COOPERATION AND CONTEXTUALIZED PATENT REMEDIES

Liza Vertinsky

ABSTRACT

Patent law, which was created in response to a constitutional mandate to encourage innovation, now threatens to impede it. Advances in technology have enabled new ways of pooling knowledge and computational capabilities, facilitating cooperation among many participants with complementary skills and motivations to collectively and openly develop solutions to complex scientific or technological problems. But emerging models of cooperative innovation increasingly run into patent roadblocks.

Why might patent law sometimes thwart instead of support socially beneficial cooperative innovation? The problem lies in the disconnect between the focus of patent law on the right of an inventor to exclude others from use of his or her invention and the principles of inclusion and sharing that motivate emerging models of cooperative innovation. While the complexity and cost of solving contemporary public challenges are nudging diverse participants together to combine and collectively build their knowledge, patents often serve to keep them apart. While digital technologies enable new forms of massively distributed, open and collaborative innovation, patents threaten the vitality and even the viability of these promising new types of innovation.

In this Article I use two examples –the battle between proprietary software companies and free open source software platforms and the risk of crowding out crowd science, to illustrate how patent law in its current form may sometimes impede beneficial kinds of cooperation in innovation. I argue that patent remedies should be constrained in ways that facilitate the co-existence of alternative systems of innovation, and I provide guidelines for administering patent remedies with broader concepts of cooperation in mind.
COOPERATION AND CONTEXTUALIZED PATENT REMEDIES

Liza S. Vertinsky∗

INTRODUCTION

In the long history of humankind (and animal kind, too), those who learned to collaborate and improvise most effectively have prevailed. - Charles Darwin

Patent law, created in response to a Constitutional mandate to encourage innovation, now threatens to impede it. Advances in technology have enabled new ways of pooling knowledge and computational capabilities. They have facilitated cooperation among many participants with complementary skills and motivations to collectively and openly develop solutions to complex scientific or technological problems.

∗ © Liza S. Vertinsky 2013. Associate Professor of Law, Emory University School of Law. Many thanks to Timothy Holbrook, Mary Dudziak, Paul Heald, Bill Church, Yaniv Heled, Cynthia Ho, Michael Perry, Joseph Miller, Christina Mulligan, Tun-Jen Chiang, Katherine Strandburg, Brett Frischmann and Michael Madison for their comments and ideas on this project. This Article also benefits from the comments of participants at the 2013 Works in Progress in IP conference at Seton Hall Law School, the 2013 PatCon, the 2013 University of Georgia-Emory University Conference, and the 2013 Intellectual Property Scholars Conference.
Cooperative processes of innovation can harness new resources, bring multiple disciplines and perspectives to bear on previously intractable scientific problems, and provide competition in key areas of intellectual production. But emerging models of cooperative innovation often run into patent roadblocks.

The problems that patents pose for cooperative innovation are becoming difficult to ignore.1 The patent litigation wars between major players in the smart phone industry such as Apple, Samsung, Google and Microsoft illustrate the divisive role that patents can play in an industry that relies upon the shared development and use of technology standards to achieve interoperability, particularly when network effects are important. By some accounts Apple and Google now spend more on patent litigation than they do on R&D.2 The effects of patents on systems of innovation that

1See e.g. Rochelle C. Dreyfuss, Does IP Need IP? Accommodating Intellectual Production Outside the Intellectual Property Paradigm, 31 CARDOZO L. REV. 1437 (2010)(describes need to change intellectual property law to accommodate new forms of collaborative intellectual production); Katherine J. Strandburg, Evolving Innovation Paradigms and the Global Intellectual Property Regime, 41 CONN. L. REV. 861 (2009)(current IP regimes not designed to cope with changes in the innovative process); Mark Lemley, The Myth of the Sole Inventor, 110 MICH. L. REV. 709 (2012)(“If patent law in its current form can be saved, we need an alternative justification for granting patents even in circumstances of near-simultaneous invention.”); Aija Leiponen and Justin Byma, If you cannot block, you better run: Small firms, cooperative innovation and appropriation strategies, 38 RESEARCH POLICY 1478 (2009)(“Earlier research has emphasized patents and trade secrets as key strategies of appropriation, yet these strategies do not appear to be very beneficial for small firms engaged in cooperative innovation. These results raise policy questions regarding the functionality of the existing system of intellectual property rights.”).

2See e.g. Charles Duhigg and Steve Lohr, In Technology Wars, Using the Patent as a Sword, New York Times, Technology Section, Oct. 8, 2012 at http://mobile.nytimes.com/2012/10/08/technology/patent-wars-among-tech-giants-can-stifle-competition.xml (“In the Smartphone industry alone, according to a Stanford University analysis, as much as $20 billion was spent on patent litigation and patent purchases in the last two years - an amount equal to eight Mars rover missions. Last year, for the first time, spending by Apple and Google on patent lawsuits and unusually big-dollar patent purchases
rely more heavily on non-market based mechanisms and incentives to sustain cooperation is potentially even more costly, however.

Systems of decentralized, massively distributed open innovation are emerging with increasing frequency and with the ability to harness new resources in powerful new ways.\(^3\) People with no prior involvement in biotechnology contribute hours of their time to solve protein folding puzzles posed by Foldit, an online video game that uses crowd science to solve complex scientific problems.\(^4\) Some of the video game players end up with publishable scientific results.\(^5\) Data gathered from volunteer bird watchers through the global ornithological network eBird are used to detect environmental changes that might otherwise go unnoticed.\(^6\) The U.S. Air Force is harnessing collaborative online platforms to solicit input from students on complex technological problems.\(^7\) Building on the efforts of a $173 million National Institute of Health (NIH) funded Human Microbione Project, a group of institutions has created the American Gut project to collect bacteria samples from citizen scientist volunteers.\(^8\) Arch2POCM, a pre-competitive public-private partnership also backed by NIH funding, is formed to “leverage the collective brain trust” of pharmaceutical companies exceeded spending on research and development of new products, according to public filings.”)

\(^3\) See Yochai Benkler; Eric von Hippel. For a list of some crowd science projects see Citizen Science, Scientific America, at http://www.scientificamerican.com/citizen-science/.

\(^4\) See Foldit home page, at http://fold.it/portal/info/about.


\(^6\) See e.g. Jim Robins, Crowdsourcing, for the Birds, New York Times, August 19, 2013 (eBird aggregates data about bird sightings that could not be collected other than through individual observations and uses it to uncover changes in the environment).


\(^8\) See American Gut, described on the Human Food Project website, at http://humanfoodproject.com/americangut/
and researchers through an open access, massively distributed approach to
the discovery and clinical validation of pioneer targets for human disease.\textsuperscript{9}

All of these processes rely on cooperation among many
participants with diverse motivations and skills to collectively and openly
develop solutions to complex scientific or technological problems. As
cooperative systems such as these emerge and grow, they must confront
legal rules that are designed with a very different model of cooperation in
mind – sometimes at great cost. Open source software systems like Linux
challenge proprietary products like Microsoft Windows in the market
place, only to find their viability threatened by patent lawsuits.\textsuperscript{10} Low
transaction costs become higher, corporate participants gain more control
over the directions that open source projects take and don’t take,
commitment to the openness of open source is tempered, and risks
associated with participating in open source projects increase. Ironically,
the open source software community finds it necessary to spend billions of
dollars acquiring patents as a way of protecting free software use.\textsuperscript{11} While

\textsuperscript{9}See T. Norman, C. Bountra, A. Edwards, K. Yamamoto and S. Friend, Leveraging
Crowdsourcing to Facilitate the Discovery of New Medicines, Vo. 2 Issue 8
www.ScienceTranslationalMedicine.org, June 22, 2011. The name Arch2PCOM is
derived from the terms archipelago – a distributed network of entities (ARCH), and
proof of clinical medicine (PCOM). Members include pharmaceutical companies, EU,
US and Canadian regulatory and funding agencies, academic institutions, patient
advocacy groups and contract research organizations. Discovery and early clinical
information are openly shared, with no patent protection, enabling scientists to
identify novel applications for test molecules that impact clinical outcomes.

\textsuperscript{10}See e.g. Roger Parloff, Microsoft takes on the free world, Fortune Magazine, May
(“Microsoft claims that free software like Linux, which runs a big chunk of corporate
America, violates 235 of its patents. It wants royalties from distributors and users.
Users like you, maybe.”)

