceuticals to meet their needs and university initiatives to archive research papers in open repositories.¹⁶⁴

¹⁶⁰ See, e.g., Leslie Chan & Sely Costa, *Participation in the Global Knowledge Commons: Challenges and Opportunities for Research Dissemination in Developing Countries*, 106 NEW LIBR. WORLD 141 (2005).

¹⁶¹ See, e.g., Jorge Conteras & Jerome Reichman, *Sharing by Design: Data and Decentralized Commons*, 350 SCIENCE 1312 (2015).

¹⁶² See BRETT M. FRISCHMANN, MICHAEL MADISON & KATHERINE J. STRANDBURG, *GOVERNING KNOWLEDGE COMMONS* (Oxford University Press 2015); Jorge L. Contreras, *Data Sharing, Latency Variables, and Science Commons*, 25 BERKELEY TECH. L.J. 1601 (2010); J. H. Reichman & Paul F. Uhler, *A Contractually Reconstructed Research Commons for Scientific Data in A Highly Protectionist Intellectual Property Environment*, 66 LAW & CONTEMP. PROBS. 315 (2003).

¹⁶³ Katherine K. Chen & Siobhan O’Mahony, *Differentiating Organizational Boundaries*, in *STUDYING DIFFERENCES BETWEEN ORGANIZATIONS: COMPARATIVE APPROACHES TO ORGANIZATIONAL RESEARCH* 183 (Brayden G. King, Teppo Felin & David A. Whetten, eds. Emerald Group Publishing Ltd. 2009).

¹⁶⁴ Reed Abelson & Katie Thomas, *Fed Up With Drug Companies, Hospitals Decide to Start Their Own*, N.Y. Times (18 Jan. 2018), <https://www.nytimes.com/>

While private ordering can be effective, it is necessary to consider whether these arrangements are optimal from both a private and a social perspective. For example, the EU trademark MOU is an agreement among commercial stakeholders: platforms (like eBay) that sell trademarked goods and trademark holders (like the Lego Group) whose trademarks are infringed. It does not include consumers, including those who would value a convenient place to buy goods and, under the law, have a right to learn about various producers through the fair use of trademarks. Similarly, SSOs involve existing market participants; their activities can raise questions about the ability of others to enter the sector. Some alliances—such as a hospital consortium to make generic drugs—could have an impact on other producers. Sometimes, the arrangements may be incomplete in ways that affect the public interest. In the case of SSOs, for example, the meaning of FRAND is in such sharp dispute, the agreements have led to considerable litigation.¹⁶⁵ In other cases, the less sophisticated parties in these arrangements may find themselves cut off from access to the output of the knowledge commons to which they contributed. That, for example, was the fate of the Canavan patient advocacy group after the genetics of the disease were elucidated by its partner.¹⁶⁶

To put this another way, it is important to evaluate the impact of such agreements on the public and to consider how far they stray from the laws that would otherwise apply.¹⁶⁷ In some cases, that can be difficult because the parties are experts and use language and concepts, or invoke technical requirements, that cannot be easily penetrated or analyzed by

2018/01/18/health/drug-prices-hospitals.html (last accessed 18 October 2019); Andres Guadamuz & Diane Cabell, *Data Mining in UK Higher Education Institutions: Law and Policy*, QUEEN MARY J. INTELL. PROP. 3 (2014).

¹⁶⁵ See, e.g., Jorge L. Contreras, *The New Extraterritoriality: FRAND Royalties, Anti-Suit Injunctions and the Global Race to the Bottom in Disputes over Standards-Essential Patents*, 25 B.U. J. SCI. & TECH. L. 251 (2019); Srividhya Ragavan, Brendan Murphy & Raj Davé, *FRAND v. Compulsory Licensing: The Lesser of the Two Evils*, 14 DUKE L. & TECH. REV. 83 (2015); Stanley M. Besen, *Why Royalties for Standard Essential Patents Should Not Be Set by the Courts*, 15 CHI.-KENT J. INTELL. PROP. 19 (2015).

¹⁶⁶ See Girod & Drabiak, *supra* note 69.