\textsuperscript{11}See e.g. Deborah Nicholson, Open Invention Network: Defensive Patent Pool for
Open Source Projects and Businesses, Technology Innovation Management Review, January
crowd science projects like Foldit share many similarities with open source software projects, defensive patenting strategies are neither feasible nor affordable for most of these projects. Here the real cost of patents lies in threats to the viability and vibrancy of the projects themselves. As Foldit begins to yield potentially patentable discoveries, participants in Foldit start to worry about the implications and risks of sharing their knowledge and using shared knowledge, jeopardizing the modes of cooperation on which Foldit relies.\(^\text{12}\)

In this article I use two case studies drawn from industries that play a critical role in economic growth and competitiveness to illustrate how patent law in its current form may be disadvantaging some kinds of socially beneficial cooperative innovation.\(^\text{13}\) I begin with the open source software movement and the ongoing patent battles between proprietary software companies and supporters of free open source software platforms. I point to ways in which patents in their current form may hamper open source systems of innovation. I then examine the potential that crowd science has to solve complex scientific problems in biotechnology, as demonstrated by the successes of Foldit. Again I point to ways in which the promise of this type of open, massively distributed innovation might be limited instead of enhanced by patents.\(^\text{14}\)

\(^{12}\)See developer chat room discussions on Foldit web site, at http://fold.it/portal/node/986061

\(^{13}\)It is important to note that not all forms of cooperation are socially beneficial, as well documented in antitrust scholarship on collusion and cartels. I am arguing simply that there are some forms of cooperative innovation that offer social benefits, such as lower cost innovation, competition with existing proprietary systems, or the creation of new products and ideas that might otherwise be unavailable.

Supporting emerging forms of cooperative innovation has become an important goal for policymakers eager to find new ways of pooling resources to overcome economic and scientific hurdles. While the need for cooperation to solve scientific and technological problems is not a new phenomenon, what is new is the scale and complexity of the problems that need to be solved and the large and diverse group of people who can come together to solve them using decentralized, low cost, web based technologies. I refer to these kinds of open, distributed innovation processes collectively as “cooperative innovation.” Scholars of innovation such as Yochai Benkler and Eric von Hippel have challenged us to consider what changes to the design of the legal and institutional system are necessary to sustain cooperative innovation. They have identified intellectual property law, particularly patent law, as threatening the open, inclusive and collaborative nature of these systems. But they and other scholars following in their wake have left the precise contours and weakening patents may not necessarily mean greater access. See e.g. Jonathan Barnett, “Is Intellectual Property Trivial?,” 157 University of Pennsylvania Law Review 1691 (2009). I am not arguing that cooperative innovation would flourish in the absence of patents, but only that the existing patent system creates problems for certain kinds of cooperative innovation strategies that could be addressed through changes to patent law.

See e.g. Ernan McMullin, Openness and Secrecy in Science: Some Notes on Early History, 10 Science, Technology & Human Values No. 2 (1985) (examines the history of the ideal and reality of open science).

“Policy-makers …can design institutions and social systems to foster cooperation by shaping social and psychological dynamics, rather than by focusing on individual incentives. The question then becomes, what aspects of the design of an institution or system—be it technical platform, legal rule, business process, or policy intervention—are likely to lead to a stable cooperative social dynamic.” Yochai Benkler, Law, Policy, and Cooperation, in E.J. Balleisen and D. A. Moss, eds. GOVERNMENT AND MARKETS: TOWARDS A NEW THEORY OF REGULATION, Cambridge University Press (2010); see also Eric von Hippel, DEMOCRATIZING INNOVATION, MIT Press (2005) (Open, distributed innovation is “attacking” a major structure of the social division of labor. ... governmental policy and legislation sometimes preferentially supports innovation by manufacturers. Considerations of social welfare suggest that this must change. The workings of the intellectual property system are of special concern.)
magnitude of the patent threats and specific proposals for patent law change for further study.\textsuperscript{17}

This article responds to the challenge by identifying and addressing some of the ways in which patent law may interfere with non-market mechanisms that support cooperative innovation. It focuses on three mechanisms that play a critical role in cooperative innovation systems: trust, reciprocity, and fairness/benefit sharing. Patents pose risks for these mechanisms by increasing incentives for group members to defect from the group and by increasing threats from third parties against the group. These risks increase the cost of participating in cooperative systems, make sharing norms harder to sustain, and allow private actors to appropriate the benefits from collective intellectual production. In response to these risks, I introduce three guidelines that are designed to contextualize the design of patent remedies in a way that limits the costs of patents for productive collective action.\textsuperscript{18} The purpose of these guidelines is to incorporate the social cost of patents in situations where patents may impede desirable forms of collective action. Building these costs into judicial and legislative decisions about injunctive relief and damages and determinations about the need for defenses and exemptions from patent infringement can be used to level the playing field for alternative innovation regimes. This approach is applied to the case studies to illustrate how patent remedies might be implemented differently if the courts, Congress, relevant agencies and the public all took cooperation more seriously.

\textsuperscript{17}See Katherine Strandburg, IP at the Boundaries (sets out an agenda for investigating how IP rules impact cooperative innovation systems).
\textsuperscript{18}It is important to note that not all kinds of cooperation are socially desirable, and patents may sometimes limit undesirable forms of cooperation. See e.g. K. Lultti, T. Takalo and J. Toikka, Patents Hinder Collusion, Helsinki Center of Economic Research Discussion Paper, January 2007; F. Scott Kieff, On Coordinating Transactions in Information: A Response to Smith’s Delineating Entitlements in Information, 117 YALE L.J. POCKET PART 101 (2007). See also Jonathan M. Barnett, Dynamic Analysis of Intellectual Property: Theory, Evidence and Policy (2013)(Observes that IP laws always intervene in markets that have private sources of IP rights, and that periods of weak patent protection may actually disadvantage new entrants). The challenge is to find ways of tailoring patent law in ways that at a minimum do not make existing collective action problems worse.
The Article proceeds as follows. Part I examines why patent law in its current form may fail to address the needs of cooperative innovation. It suggests that current approaches to patent law need to be expanded to encompass cooperation that falls outside of traditional market driven production and exchange. This includes processes of intellectual production that rely on collective trust and reciprocity, the pursuit of non-monetary benefits such as reputation and use, and intrinsic motivations such as altruism and the desire to be creative.\textsuperscript{19} Part II shows how patent law could be adapted to accommodate a richer variety of innovation systems through limited changes to patent remedies. Rather than fundamentally changing patent law, it may be enough to limit the effects that patents have on non-market mechanisms for cooperation by internalizing these costs when fashioning patent remedies. Part II provides three guidelines for courts and legislators to use in the design and implementation of patent remedies. The guidelines provide one way of internalizing the negative effects of patents on core mechanisms of non-market cooperation such as trust, reciprocity, and benefit sharing into decisions about injunctive relief, patent damages, and defenses to infringement.\textsuperscript{20} Part III uses the two case studies described earlier to

\textsuperscript{19}See e.g. Rochelle Dreyfuss, IP without IP, supra no. __. See also Gregory Mandel, To Promote the Creative Process: Intellectual Property Law and the Psychology of Creativity, 86 Notre Dame L. Rev. 1999 (2011)(recognizes importance of collaborative efforts among innovators and the psychological effects that patent laws can have on incentives to innovate, particularly in collaborations); Gregory Mandel, Left-Brain versus Right-Brain: Competing Conceptions of Creativity in Intellectual Property Law, 44 U.C. Davis L. Rev. 283 (2010)(notes that intellectual property law has failed to recognize insights from psychology, neurobiology and cultural research about how to promote creativity, resulting in laws based on distorting stereotypes of creativity); Michael Mattioli, Communities of Innovation, 106 Northwestern Law Review 103 (2012)(examines collective patent licensing to inform discussion about role of collective behavior in the patent system).

\textsuperscript{20}The literature includes an increasing number of proposals for tailoring patent remedies in ways that take the public interest in supporting innovation into account. See e.g. Sarah R. Wasserman Rajec, Tailoring Remedies to Spur Innovation, 61 AM. U. L. REV. 733 (2012); Ted Sichelman, Purging Patent Law of ‘Private Law’
illustrate the problems that patents may sometimes pose for cooperative innovation and to test the use of the guidelines to mitigate these problems. Part IV addresses some of the potential costs associated with this contextualized approach to patent remedies and suggests why the change is nevertheless worth making.

I. MAKING ROOM FOR COOPERATIVE INNOVATION

"Gettin’ good players is easy. Gettin’ ’em to play together is the hard part." - Casey Stengel

Although patent law did not quite make it into the headlines of the 2012 presidential campaign, for the first time it came close. During his re-election campaign President Obama challenged the image of the rugged individual inventor and entrepreneur. He emphasized the social context in which innovation takes place and the importance of cumulative contributions to business success.21 In one of his campaign speeches, now known as the “you didn’t build that” campaign speech, President Obama told his audience that “[i]f you were successful, somebody along the line gave you some help…,” emphasizing the essential role of public infrastructure and collective knowledge in supporting individual

Remedies (September 23, 2011), Texas Law Review (forthcoming); Samson Vermont, Basing Patent Remedies on Harm to the World Instead of Harm to the Patente, working paper (2011). It also includes proposals for tailoring patent remedies to reflect the relational or transactional aspects of patents. See e.g. Paul J. Heald, Optimal Remedies for Patent Infringement: A Transactional Model, 45 Houston L. Rev. 1165 (2008)(goal of patent remedies to provide incentives for efficient transactions to occur while minimizing cost of transacting); Thomas F. Cotter, Patent Holdup, Patent Remedies, and Antitrust Response, 34 J. Corp. L. 1151 (2009)(focuses on relational value of patents and importance of employing practical reason as approach to patent remedies, argues that patent law has a role in supporting private efforts to avoid patent hold up).

achievement. The heated controversy that ensued highlighted in a very public way competing views among policymakers and the public about the role of the individual versus the community in spurring economic growth. Other areas of the law, such as antitrust law, have evolved in response to changing paradigms of innovation. The same questioning of traditional views of innovation should be taking place in patent law. Instead, patent law has remained seemingly impervious to the shifting social, economic and technological structures of innovation.

Indeed, at the same time as innovation is becoming more cooperative – in the sense of simultaneous discovery, team invention, increasing collaboration even among competitors, and new paradigms of open and distributed innovation, the ways in which patents are being used are becoming in many ways less cooperative. Patents are used primarily as defensive tools in high technology industries such as software and semiconductors, with the primary goal of deterring infringement suits. Even open source development communities find themselves in the

---

22This speech now has its own spot on Wikipedia. See a full discussion of this and related speeches at http://en.wikipedia.org/wiki/You_didn't_build_that
23See e.g. Christina Bohannan and Herbert J. Hovenkamp, IP and Antitrust: Reformation and Harm, 51 BOST. COLL. L. REV. 905 (2010) (antitrust law further along than patent law in tying remedies to the public law goal); Herbert J. Hovenkamp, Innovation and the Domain of Competition Policy, 60 ALABAMA L. REV. 103 (2008)
24See e.g. Robert C. Allen, Collective Invention, 4 J. ECON. BEHAV. & ORG. 1 (1983); Mark Lemley, Myth of the Sole Inventor; Dreyfuss, Commodifyng Collaborative Research, supra n. 11; OPEN INNOVATION: RESEARCHING A NEW PARADIGM (Henry Chesbrough et al. eds, 2005); Michael Mattioli, Communities of Innovation, 106 NORTHWESTERN UNIVERSITY LAW REVIEW 103 (2012).
business of stockpiling patents for defensive purposes. While at first blush these defensive strategies may seem to support cooperation, this kind of cold war deterrence is both expensive and limited in what and who it protects. Moreover, it involves coalition building, creates barriers to entry, and fuels incentives to acquire large numbers of patents, some of which inevitably fall into the hands of patent trolls. As patenting moves upstream into increasingly early stage discoveries, even private companies find themselves worrying about the cost of preserving access to knowledge and the privatization of the public domain.

This is not to suggest that patents are always a constraint on innovation or that innovation would increase in the absence of patents. Patents play important roles in attracting resources and providing market


incentives for proprietary, producer driven innovation.\textsuperscript{29} Patents can also enable limited departure from closed, producer driven system of innovation by supporting open innovation models in which companies sell or license out unused technologies and acquire or license in third party discoveries.\textsuperscript{30} The problem is not that patents interfere with all forms of cooperation, but rather that patents can systematically and significantly disadvantage some forms of socially valuable cooperative innovation.\textsuperscript{31} Since it is effectively impossible to opt out of the patent system, change is needed from within patent law to give these forms of cooperative innovation a chance to compete.\textsuperscript{32} Such change has not been forthcoming.

\textit{A. Limits of Traditional Model}

What explains the seeming intransigence of patent law to changing modes of intellectual production? After all, in many ways the U.S. patent system has changed a lot since the passage of the first patent act in 1790. Patent law has, for example, moved from a registration system administered by a three member board, with registration up front and patents examined later by the courts if challenged, to an application and

\textsuperscript{29}See e.g. Scott Kieff, Property & Intellectual Property, n.7; Paul Heald, Transaction Cost, n.7.

\textsuperscript{30}See e.g. Henry Chesbrough, OPEN INNOVATION: THE NEW IMPERATIVE, 2003 (defines open innovation as “is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology.”). See also Jonathan Barnett, Intellectual Property as Organization.


examination system administered by a large government agency.\footnote{See e.g. Morgan Sherwood, The Origins and Development of the US Patent System, American Scientist Vol 71, Issue 5, p. 500-506.} Even within the last forty years there have been significant changes in substantive, procedural and administrative aspects of the law, including the formation of a specialized court of appeals to hear patent cases,\footnote{A specialized court of appeals, the Federal Circuit, was created in 1980 to hear appeals of patent cases.} the passage of a comprehensive international treaty governing intellectual property law,\footnote{See Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, 33 I.L.M. 1197 (1994)} and most recently the passage of the America Invents Act, an amendment to the patent statute signed into law on September 16, 2011 that includes a shift to a first to file system for awarding patents, an expansion of what constitutes prior art, and new avenues for challenging the patent after it is granted.\footnote{See e.g Dan L. Burk, Lessons Learned: The new America Invent Act resolves some old issues, but it creates some worrisome new ones, Regulation, P 20, Winter 2012-2013.} The courts have also been actively modifying patent law doctrine in response to patent law issues raised by advances in science and technology, such as the patentability of genes and self-replicating technologies.\footnote{See e.g. Myriad case.}

In at least one fundamental way, however, patent law has remained remarkably unchanged. The U.S. patent statute, as well as the broader international patent law framework now in place, is anchored on a paradigm of market-based, producer driven innovation.\footnote{See e.g. Dreyfuss, Commodifying Collaborative Research, supra n. 11 (examines myth of the individual inventor and disjuncture between current IP law and issues of importance to collaborators).} Indeed, the patent system is even designed “with a paradigm invention in mind – a new device or machine covered by a single patent”,\footnote{See e.g. Mark Lemley and Carl Shapiro, Patent Holdup and Royalty Stacking, supra n. __, p. 1992.} and a paradigm inventor
interested in seeing this new device or machine commercialized.\textsuperscript{40} It is focused on solving a market failure that occurs for the inventor within that paradigm.\textsuperscript{41} Rational actors engage in the discovery and development of inventions in response to market incentives. These inventors know what their inventions are, the inventions have independent commercial value, and patents provide the economic incentives needed to produce and push inventions through development and into usable forms.\textsuperscript{42}

Patent law has evolved around reward and disclosure functions within a mass market producer-driven paradigm of innovation.\textsuperscript{43} As a result, the patent statute and implementing laws and regulations deal primarily with the creation, definition and enforcement of ownership rights over inventions and the administration of this process.\textsuperscript{44} The right of the patent owner to exclude others from use of the invention forms the backbone of patent law, and most of the statute is devoted to defining and policing these rights. The statute pays much less attention to the source

\textsuperscript{40}The rising costs on innovators imposed by patent trolls, non-practicing entities that acquire patents solely to obtain revenue from license fees and damages from litigation, has already highlighted the limits of this paradigm. See e.g. Colleen V. Chien, From Arms Race to Marketplace: The New Complex Patent Ecosystem and Its Implications for the Patent System (November 5, 2010). Hastings Law Journal, Vol. 62, p. 297.


\textsuperscript{42}See e.g. Charles Leadbeater, Talk on Innovation, TED.

\textsuperscript{43}See e.g. ROBERT P. MERGES, JUSTIFYING INTELLECTUAL PROPERTY (2011) (traditional justification for IP law based on market based incentives); Katherine Strandburg, Evolving Innovation Paradigms and the Global Intellectual Property Regime, 41 Connecticut Law Review 861 (2009).

\textsuperscript{44}See United States Code Title 35 – Patent Law. Part I of the statute deals with the establishment and operation of the USPTO, Part II focuses primarily on how to obtain a patent, including requirements for patentability. Part III focuses on protection of patent rights. Part IV deals with the Patent Cooperation Treaty, addressing international issues relevant to the Act.
and nature of the inputs leading to invention,\textsuperscript{45} and to how the subsequent patents are managed and used,\textsuperscript{46} or even more importantly not used.\textsuperscript{47} Provided that the patent owner sticks to the scope of the patent and doesn’t try to leverage it in ways that constitute patent misuse, there are few limits on the owner’s right to exclude others from use of the patented invention once its validity has been established. Efforts to accommodate the special issues that arise when different entities collaborate to innovate within the patent statute have been largely confined to addressing the barriers that sharing information may pose for patenting inventions that emerge from the collaboration.\textsuperscript{48} By focusing primarily on this model of innovation, patent law neglects the needs of other forms of intellectual production.\textsuperscript{49}

This neglect of the context and the community in which innovation occurs pervades not only the patent statute but also the case law. To illustrate, until recently the owner of a valid patent was presumed to have the right to stop uses of the patented invention by third parties, leaving the

\textsuperscript{45}See e.g. Mark Lemley, The Myth of the Sole Inventor, supra n. 9; Mark Lemley, Point of Novelty.

\textsuperscript{46}See e.g. Hovenkamp (rules dealing with patent management confined to defining what constitutes infringement, remedies, patent misuse).