¹⁶⁷ See, e.g., Philippe Chappatte, *FRAND Commitments—The Case for Antitrust Intervention*, 5 EUR. COMPETITION J. 319 (2015). See also C. Scott Hemphill, *Paying for Delay: Pharmaceutical Patent Settlement As A Regulatory Design Problem*, 81 N.Y.U. L. REV. 1553 (2006) (examining private agreements to settle litigation).

outsiders.¹⁶⁸ As more is learned about private ordering, it may well be that they require what Graeme Dinwoodie has called public structuring.¹⁶⁹ That might take the form of government intervention to set the parameters within which an agreement can alter positive law. Or the government might establish procedural requirements, such as rules on transparency or recourse to a court and appellate process when disputes arise. The European Commission's Communication on Standard Essential Patents, which sets out guidelines for SSO practices on licensing, enforcement, and transparency, exemplifies the intervention approach.¹⁷⁰ Intervention could also include off-the-shelf agreements that would-be collaborators can use, safe in the knowledge that they are comprehensive, even handed, and well understood by the parties and the courts. For example, the US National Institutes of Health created a resource list of private agreements pertinent to medical research.¹⁷¹

2. Supranational procedural institutions: the UPC (redux) and other tribunals, The Hague Conference

A more troubling gap may be opening between law and the needs of the creative sector: the longstanding commitment to multilateralism in IP appears to be breaking down. Existing instruments (such as the Berne and Paris Conventions and the TRIPS Agreement) impose minimum substantive standards and do not purport to fully harmonize the laws of member states. However, the expectation has been that as the creative sector becomes more tightly knit, successive rounds of negotiations or new instruments would draw national laws into closer alignment. For example, in the EU, where goods move freely, IP law is more harmonized than it is among WTO members under the TRIPS Agreement. The TPP (now CPTPP) falls somewhere between the two in key areas, such

¹⁶⁸ See TIM BÜTHE & WALTER MATTLI, *THE NEW GLOBAL RULERS: THE PRIVATIZATION OF REGULATION IN THE WORLD ECONOMY* (Princeton University Press 2011).

¹⁶⁹ Graeme B. Dinwoodie, *Private Ordering and the Creation of International Copyright Norms: the Role of Public Structuring*, 160 J. INSTIT. AND THEORETICAL ECON. 161 (2004). See also Mulligan, *supra* note 119 (arguing for state intervention in the terms available under EULAs).

¹⁷⁰ EUROPEAN COMMISSION, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL AND THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, SETTING OUT THE EU APPROACH TO STANDARD ESSENTIAL PATENTS, COM/2017/0712 Final (29 Nov. 2017), <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2017:0712:FIN> (last accessed 17 October 2019).

¹⁷¹ NATIONAL INSTITUTES OF HEALTH, RESOURCES: FORMS AND MODEL AGREEMENTS, <https://www.ott.nih.gov/resources> (last accessed 17 October 2019).

as on rules for the digital economy.¹⁷² The hope among the parties has been that if it is successful, its rules might eventually be multilateralized.

However, thanks to the possible exit of the UK from the EU, withdrawal of the US from the TPP and its plans to renegotiate the North American Free Trade Agreement (NAFTA) and possibly the WTO Agreement, the prospect of further harmonization is now in doubt. To be sure, my coauthor, Graeme Dinwoodie, and I have argued for a degree of heterogeneity in international IP lawmaking.¹⁷³ Flexibility promotes public acceptance because it allows each state to adapt international standards to its own values and situation. And given the earlier discussion of the uncertainties introduced by new technologies, it is helpful to leave room for a country to serve as what Justice Louis Brandeis called “a laboratory [for] novel social and economic experiments.”¹⁷⁴

That said, Dinwoodie and I have also argued that it is too late to return to the pure Westphalian statehood Trump and the Brexiteers envision, where each country can “Make [Itself] Great Again,” without regard to the needs of others.¹⁷⁵ At least for IP law (and likely other laws as well), globalization is simply too far along: multinational enterprises and global value chains are too entrenched, consumer taste is too cosmopolitan, expertise and capital are too mobile, and worldwide distribution channels are too developed for either producers or consumers to be satisfied with fragmented laws and an international regime that makes transnational transactions in knowledge goods difficult, expensive, and risky.¹⁷⁶ And while both the Brexiteers and the Trumpians plan to replace the older instruments with a series of bilateral trade agreements, it is difficult to imagine how such a system would fail to produce uneven protection,

¹⁷² CPTPP, Chs. 14 (electronic commerce) & 18 (Intellectual Property). See Thomas Streinz, *Contested Rulemaking for the Digital Economy*, in CONTESTED MEGAREGULATION: GLOBAL ECONOMIC ORDERING AFTER TPP (Benedict Kingsbury, David Malone, Richard B. Stewart & Atsushi Sunami, eds. Oxford University Press 2019). See also Laurence R. Helfer, *Regime Shifting in the International Intellectual Property System*, 7 PERSP. ON POL. 39 (2009).