\textsuperscript{48}See the Cooperative Research and Technology Enhancement (CREATE) Act, Pub. L. No. 108-453 (enacted Dec. 10, 2004), which amends Section 103 of the Patent Act. For a discussion of the CREATE Act, including some potential concerns that it may pose for participants in collaborations, see e.g. L. Vertinsky, Understanding and Applying the CREATE Act in Collaborations. Chapter 3 in AUTM Technology Transfer Practice Manual, 2008. See also Scott Pierce, The Effects of the Leahy-Smith America Invents Act on Collaborative Research, 94 JPTOS 133 (2012).

\textsuperscript{49}While the requirement to disclose the invention could be seen as facilitating sharing, it is at best a limited form of sharing. See also Timothy R. Holbrook, Possession in Patent Law, 59 SMU Law Review No. 1. (points out disconnect between role of disclosure as teaching and theory of combatting free riding, suggests that we think of the function of disclosure as possession).
users to battle this presumption in court.\textsuperscript{50} Defenses to infringement based on special circumstances of creation and use, such as independent discovery or experimental use, remain narrow even after changes introduced to patent law by the America Invents Act to expand protections for prior inventors.\textsuperscript{51} Concepts of fair use such as those found in copyright law are missing altogether from the patent statute.\textsuperscript{52} Members of a community that contribute valuable ideas to the inventor are simply out of luck unless they have the resources and the ability to show that they are joint inventors,\textsuperscript{53} the invention was derived from them,\textsuperscript{54} or that the

\textsuperscript{50}This presumption took the form of the almost automatic right of a patent owner who proved patent infringement to injunctive relief under Federal Circuit case law prior to the Supreme Court decision in Ebay. The Ebay decision overturned this presumption. See eBay, Inc. v. MercExchange, LLC, 547 US 388 (2006).

\textsuperscript{51}See e.g. Mark Lemley, The Myth of the Solo Inventor, 110 MICH. L. REV. 709 (2012) (Evaluates problems with the traditional theories of patent law and their disconnect with real world experience, particularly in the context of independent invention). The Leahy-Smith America Invents Act (AIA) expands the protection for prior inventors. It provides a “prior use defense” to patent infringement that protects parties who can establish that they have in good faith commercially used a product or process covered by a patent at least one year before the earlier of the public disclosure or the effective filling date of the patent disclosing the invention. Although this defense is significantly more robust than the one it replaced, it includes a number of limitations. See Report to Congress, January 2012, Report on the Prior User Rights Defense, prepared by the USPTO, at http://www.uspto.gov/aia_implementation/20120113-pur_report.pdf. See also Katherine J. Strandburg, Patent Fair Use 2.0, 12 UC IRVINE L. REV. 266 (2011) (argues that there should be greater use of defenses and exemptions to patent infringement to respond to the different contexts in which inventions are used).

\textsuperscript{52}See e.g. Maureen A. O'Raourke, Toward a Doctrine of Fair Use in Patent Law, 100 COLUM. L. REV. No. 5 (2000) (argues that new technology has put pressure on patent laws that increasingly interfere with follow on innovation, and proposes a doctrine of fair use in patent law to relieve some of this pressure). See also Lorelei Ritchie de Larena, What Copyright Teaches Patent Law About "Fair Use" and Why Universities Are Ignoring the Lesson, 84 OR. L. REV. 779 (2005) (argues that a doctrine of fair use will help reduce negative externalities and clarify expectations on what type of infringement is actionable); Katherine Strandburg, Patent Fair Use.

\textsuperscript{53}Where an invention is made by two or more persons jointly, they are considered joint inventors even if they did not work together or make the same kinds or amount
A patented invention would be obvious to individual community members in light of the combined knowledge and effort of the community. \(^{55}\) Determining who contributed what to an invention in a collaborative effort is notoriously difficult, particularly where innovation takes the form of cumulative, incremental contributions by many participants. \(^{56}\) Showing that an invention was derived from the cumulative, widely shared discoveries of the group is also both costly and challenging, \(^{57}\) and the limits that non-obviousness imposes on patentability are unlikely to provide adequate protection for collective knowledge production. \(^{58}\) Patent law, both on the books and as applied, remains oriented around the patent ownership rights of the pioneering lone inventor or his or her assignee.

Modern processes of invention and innovation, by contrast, increasingly involve formal and informal collaborations among and incremental contributions by many heterogeneous participants. The lone inventors have moved out of the garage or lab and onto the internet, where they work with other people to share data, pool knowledge and solve
Invention is increasingly the product of more than one inventor and is often the result of team production. Simultaneous discovery is also common, suggesting that inventions are a social phenomenon. Communities of innovation emerge as users seek to solve their own problems or meet their own needs, members of the public spend their time solving scientific puzzles, and networks of academics experiment with open science. User driven innovation models are competing with, and even displacing, traditional producer approaches to innovation in contexts ranging from scientific instrumentation and software to mountain bikes and snowboards. In other cases of cooperative innovation members of the general public self select into communities of innovation simply because they want to, devoting their free time to issues of social importance or intellectual intrigue such as drug discovery or the evolution of dinosaurs. Contributions of time and ideas are made on a voluntary basis, and ideas are shared freely for the benefit of the group or for the public at

59 See e.g. Rochelle C. Dreyfuss, Comminging Collaborative Research, in THE COMMODIFICATION OF INFORMATION, Neil Netanel & Neva Elkin Koran, eds., Kluwer Law International (“In fact, the artist starving in a garret, the scientist madly experimenting in the garage, and the reclusive professor burning midnight oil are all rapidly becoming myths.”)
60 See e.g. Dreyfuss, Comminging IP, supra n. ___.
61 See e.g. Mark Lemley, The Myth of the Sole Inventor, supra n. ___.
62 See e.g. Michael Mattioli, Communities of Innovation, 106 NORTHWEST. UNIV. L. REV. No. 1 (2012) (describes communities of innovation and the role of collective behavior in the patent system).
64 See von Hippel, supra n. 12.
large. Prominent examples of open source innovation include Wikipedia, the peer produced encyclopedia, and Linux, a widely used open source software operating system.65

These systems, which are driven by the free sharing of incremental contributions, offer a powerful alternative to proprietary, producer driven systems.66 Non-market mechanisms such as trust, reciprocity, and norms and customs that support sharing play important roles in these kinds of collective intellectual production. This transformation of the innovation process shifts it outside of the paradigm that patent law is designed to support, however. The principles of inclusion and respect for collective rights that characterize cooperative innovation are difficult to reconcile with the assumptions and presumptions of the traditional patent law framework, and the incentives that patents create may actually harm rather than support cooperative innovation.67

Rather than ignore and potentially interfere with these non-market mechanisms, patent law should be designed to facilitate, or at the very least not block, the variety of new ways in which people cooperate to innovate.68

65 For a list of examples of open innovation and crowdsourcing in many different forms and industries, see Open Innovators list at http://www.openinnovators.net/list-open-innovation-crowdsourcing-examples/


68 See e.g. Rochelle Cooper Dreyfuss, Does IP Need IP? Accommodating Intellectual Production Outside the Intellectual Property Paradigm, 31 CARDOZO L. REV. 1437, 1441 (2010)(suggests need for new conversation about how intellectual property law ought to change to accommodate intellectual
While in some cases patent law may work well to support the kinds of cooperation needed to encourage innovation,\textsuperscript{69} in many other cases it does not.\textsuperscript{70} Patent policymakers need to identify and respond to the problems that patents pose for cooperative innovation. To do this well, however, requires a deeper understanding of how laws intersect with cooperation.

\textbf{B. Accounting for Cooperation}

\begin{quote}
“\textit{what really distinguishes open source is not just source, but an “architecture of participation”}…..” Tim O’Reilly
\end{quote}

Cooperation involves working together to advance common goals or obtain mutual benefits. It can occur among even purely selfish economically rational actors where individual economic interests align with the collective interest. Sustaining cooperation when individual economic interests diverge from the interests of the collective is a more complex and
challenging problem. Classic examples of the divergence of private and collective interests, referred to as social dilemmas, have been captured in the literature as metaphorical stories such as the Prisoner’s Dilemma,\textsuperscript{71} the Tragedy of the Commons,\textsuperscript{72} and the Public Goods Dilemma.\textsuperscript{73} These social dilemmas illustrate situations in which the most beneficial action for an individual will, if selected by most members of the group, leave everyone in the group worse off. Patents are designed to solve a kind of Public Goods Dilemma, the underproduction and underdevelopment of inventions.\textsuperscript{74} But in solving this dilemma, patents have created others. In fact, patent law now has its own metaphoric stories of patent based social dilemmas, such as the Tragedy of the Anti-Commons,\textsuperscript{75} Patent Thickets,\textsuperscript{76} and Patent Hold-up.\textsuperscript{77}

\textsuperscript{71}The prisoner’s dilemma refers to a situation, illustrated by two prisoners who are separately given the choice to testify against the other for no penalty (non-cooperation) or to maintain secrecy (cooperation). Each prisoner is best off by testifying where the other stays silent, but both are worse off if they both testify. They nonetheless both testify because it is in their individual self-interest to do so.

\textsuperscript{72}The tragedy of the commons refers to a situation in which a resource is shared by a group. It is in the interest of each individual to use as much of the commons as possible, since the harm to the common resources is shared by the group while the benefit is retained by the individual, but if everybody does this then the common resource is depleted in a way that leaves the group worse off. See Garrett Hardin, The Tragedy of the Commons, SCIENCE (1968).

\textsuperscript{73}The Public Goods Dilemma refers to the problem of ensuring socially efficient investments in public goods, which are goods that are non-excludable and benefit everyone. People have an incentive to free ride on the investments of others and enjoy the public good without paying for it, leading to inadequate investment in public goods.

\textsuperscript{74}See e.g. Robert Merges, JUSTIFYING INTELLECTUAL PROPERTY. Harvard University Press (2011).

\textsuperscript{75}The tragedy of the anticommons refers to a situation in which a single resource has multiple rightsholders who prevent others from using the resource, resulting in a breakdown in coordination. See e.g. Michael A. Heller and Rebecca S. Eisenberg, Can Patents Deter Innovation? The Anti-Commons in Biological Research, 280 SCIENCE 698 (1998)(“The recent proliferation of intellectual property rights in biomedical research suggests a different tragedy, an “anticommons” in which people underuse scarce resources because too many owners can block each other.”).
Patents create risks for participants in cooperative projects by increasing incentives for members of the project to defect from the project and by increasing threats from third parties against the project and its members. These risks make it more costly to engage in cooperative innovation and more difficult to support the informal rules and norms of sharing that support cooperative outcomes. As further discussed in Part III, open source software projects are jeopardized when participants defect from cooperative group norms. They are also threatened by patent hold up and free riding, with third parties seeking to expropriate the value of free community production. Volunteer driven models of collaborative innovation such as crowd science are similarly vulnerable to these risks. In both cases, individuals or entities acting rationally in their individual economic self interest use patents in ways that leave the group, as well as society at large, worse off.

The challenge for patent policymakers is to limit the ways in which patents might interfere with socially beneficial collective action. To do

---

76 Patent thickets refer to an overlapping set of patent rights owned by different entities that block the path that an innovator might take. See e.g. Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools and Standard Setting*, in Jaffe, Adam B.; et al.. INNOVATION POLICY AND THE ECONOMY. MIT Press. (a patent thicket is "a dense web of overlapping intellectual property rights that a company must hack its way through in order to actually commercialize new technology");

77 Patent Hold-Up occurs when a component patent owner can exploit its bargaining power with respect to downstream users because it can threaten losses that far exceed the value contribution of the component. See e.g. Thomas Cotter, Patent holdup, patent remedies, and antitrust responses, 34 Journal of Competition Law Issue 4 (2009); Mark A. Lemley and Carl Shapiro, *Patent Holdup and Royalty Stacking*, supra no. __.

78 For use of game theoretic models to explore opportunities for using patents to improve cooperative outcomes see e.g. Shubha Ghosh, Patent Law and the Assurance Game: Refitting Intellectual Property in the Box of Regulation. Canadian Journal of Law and Jurisprudence, Vol. 18, No. 2, July 2005 (reference to the assurance game as an alternative way of thinking about the role of patent law in regulating innovation). Under the assurance game, more commonly known as the stag hunt, two hunters can jointly hunt a stag for high payoffs, or individually hunt rabbits for smaller payoffs. If
this, patent policymakers need to be concerned with both factors that influence cooperative and non-cooperative outcomes and how the law interacts with those factors. This is no easy task.

The relationship between law and cooperation has occupied legal scholars and policymakers for decades. They have puzzled over how people cooperate in the absence of law, how laws emerge from cooperative practices, and how laws may hinder or help existing non-legal mechanisms for supporting cooperation in groups. A number of studies have tried to identify the factors that are needed to sustain cooperation beyond situations in which rational economic actors have aligned interests. Common themes in the literature on cooperative systems of producing and managing shared resources include the importance of trust, reciprocity and fairness in attracting and sustaining cooperative participation. Case studies of open source software communities have been particularly helpful in uncovering the roles that these mechanisms play in supporting the vibrancy and output of the community. They have also illustrated ways in which mechanisms either hunts a stag alone, the chance of success is minimal. Hunting stags is most beneficial for the group but requires significant trust among its members. See also Ted M. Sichelman, Quantum Game Theory and Coordination in Intellectual Property. San Diego Legal Studies Paper No. 10-035.


80 See e.g. Yochai Benkler, Law, Policy and Cooperation, supra n. ___.


such as trust can work when groups become large and relationships attenuated. In open source software communities, people cooperate with each other even when they do not know each other and their interactions are limited. To do so, they need to be able to sustain a sense of community trust, since team members must decide how much they can trust each other before joining the team and without the chance to establish personal relationships or forms of mutual control. The decision to join the team is instead based on beliefs about the intrinsic motivation of other team members to adhere to the mutual norms of the group. In these groups the maintenance of the communities depends on “their ability to (a) develop and enforce rules of cooperation in a self organized manner, and (b) develop self-enforcing swift trust which is based on generalized reciprocity between group members.”

Low cost participation is also important to the sustainability of these groups. This work, along with a growing body of empirical work in other areas involving self-governing systems of cooperative resource management and use, suggests that to sustain cooperation, laws need to be applied in ways that support, or at the very least minimize interference with, the norms, customs and organizational structures that support trust, reciprocity, and benefit sharing. These insights are making their way into at least some areas of the law. In contract law, for example, relational contract theory provides a view of contracts as relations rather than discrete

---

83 See Margit Osterloh and Sandra Rota, Trust and Community, supra n. __, p. 279–301
84 Id.
85 Copyright law has provided a limited enforcement mechanism, through the use of licenses that impose varying commitments on users of open source software to make their own contributions open and accessible. Even with these licenses in place, however, trust remains an important part of sustaining open source software systems.
transactions, with many of the contract terms left implicit and governed by trust between the parties.\textsuperscript{87} Recent work on contracts and innovation illustrates how firms use incomplete contracts to sustain cooperative relationships in the face of imperfect information.\textsuperscript{88} Contracts allow parties to structure their relationships with each other in ways that foster trust and facilitate relationship specific investments where the payoffs from the relationship cannot be predicted and contracted for in advance. In some cases the terms governing the division of payoffs from a shared innovation project are left open, the parties relying instead on the braiding of formal terms for sharing information about the progress and prospects of their joint activities with informal terms governing subsequent outcomes of the joint work.\textsuperscript{89} This information sharing regime “braids” together the formal and informal elements of the contract in a way that endogenizes the growth of trust between the participants.\textsuperscript{90} In corporate law, behavioral theories based on trust and trustworthiness challenge conventional views of the firm.\textsuperscript{91} This work suggests that laws impact not only external incentives but also the internalized preferences of directors within the firm and cautions against excessive reliance on external sanctions that may


\textsuperscript{89}Id.


undermine internal trust.\textsuperscript{92} As new forms of collective production emerge, there have even been suggestions for creating an entirely new field of law, cooperation law, to reflect arrangements between people that are based on a variety of modes of sharing, cooperation and collaboration such as co-housing, barter, and community financed businesses.\textsuperscript{93} These kinds of changes have yet to occur in patent law.

Perhaps in the future patent law will undergo a more radical shift in response to changes in the ways that people innovate. But for now, contextualizing patent remedies to internalize the costs of patents on collective action will begin to pull similar kinds of considerations into patent law.\textsuperscript{94} This limited approach can provide a good way of protecting the vulnerabilities of cooperative innovation without undermining the patent system in areas where it seems to work well. Part II begins with a description of challenges currently confronting judges in the fashioning of patent remedies when collective interests in access to patents are at stake. It goes on to propose some limits on patent remedies in contexts where mechanisms of trust, reciprocity and norms of sharing are both critical to innovation and vulnerable to the incentives and costs that patents create.