¹⁷³ DINWOODIE & DREYFUSS, *supra* note 110. See also Jerome H. Reichman & Rochelle Cooper Dreyfuss, *Harmonization Without Consensus: Critical Reflections on Drafting a Substantive Patent Law Treaty*, 57 DUKE L.J. 85 (2007).

¹⁷⁴ *New State Ice Co. v. Liebmann*, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting).

¹⁷⁵ Graeme B. Dinwoodie & Rochelle Cooper Dreyfuss, *Brexit and IP: The Great Unraveling?*, 39 CARDOZO L. REV. 967 (2018).

¹⁷⁶ See, e.g., *Harvard College v. Canada (Commissioner of Patents)*, [2002] 4 SCR 45, 2002 SCC 76, ¶ 13 (Binnie, J., dissenting).

conflicting rules, hard questions about existing obligations (particularly national treatment and most favoured nation status), and disputes that cycle among tribunals without producing a final resolution on what international law requires.¹⁷⁷ Indeed, history suggests that multilateralism was developed to solve exactly these sorts of problems.¹⁷⁸

But if the day for multilateralism has passed (for now), new institutions could emerge to facilitate global coordination. They would do it not through substantive harmonization, but rather with novel procedural arrangements. One proposal is to develop judicial institutions that are able to resolve global disputes, even when they arise under laws that differ in significant ways. The UPC may well evolve into a prototype of such an institution. Not all EU members joined the UPCA. However, until Brexit, all the participating countries were members of the EU. While it is possible that the UK will therefore be required to leave upon exit, its presence in the system is extremely valuable, for it creates a larger market for the holders of Unitary Patents. Moreover, retaining the UK allows experienced UK judges to serve on the Unified Patent Court and contribute to the development of UPCA law. To permit that to happen, it will, however, be necessary to transform the UPC into a new institution—an international, rather than an EU court. That court will be required to develop ways to deal with the skepticism with which Brexiteers regard review by the CJEU. And if the UK replaces EU instruments of relevance to IP (the Biotech Directive, the Charter of Fundamental Rights, EU competition law¹⁷⁹) with legislation of its own, the UPC will further be required to adjudicate cases arising under more than one body of law. Once (if) that bridge is crossed, other countries could also join the UPC—certainly, the other nations that belong to the

¹⁷⁷ An example is the worldwide dispute between Anheuser Busch and Budvar, which raises questions about national responsibilities to protect trademarks and geographical indications under various agreements, see Graeme B. Dinwoodie & Rochelle C. Dreyfuss, *Designing A Global Intellectual Property System Responsive to Change: The WTO, WIPO, and Beyond*, 46 HOUS. L. REV. 1187, 1192–93 (2009).

¹⁷⁸ SAM RICKETSON & JANE C. GINSBURG, *INTERNATIONAL COPYRIGHT AND NEIGHBORING RIGHTS: THE BERNE CONVENTION AND BEYOND*, §2.01 (2d ed. Oxford University Press 2006).

¹⁷⁹ Directive 98/44/EC of the European Parliament and the Council on the legal protection of biotechnological inventions, 1998 O.J. (L 213/3); Charter of Fundamental Rights, 2000 O.J. (C 364/01); Consolidated Version of the Treaty on the Functioning of the European Union of 13 Oct. 2007, 2016 O.J (C 202,47), arts. 101-106.

European Patent Convention and the validation states,¹⁸⁰ but possibly other countries as well. After all, if the UPC became adept at resolving cross-border patent disputes involving multiple sources of law, it would become very attractive to patent-intensive firms like Apple and Samsung. These firms operate globally and now find themselves litigating essentially the same case in multiple forums, sometimes to conflicting judgments.¹⁸¹ A court with the authority to consolidate a global dispute could save both private and public resources by resolving the cases in one fell swoop.

The UPC will deal only with patents, yet other IP industries have similar problems. But even if the idea for an international patent court is farfetched or too narrowly focused, there are other potentially useful procedural approaches for dealing with global disputes. Saskia Sassen predicted over 20 years ago that in a globalized trade environment, the sites for the “articulation of sovereignty” must change. For dispute resolution, her solution was commercial arbitration.¹⁸² Gary Born, a preeminent arbitrator and lawyer, has taken up this idea and is campaigning for an international agreement that would adopt, as a default rule, a requirement that the citizens of member states arbitrate their transnational commercial disputes.