\section*{II. PATENT REMEDIES WITH COOPERATION IN MIND}

Judge Posner, who has been particularly vocal about the problems that patents pose for innovation ecosystems, recently made a bold move in high profile patent infringement litigation between Apple and Motorola,

\footnotesize
\begin{itemize}
\item See e.g. Janelle Orsi, Cooperation Law for a Sharing Economy, yes! Magazine, September 23, 2010 at http://www.yesmagazine.org/new-economy/cooperation-law-for-a-sharing-economy ("a new sharing economy is emerging – but how does it fit within our legal system? Time for a whole new field of cooperation law).
\item For a discussion of how IP operates at the boundaries between groups, see e.g. Katherine Strandburg, Intellectual Property at the Boundary,Chapter 12 in forthcoming book.
\end{itemize}
two of the largest players in the smartphone industry.\textsuperscript{95} He threw their cross-claims of infringement of patents essential to the use of smartphone standards out of court because they failed to provide convincing calculations of harm from infringement.\textsuperscript{96} His decision was likely motivated by concerns about how patents may interfere with collective action. When parties are coordinating around shared technology standards that are covered by large numbers of patents, the benefits of cooperation become entangled with the value of individual patented contributions to the standard. Moreover, interests in rewarding individual companies for their inventions are tempered by concerns about the collective interest in access to industry standards. In reaching his decision, Judge Posner emphasized the need to address the “frequent disproportion between harm to the patentee from infringement and harm to the infringer and to the public from an injunction”, indicating that collective interests in mechanisms of coordination such as standard setting are deserving of protection.\textsuperscript{97} Not surprisingly, Judge Posner’s decision in this case has since been appealed.\textsuperscript{98}

\textsuperscript{95}See Apple, Inc. and NeXT Software Inc. v. Motorola Inc. and Motorola Mobility, Inc., No 1:11-cv-08540, case in the US District Court for the Northern District of Illinois Opinion and Order dated June 22, 2012, Judge Posner.

\textsuperscript{96}Apple v. Motorola decision (“In fact neither party is entitled to an injunction. Neither has shown that damages would not be an adequate remedy. True, neither has presented sufficient evidence of damages to withstand summary judgment—but that is not because damages are impossible to calculate with reasonable certainty and are therefore an inadequate remedy; it’s because the parties have failed to present enough evidence to create a triable issue. They had an adequate legal remedy but failed to make a prima facie case of how much money, by way of such remedy, they are entitled to. That was a simple failure of proof.”) For an analysis of the many aspects of this decision, including in particular the insights it offers for how FRAND obligations should be handled, see e.g. Judge Posner’s dismissal of two-way Apple-Motorola lawsuit has many important implications, FOSS Patents blog, 23, 2012 at http://www.fosspatents.com/2012/06/judge-posners-dismissal-of-two-way.html

\textsuperscript{97}See Posner’s decision, p. 26.

But his underlying message about the need to reconsider patent remedies in contexts where they may threaten important forms of coordination and cooperation is being taken seriously by policymakers and commentators alike.  

Recognizing the strong public interest in using standards as mechanisms for coordinating interoperable technologies, the Federal Trade Commission, the Department of Justice, and the U.S. Patent and Trademark Office have all weighed in on how patents that are essential to the use of common standards should be handled. Taking a pragmatic approach informed by the public interest in supporting standard setting and preserving reasonable access to the standards adopted, they have agreed that the patent owner must generally settle for limited damages in these circumstances. To do otherwise, they recognize, would create significant

99Judge Posner’s approach in Apple v. Motorola is contrasted with Judge Robart’s ruling on FRAND damages in Microsoft v. Motorola, 10-CV-01823-ORD, District Court for the Western District of Washington, April 25, 2013. Both decisions, however, point to the importance of the public interest in access to standard essential patents and the need to exclude the hold up value of patents covering standards from royalty determinations.


101They have focused on the question of whether the owner of a standard essential patent who has committed to license this patent on fair, reasonable and non-discriminatory terms can seek injunctive relief for infringement. Consistent with this approach, Judge Posner in Apple v. Motorola and Judge Robart in Microsoft v. Motorola have taken the position that a commitment to license a standard essential patent on fair and reasonable and nondiscriminatory terms means that the patent owner must settle for damages. See discussion by Thomas F. Cotter, Remedies for the Infringement of Standard Essential Patents Subject to a FRAND Commitment, Comparative Law Remedies Blog, May 8, 2013.
hurdles for the kind of broad industry cooperation that is needed in industries such as telecommunications. But beyond this attention to a very limited, market driven form of cooperation in the context of patents essential to common industry standards there is little discussion about how patent remedies should account for cooperation.\footnote{Existing proposals in the literature focus primarily on risks of patent hold up and related forms of opportunistic behavior by patent holders. See e.g. Mark A. Lemley, Ten Things to do About Patent Holdup of Standards (And One Not To), 48 B.C.L. Rev. 149 (2007); Merges, Robert P. and Kuhn, Jeffrey M., An Estoppel Doctrine for Patented Standards (March 1, 2008). California Law Review, Vol. 97, No. 1, 2009; Mark A. Lemley & Carl Shapiro, Patent Holdup and Royalty Stacking, 85 TEX. L. REV. 1991 (2007); Joseph Scott Miller, Standard Setting, Patents, and Access Lock-in: RAND Licensing and the Theory of the Firm, 40 IND. L. REV. 351 (2007); Cotter, Thomas F., Patent Holdup, Patent Remedies, and Antitrust Responses (December 10, 2008). Journal of Corporation Law, Vol. 34, No. 1151, 2009. While I am also concerned with patent hold up, my concerns extend to other ways in which patents might interfere with cooperative innovation and my goal is to limit patent remedies when, and to the extent, that the presence of patents makes useful cooperative systems of innovation unviable.}

This gap in the law is not surprising. As I have suggested, traditional patent theories provide little guidance for policymakers in situations of intellectual production that fall outside of traditional market based models of exchange. How the gap is filled will have important ramifications for the cost and viability of cooperative innovation. Section A provides a more detailed description of the current modest evolution in patent remedies as courts confront patents covering common technology standards. Section B provides three guidelines for applying patent remedies with cooperation in mind.

\section*{A. Remedies Without Context}

Patent remedies have historically been based on measuring and awarding reasonable compensation for past infringement to the owner of a valid, infringed patent, typically accompanied by injunctive relief to
preclude future infringement.\textsuperscript{103} The patent owner has been entitled to no less than a reasonable royalty, defined as “the amount that a prudent licensee who wished to obtain a license would have paid and a prudent patentee who wished to grant a license would have accepted if they had been negotiating at the time of the initial infringement”.\textsuperscript{104} Prior to 2006, courts would routinely provide the plaintiff patent owner with injunctive relief precluding further infringing activity by the defendant.\textsuperscript{105} This approach to patent remedies aligns nicely with the reward function of patents within the traditional paradigm of producer driven, market based innovation. It can be reconciled with the disclosure function.\textsuperscript{106} It is much harder to reconcile with the mechanisms that are important in sustaining cooperative innovation, however.

One of the biggest limitations of the traditional approach to patent remedies is its focus on the incentives of the inventor, to the exclusion of the additional participants in the innovation process. The interests of these broader participants started to matter more in the calculation of patent

\textsuperscript{103}See 35 USC Section 284. The Patent Act provides that the owner of a valid, infringed patent is entitled to damages that are “adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer…” with the possibility of punitive damages for willful infringement.


\textsuperscript{105}See e.g. Richardson v. Suzuki Motor Co. Ltd., 868 F.2d 1226, 1247 (Fed. Cir. 1989)(“It is the general rule that an injunction will issue when infringement has been adjudged, absent a sound reason for denying it.”)

\textsuperscript{106}To the extent that the primary purpose of the disclosure requirement is seen as teaching the world about the new discovery, such an approach would be in tension with the disclosure function. But see e.g. Holbrook, Timothy R., Possession in Patent Law. SMU Law Review, Vol. 59, No. 1 (explores tension between quid pro quo view of patent system, in which inventor is required to disclose invention to teach the world about this creation, and role of patents in preventing free riding, suggests that purpose of disclosure is to demonstrate that inventor was in possession of invention).
remedies in 2006, when the Supreme Court ruled that injunctive relief in patent cases, just as in other types of cases, should be determined based on the conventional four factor test for injunctive relief rather than presumed.\textsuperscript{107} The harm of an injunction to the public and the defendant are now taken into account when determining whether to award injunctive relief.\textsuperscript{108} As a result injunctive relief has become harder for patent owners to obtain. Courts have paid particular attention to whether the plaintiff is a competitor of the defendant, making injunctive relief more likely, or a non-competitor, making injunctive relief much less likely.\textsuperscript{109} [Expand here on what factors the courts have taken into account when determining injunctive relief and where they have stopped short.]

Determinations of whether to award injunctive relief have thus moved in the direction of reflecting a richer range of entitlements, including attention to the public interest and the balance of hardships to the patent owner and the infringer.\textsuperscript{110} This movement in patent remedies has been pushed further by the need to resolve high profile disputes over patents that are essential to the use of innovative standards, particularly standards covering mobile telecommunication devices such as smartphones. In the case of Apple v. Motorola mentioned above, Judge

\textsuperscript{107} Prior to 2006, plaintiffs routinely sought and were granted injunctive relief, but injunctions have become harder to obtain after the Supreme Court ruling in eBay v. MercExchange, 547 U.S. 388 (2006) which reaffirmed the need to make an equitable determination based on the conventional four factor test applied in determinations of injunctions. To obtain injunctive relief, the plaintiff must show that it has suffered irreparable harm, remedies available under the law are inadequate to compensate, the balance of hardships associated with injunctive relief favor the plaintiff, and the public interest will not suffer by the issuance of the requested injunction.

\textsuperscript{108} REFS on post-eBay cases, factors in determining injunctive relief.


\textsuperscript{110} See e.g. Fractus, S.A. v. Samsung Electronics Co., Ltd., 876 F. Supp. 2d 802, 854 (E.D. Tex. 2012), appeal dismissed (Aug. 30, 2012) (holding an injunction is inappropriate when the infringer is not a direct competitor and an injunction would disserve the public interest by severely disrupting the business of the infringer and its third parties).
Posner argued that injunctive relief should not be available for standard essential patents where patent owners have previously agreed to license their patents on reasonable and non-discriminatory terms (RAND requirements). Where the parties cannot agree on RAND terms, Judge Posner tells us that compulsory licensing with ongoing royalties should be used to resolve the dispute in a way that appropriately balances the harm to the patentee from infringement with the harm to the infringer and to the public form an injunction. \[^{111}\] This approach is consistent with the Supreme Court’s emphasis on the balancing of hardships and the public interest in determining injunctive relief in *eBay v. MercExchange*. \[^{112}\] The Federal Trade Commission, the U.S. Patent and Trademark Office, and the Department of Justice have all offered similar views on the licensing of patents that are essential to the operation of industry standards, suggesting that injunctive relief is unavailable for infringement of a patent governed by FRAND. \[^{113}\] The Federal Trade Commission has employed such an approach in its settlement with Google over certain anti-competitive practices relating to standard essential patents acquired by Google. \[^{114}\] Even the U.S. Trade Representative for the President has weighed in on the public interest in protecting public access to technology standards, disapproving the decision of the U.S. International Trade Commission to enjoin Apple from importing and selling smartphones covered by standard

---

\[^{112}\] See in particular Justice Kennedy’s comments.
\[^{113}\] Third Party US FTC Statement on the Public Interest, filed on Jun 6, 2012 in In RE Certain Wireless; USPTO and DOJ statement.
\[^{114}\] See John Riberio, Google withdraws standard-essential patent claims in Xbox complaint, Jan 9 2013 http://www.computerworld.com/s/article/9235502/Google_withdraws_standard_essential_patent_claims_in_Xbox_complaint. The FTC recently invoked its statutory mandate to prohibit unfair processes and methods of competing to limit how Google uses some of the standard-essential patents that it owns as a result of its acquisition of Motorola Mobility. Google and the FTC reached a settlement in January 2013 that prohibits Google from seeking to exclude competitors from the use of standard essential patents that Motorola Mobility, now owned by Google, had first promised and then refused to license on “fair, reasonable and non-discriminatory” (FRAND) terms.
essential patents owned by Samsung. The policy statements made by the
FTC and the DOJ, as affirmed by the U.S. Trade Representative, emphasize
the public interest in preserving access to innovative standards.

Determinations of damages have also moved in the direction of a
more contextualized analysis, again driven largely by decisions in the
standard setting context. In the first court decision to confront and
calculate fair, reasonable and non-discriminatory (FRAND) royalties in the
context of standard essential patents, Judge Robart concluded in his 207-
opinion in Microsoft v Motorola that the traditional factors used to determine
reasonable royalties, referred to as the Georgia-Pacific factors, should be
explicitly modified to take the standard setting context into account. Judge

---

115See e.g. Letter to Chairman Williamson of the U.S. International Trade
Commission dated August 3, 2013 from U.S. Trade Representative, Ambassador
Michael B. G. Froman (policy decision to disapprove Commission’s determination to
enjoin Apple form importing and selling infringing devices, after review in light of
“(1) public health and welfare; (2) competitive conditions in the U.S. economy, (3)
production of competitive articles in the U.S.; (4) U.S. consumers, and (5) U.S.
foreign relations, economic and political”).

116See e.g. Microsoft Corp. v. Motrola, Inc., U.S. District Court for the Western
District of Washington (Judge Robart), 25 April 2013 (decision in contract dispute
over whether Motorola had breached contract to offer patents on FRAND terms by
asking for royalties that were unreasonably high). Judge Robart’s decision explicitly
modifies the traditional Georgia Pacific factors to account for the standard setting
context. He emphasizes, for example, that patent royalties should not incorporate the
hold-up value that may result after a standard incorporating the patent has been
chosen, and attention to royalty stacking. See e.g. Thomas Cotter, Some Initial
Reactions to Judge Robart’s opinion in Microsoft v. Motorola, May 3, 2013 at
http://intellectualip.com/2013/05/03/some-initial-reactions-to-judge-robarts-opinion-
in-microsoft-v-motorola/. Judge Robart explicitly recognizes that the licensing of
standard essential patents takes on a public character and must be conducted and
reviewed with those public benefits in mind. See also Jorge L. Contreras, So That’s
What “RAND” Means” A Brief Report on the Findings of Fact and Conclusions of
Law in Microsoft v. Motorola, Patently-O, April 27, 2013; Carrier, Michael A., A
U.S. Court Issues First Analysis of an Appropriate Royalty that a Patentee Could
Obtain after Promising to License its Patent on Reasonable and Nondiscriminatory
(RAND) Terms (Microsoft v Motorola) (May 9, 2013), e-Competitions Bulletin, No
51802, 2013.
Robart, as Judge Posner had before him, emphasized the need to take the public interest into account in determining patent remedies and the need to exclude any patent hold-up value arising from the collective adoption of a standard covered by the patent from the calculation of damages.\(^{117}\) In the words of Judge Posner, the purpose of the RAND requirement is “to confine the patentee’s royalty demand to the value conferred by the patent itself as distinct from the additional value – the hold-up value – conferred by the patent’s being designated as standards essential.”\(^{118}\) Context has thus become a more important part of determining patent remedies.

While these recommendations and court decisions are moving in the right direction, they leave open many questions about how tensions between patents and systems of open standards, open source and crowd science will be handled. They address only problems arising from commercial participants in standard setting organizations who do not honor their obligations to each other relating to standard essential patents. They limit their focus to the potential harms to the public from refusals of both patent holding members of standard setting and the uses of patented standards to negotiate licenses to patents essential to innovative standards on terms that are fair, reasonable, and non-discriminatory. More

\(^{117}\) Id.

\(^{118}\) Apple Inc. and NeXT Software v Motrola and Motorola Mobility, Opinion and Order of June 22, 2012, Judge Poser, In the US District for the Northern District of Illinois, No. 1:11-cv-08450. (Broadcom Corp. v Qualcomm Inc., 501 F. 3d 297, 313-14 (3d Cir 2007); Daniel G. Swanson and William J. Baumol, Reasonable and Nondiscriminatory (RAND) Royalties, Standard Selection, and Control of Market Power,” 73 Antitrust L. J. 1 (2005)). ‘By committing to license its patents on FRAND terms, Motroloa committed to license the ‘898 to anyone willing to pay a FRAND royalty and thus implicitly acknowledged that a royalty is adequate compensation for a license to use that patent.’ See e.g. Dan Levine, Judge Grills Apple in Smartphone case, Reuters June 21, 2012 (Posner called the U.S. patent system "chaos" and said an order barring the sale of Motorola phones could have "catastrophic effects; Posner questioned the very possibility of getting an injunction against the use of a standard essential patent); Jon Brodkin, In bid for patent sanity, judge throws out entire Apple/Motorola case, arstechnica June 22, 2012 at http://arstechnica.com/tech-policy/2012/06/in-bid-for-patent-sanity-judge-throws-out-entire-applemotorola-case/
importantly, they fail to acknowledge or protect the public interest in sustaining non-market mechanisms of cooperation that are valuable to innovation.

Courts, legislators and agencies with influence over patent policy should move patent remedies as a whole further in the direction of capturing a richer range of entitlements. The guidelines that I propose would do exactly that. They are focused explicitly on situations in which non-market mechanisms play a critical role in promoting socially beneficial innovation, and they seek to capture the public interest in sustaining these alternative modes of innovation.

B. Guidelines for the Design of Remedies

Courts and Congress should balance the private and collective interests in enforcing patents, with attention to the mechanisms that further these interests. To do this they will need to incorporate considerations of trust, reciprocity, and fairness/benefit sharing into the design and application of patent remedies in situations where these mechanisms are important determinants of socially beneficial innovation. The following three guidelines are directed at limiting patent remedies in ways that strengthen informal rules used to support cooperation, reduce the incentives of individuals to defect from the group, and limit the ability of outside parties to appropriate the value arising from collective efforts. The three guidelines are: (1) value reliance interests in norms that enforce reciprocity and enable sharing; and (2) limit the private appropriation of collective value; and (3) support reciprocity in free, open systems of innovation.