Indeed, for IP, arbitration of transnational cases has been popular and has proved to have many advantages.¹⁸³ It avoids races to national courthouses and eliminates the risk of multiple (and possibly conflicting) judgments. Because arbitral awards are subject to the New York Convention,¹⁸⁴ enforcement is straightforward and rarely subject to appeal. Disputes involving parties in multiple countries can be decided with a single set of lawyers. Accordingly, arbitration can be significantly

¹⁸⁰ For a list of countries that recognize EPO patent grants, see <https://www.epo.org/about-us/foundation/validation-states.html> (last accessed 17 October 2019).

¹⁸¹ See Matthew Lammertse, *Apple vs. Android: Global Software Patentability and the Mobile OS Wars*, 39 *BROOK. J. INT'L L.* 793 (2014). See also cases cited in note 196, *infra*.

¹⁸² SASKIA SASSEN, *LOSING CONTROL* 14–15 & 39 (Columbia University Press 1996).

¹⁸³ For statistics, see WIPO ARBITRATION AND MEDIATION CENTER, *RESULTS OF THE WIPO ARBITRATION AND MEDIATION CENTER INTERNATIONAL SURVEY ON DISPUTE RESOLUTION IN TECHNOLOGY TRANSACTIONS* (2013), <http://www.wipo.int/export/sites/www/amc/en/docs/surveyresults.pdf> (last accessed 17 October 2019).

¹⁸⁴ Convention on the Recognition and Enforcement of Foreign Arbitral Awards, 10 June 1958, 21 U.S.T. 2517, 330 U.N.T.S. 38.

cheaper than litigation (even after the costs of private proceedings are paid). Since the parties usually have a role in choosing the arbitrators, they can select for expertise in the relevant issues and technologies. Furthermore, the proceedings can be kept confidential, meaning that decisions that disfavor the right holder—that for example, hold a patent invalid—do not damage the value of the right with respect to nonparties. Most important, an arbitral decision can bring the parties global peace and certainty.¹⁸⁵

But as with private ordering, the advantages of arbitration to the parties must be measured against its public impact. At one time, intellectual property was considered a public right. In the US, for example, arbitration of IP disputes was regarded skeptically because awards could affect access interests and act as a cover for anticompetitive practices. However, in 1985, the Supreme Court permitted the enforcement of an international arbitration agreement in a dispute arising under competition law, which at the time was also considered unarbitrable because of its public dimension.¹⁸⁶ Since then, IP arbitration has also been regarded as acceptable. In fact, the Patent Act now explicitly permits the arbitration of patent disputes.¹⁸⁷ Still, arbitration has several worrisome aspects. It reduces the salience of IP disputes on the national docket, making it harder for legislators to learn about or regulate problems arising in the IP realm. In countries that rely on common law development, arbitration can dampen the ability of the law to respond to changes in the technological environment. Repeat players—usually IP holders rather than users—have distinct advantages: they are better acquainted with the process and choose arbitrators more often. There is thus a fear that arbitrators, interested in improving their employment opportunities, will favor (or be perceived as favoring) the interests of the creative industries over those who rely on the knowledge produced.

The resolution of domain name disputes demonstrates the concern. In many internet domains, registrants are required to agree to the Uniform Domain Name Dispute Resolution Policy (UDRP) promulgated by the Internet Corporation for Assigned Names and Numbers (ICANN). The

¹⁸⁵ Sandra J. Franklin, *Arbitrating Technology Cases*, 80 MICH. B.J. 30 (2001). For an example of practitioners' enthusiasm for arbitration, see BIRD AND BIRD, *ARBITRATION OF INTELLECTUAL PROPERTY DISPUTES* (2007), <https://www.lexology.com/library/detail.aspx?g=51bc7611-e988-4a1e-9bf1-3108becf8748> (last accessed 17 October 2019).

¹⁸⁶ *Mitsubishi Motors Corp v. Soler Chrysler-Plymouth, Inc.* 473 U.S. 614 (1985).

¹⁸⁷ 35 U.S.C. § 294 (2014).

UDRP requires arbitration of domain name disputes.¹⁸⁸ Although it does not preclude resort to courts,¹⁸⁹ Andrew Christie has shown that the system has been remarkably successful at efficiently resolving cross-border disputes over the use of trademarks as domain names.¹⁹⁰ Nonetheless, because trademark holders are the repeat players in the UDRP regime and have the right to choose the provider of arbitration services, there is a strong perception—borne out by statistics—that the system favors right holders.¹⁹¹

There has been even more dissatisfaction voiced about arbitration in the context of investor-state dispute settlement (ISDS) under BITs and FTAs that allow investors to challenge state measures (including IP-related actions) on the ground that they constitute expropriation or a denial of fair and equitable treatment.¹⁹² As in commercial arbitration, observers are concerned that the arbitrators are biased in favor of right holders and do not sufficiently consider the public interest that the respondent state is attempting to further.¹⁹³ Accordingly, there has been significant clamor to change the process: to make it more transparent, to permit appeal, and to curb the use of ad hoc arbitrators.¹⁹⁴ Recent

¹⁸⁸ ICANN, UNIFORM DOMAIN NAME DISPUTE RESOLUTION POLICY, art. 4 (a) (1999), <https://www.icann.org/resources/pages/policy-2012-02-25-en> (last accessed 17 October 2019).

¹⁸⁹ *Id.*, art. 4(k).

¹⁹⁰ Andrew F. Christie, *Online Dispute Resolution: The Phenomenon of the UDRP*, in RESEARCH HANDBOOK ON THE CROSS-BORDER ENFORCEMENT OF INTELLECTUAL PROPERTY 642 (Paul Torremans ed. Edward Elgar Publishing 2014).

¹⁹¹ See, e.g., Gerald M. Levine, *Is the UDRP Biased in Favor of Trademark Owners?*, 88 N.Y. ST. B.J. 18 (2016); Michael Geist, *Fair.com?: An Examination of the Allegations of Systemic Unfairness in the ICANN UDRP*, 27 BROOK. J. INT'L L. 903 (2002).

¹⁹² See, e.g., *Philip Morris Brands SARL v. Oriental Republic of Uruguay*, ICSID Case No. ARB/10/7, Award (8 July 2016); *Eli Lilly and Co. v. Government of Canada*, UNCITRAL, ICSID Case No. UNCT/14/2, Final Award (16 March 2017); Dreyfuss & Frankel, *supra* note 4; Rochelle Dreyfuss & Susy Frankel, *Reconceptualizing ISDS: When is IP an Investment and How Can States Regulate It?*, 21 VAND. J. ENTER. & TECH. L. 337 (2018).

¹⁹³ See, e.g., Robert Howse, *International Investment Law and Arbitration: A Conceptual Framework*, INT'L L. & LITIG. 363 (Hélène Ruiz Fabri, ed. Nomos 2019).

¹⁹⁴ See, e.g., James Gathii & Cynthia Ho, *Regime Shifting of IP Lawmaking and Enforcement from the WTO to the International Investment Regime*, 18 MINN. J.L. SCI. & TECH. 427 (2017); UNITED NATIONS COMMISSION ON INTERNATIONAL TRADE LAW [UNCITRAL] RULES ON TRANSPARENCY IN

investment agreements suggest that the criticism is beginning to have an effect: the 2017 Comprehensive Economic and Trade Agreement between Canada and the EU (CETA) creates a sitting tribunal, an appellate body to review initial decisions, and a commitment to pursue the establishment of a multilateral investment court.¹⁹⁵ While there are certainly differences in terms of public impact between commercial arbitration, where awards largely affect businesses, and ISDS, where awards can intrude into sovereign power to legislate in the public interest, some of the approaches suggested for ISDS may be appropriate for private disputes, such as in IP, that have important implications for public welfare.

Another alternative is to improve the ability of national courts to handle cross-border and multinational disputes. Courts have been reluctant to consolidate such disputes because entertaining them would require judges to apply foreign laws and make decisions that will affect foreign populations. They also fear that, for all the effort that would be required, the judgments they render could be challenged and held, in whole or in part, nonenforceable or in conflict with the decision of another court that had been seized with all or part of the same dispute.¹⁹⁶ While courts have in recent years responded to concerns about fragmented and repetitive adjudication by becoming somewhat more receptive to multinational cases,¹⁹⁷ an international agreement on procedural issues including jurisdiction, choice of law, and enforcement of judgments would offer courts guidance on how to proceed and provide assurance that their work

TREATY-BASED INVESTOR-STATE ARBITRATION (2014), <http://www.uncitral.org/pdf/english/texts/arbitration/rules-on-transparency/Rules-on-Transparency-E.pdf> (last accessed 17 October 2019); Charles H. Brower, II, *Structure, Legitimacy, and NAFTA's Investment Chapter*, 36 VAND. J. TRANSNAT'L L. 37 (2003).

¹⁹⁵ Comprehensive Economic and Trade Agreement Between Canada, of the one Part, and the European Union and its Member States, of the other Part signed 30 Oct. 2016, 2017 O.J. (L 11, 23).

¹⁹⁶ See, e.g., *Voda v. Cordis Corp.*, 476 F.3d 887 (Fed. Cir. 2007); CJEU, Case C-4/03, *Gesellschaft für Antriebstechnik mbH & Co KG v. Lamellen und Kupplungsbau Beteiligungs KG* [2006] E.C.R. I-6523; id. Case C-593/03, *Roche Nederland BV v. Primus & Goldberg* [2006] E.C.R. I-6569.

¹⁹⁷ See, e.g., *Unwired Planet International Ltd v Huawei Technologies Co Ltd*, Court of Appeal, London, UK [2018] EWCA Civ 2344 (entertaining global case involving FRAND licenses); *Eli Lilly and Co. v. Actavis UK*, [2017] UKSC 49 (consolidating enforcement actions involving the UK, Italian, French, and Spanish designations of a European patent); *Lucasfilm Ltd. v. Ainsworth*, [2011] UKSC 39 (consolidating US and UK copyright claims); CJEU, Case C-145/10, *Painer v. Standard Verlags* [2011] E.C.R. I-12533 (consolidating Austrian and German copyright cases).

will not be in vain. In 2008, the American Law Institute published a set of principles to demonstrate how such an instrument might work and to suggest procedures for consolidation.¹⁹⁸ A somewhat similar project was completed in Europe.¹⁹⁹ In 2019, the Hague Conference on Private International Law promulgated a convention that sets out rules on jurisdiction and the enforcement of judgments in cross-border cases.²⁰⁰ However, its ambit does not extend to most IP disputes. Admittedly, there are many difficulties in a system that would allow the courts of one country to pass judgment on the validity and enforceability of foreign rights.²⁰¹ Nevertheless, as between the current system of atomistic adjudication, wholesale diversion to arbitration, or waiting for an international forum to emerge, an institutional arrangement under the auspices of the Hague Conference may present the best alternative.

IV. CONCLUSION

We live in interesting times, in an Information Age, when the economy turns on technological development, when technologies—and technologies for creating technology—are changing rapidly. We find ourselves in a world where international cooperation may be growing—but might be fading. In this new era, we face an acute need for research on how IP law should be structured to efficiently transform ideas into products and disseminate them effectively. There are many problems. However, there is one heartening feature on the contemporary scene: the interest in intellectual property research has increased dramatically.

¹⁹⁸ AMERICAN LAW INSTITUTE, *INTELLECTUAL PROPERTY: PRINCIPLES GOVERNING JURISDICTION, CHOICE OF LAW, AND JUDGMENTS IN TRANSNATIONAL DISPUTES* (American Law Institute 2008).

¹⁹⁹ EUROPEAN MAX PLANCK GROUP ON CONFLICT OF LAWS IN INTELLECTUAL PROPERTY, *CONFLICT OF LAWS IN INTELLECTUAL PROPERTY: THE CLIP PRINCIPLES AND COMMENTARY* (Oxford University Press 2013).

²⁰⁰ HCCH, *Convention of 2 July 2019 on the Recognition and Enforcement of Foreign Judgments in Civil and Commercial Matters*, <https://www.hcch.net/en/instruments/conventions/full-text/?cid=137> (last accessed 17 October 2019).

²⁰¹ For example, in the *Eli Lilly v. Actavis* case cited in note 197, *supra*, the court determined that the defendant infringed the Italian patent; Italian courts initially reached the opposite conclusion in a later case on similar facts, *Fresenius Kabi Oncology plc v. Eli Lilly and Co.*, N.R.G. 54470/2016 (12 Sept. 2017), *rev'd*, Case No. 45209/2017 (Court of Milan 15 October 2018).

Scholars now entering the field are beginning to keep pace with the growing importance of innovation and IP law to the economy and public welfare.