119 See e.g. Dan L. Burk, Intellectual Property in the Cathedral (provides a framework for thinking about and reconstructing the entitlement structure provided for intellectual property, including a range of alternative allocation rules that reflect different entitlement interests).
120 The idea of respecting the reliance interests of firms in standards that are adopted by the industry has been suggested in Robert P. Merges & Jeffrey M. Kuhn, An Estoppel Doctrine for Patented Standards, 97 California Law Review No. 1 (2009). This guideline goes further, extending to any situation in which multiple participants work collectively to advance a particular product or field and either must coordinate
First, the reasonable reliance of innovation communities on norms governing access to and use of inventions should be treated as an important interest to be balanced against the private interests of a patent owner when fashioning patent remedies. Where publicly recognized community norms lead to community expectations about continued access to and use of inventions, whether made by group members or by third parties, this reasonable reliance should be taken into account as a limiting factor in determinations of both injunctive relief and damages. The availability of injunctive relief in particular should depend on whether freedom to use the patented inventions has been reasonably presumed by the relevant innovation community. Academic science, for example, is characterized by norms that support open dissemination and use of research results. The their activities through standards and/or find it necessary to use certain core technologies as research tools or platform technologies on which to build their contributions. There are similarities here to an essential facilities doctrine approach to intellectual property. See e.g. M. Elaine Johnston, Intellectual Property as an “Essential Facility,” The Computer and Internet Lawyer, February 2005 (summarizes case law and trends in applying essential facilities doctrine to intellectual property contexts). It also relies on determinations of reasonableness that relate to norms and customs of use, such as academic norms governing access to and use of research tools. See e.g. Mark A. Lemley and Carl Shapiro, Patent Holdup and Royalty Stacking, 85 Texas Law Review (2007) (explore problems of patent hold up, royalty stacking, and consequent royalty overcharges); Thomas F. Cotter, Reining in Remedies in Patent Litigation: Three (Increasingly Immodest) Proposals, 29 SANTA CLARA COMPUTER & HIGH TECH L.J. (Mar. 19, 2013) (arguing that damages should be apportioned according to relative value of patent to the whole product).  

For discussions of the effects of patents on norms, see e.g. Katherine J. Strandburg User Innovator Community Norm: At the Boundary Between Academic and Industry Research, 77 FORDHAM L. REV. 2237 (2009) (exploring implications of convergence of academic research with commercial interests and implications for norms of sharing research tools and materials and suggesting need for policies to enhance sharing); Fiona Murray and Scott Stern, Learning to Live with Patents: A Dynamic Model of a Knowledge Community’s Response to Legal Institutional Change; Fiona Murray, The Oncomouse that Roared: Resistance to and Accommodation to Patenting in Academic Science; Robert Merges, Property Rights Theory and the Commons, The Case of Academic Research, in Scientific Innovation, Philosophy and Public Policy (1996).
more scientists can rely on these norms, the more willing they will be to continue to share their own discoveries and to use and experiment with the discoveries of other scientists, encouraging trust and reciprocity. The ability of a scientist to defect from the group norms and restrict access to his or her invention would be limited by this guideline. Where the norm encompasses limited research use of patented inventions owned by third parties, the ability of third parties to limit access to the invention would also be reduced.

While existing doctrines of implied license and estoppel go part of the way towards recognizing and protecting reasonable reliance by protecting relationship specific investments, the guideline I propose would go beyond the limits of these doctrines. The guideline would encompass the reliance interests of participants who are not in contractual privity, or even in direct or indirect communication, with the patent owner. It is designed to enable and support trust and reciprocity among large groups of participants in a system of cooperative innovation. Trust is sustained by limiting the ability of group members to deviate from accepted group rules governing reciprocity and sharing. Reciprocity is strengthened through presumptions that people will be free to use the scientific results of others, but will also be obligated to share their own scientific results. Pursuant to this approach, members in a community of innovation may rely on widely adopted norms governing when and how knowledge will be shared and used. Where technologies are broadly and publicly adopted, and participants in the industry reasonably rely on continued access to these technologies, continued access to these technologies should be presumed as a way of supporting the norms and expectations of the community. Patent

123 See e.g. Lautzenhiser Technologies, LLC v. Sunrise Med. HHG, Inc., 752 F. Supp. 2d 988, 1009 (S.D. Ind. 2010) (holding that amicable dealings over a period of years may be enough to constitute misleading conduct that induces reasonable reliance); Barnes & Noble, Inc. v. LSI Corp., 849 F. Supp. 2d 925 (N.D. Cal. 2012) (holding that a competitor’s adoption of set standards can constitute reasonable reliance). Similar trends are evident in contract law, where courts are increasingly willing to protect reasonable reliance interests of negotiating parties prior to or in the absence of a final contract. See e.g. Schwartz, Alan and Scott, Robert E., Precontractual Liability and Preliminary Agreements, 120 Harvard Law Review 662 (2007).
owners can overcome this presumption by showing that reliance is not reasonable or that there are competing interests which outweigh this reliance interest. Defining what is “reasonable” reliance would be a context-dependent decision, based on the accepted norms and customs in the industry and the balancing of collective interests in access and private incentives to make and develop the patented technology.

The second guideline is to limit the private appropriation of collective value by a patent owner arising from the ability of a patent owner to free ride on the work done by the group or to hold up the group with a patent that covers their activities. The goal is to limit incentives to defect from group norms and to ensure a fair allocation of benefits among contributors to intellectual production. [Consider injunctive relief too.] [Also explore impact of guidelines on the bargains that parties will enter into – will this approach to remedies reduce threats of litigation, alter the negotiating power of patent owners…what consequences?] Pursuant to this guideline damages should not include the value that the patented invention has as a result of its adoption as a standard technology by the group. This approach has already been employed in the context of standard essential patents, where courts have held that damages should not include the value that the patent derives from its adoption as a standard.\(^\text{124}\) Damages should also be adjusted in light of the benefits received from the group. Where people are contributing their knowledge freely and inventions emerge from sequential incremental contributions by the group, it may be difficult for the group to capture the benefit of this invention. Capturing the value of the knowledge produced by the group is even harder. Where a member of the group is able to defect from the group and patent and privately benefit from an invention that builds on the efforts of the group, this results in unfairness, lacks reciprocity, and erodes trust. Where the incremental improvement is made and patented by a third party, the result is less harmful to group dynamics but still results in unfairness. Moreover, if the patent can be used to block the future efforts of the group, or to extract

rents from the group through licensing, benefit sharing is even more skewed and the transaction costs for participants in the cooperative project increase.

This guideline, like the first, builds on and finds support in existing proposals to address patent hold up by limiting the ability of patent holders to obtain injunctive relief and by restricting what can be included in the calculation of damages.\textsuperscript{125} It is also consistent with recent decisions in the context of standard essential patents that limit patent damages to the royalties that would have been paid prior to the adoption of the patented technology as a standard.\textsuperscript{126} The guideline goes further than the existing

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{125}See e.g. Cotter, Thomas F., Patent Holdup, Patent Remedies, and Antitrust Responses (December 10, 2008). Journal of Corporation Law, Vol. 34, No. 1151, 2009 (patent law should play a role in responding to, or enabling private parties to avoid, patent hold up); Mark A. Lemley and Shapiro, Carl, Patent Holdup and Royalty Stacking, 85 Texas Law Review (2007) (patent law should be modified to respond to problems of patent hold up and royalty stacking, including limits on injunctive relief and damages).
\item \textsuperscript{126}See Judge Robart’s decision, supra. at __. Also see e.g. proposals designed to address patent hold up in context of standard setting such as Robert P. Merges & Jeffrey M. Kuhn, An Estoppel Doctrine for Patented Standards, 97 \textsc{Calif. L. Rev.} 1 (Mar. 1, 2008) (arguing for a standards estoppel doctrine to check for good-faith behavior by the patentee) and Kesan, Jay P. and Hayes, Carol M., FRAND's Forever: Standards, Patent Transfers, and Licensing Commitments (February 28, 2013). Indiana Law Journal (suggest combination of contract and property principles to govern FRAND commitments); proposals designed to protect areas of innovation that rely on free sharing of information such as Katherine Strandburg, Patent Fair Use. Alternative approaches have included improving incentives of private parties to agree through limits on injunctive relief, mandatory arbitration, and other mechanisms for improving private ordering. See e.g. Lemley, Mark A. and Shapiro, Carl, A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents (March 30, 2013)(mandatory arbitration mechanism where owner of standard essential patent and standard implementor don’t agree on FRAND terms); Jorge L. Contreras, Fixing FRAND: A Pseudo-Pool Approach to Standards-Based Patent Licensing, Working Paper, March 2013 (adapts patent pool approach to standard setting organizations); Tim Simcoe, Governing the Anti-Commons: Institutional Design for Standard Setting
\end{itemize}
\end{footnotesize}
proposals, however. It requires broader calculation of what part of the value from a technology comes from its use by the group, and also greater respect for the value of the knowledge contributions from the group that enabled the invention. It requires courts to consider the value attributable to the adoption and use of an invention by an innovation community as well as the value it contributed to the original creation when determining patent remedies, with the goals of approximating fairness, encouraging trust and reciprocity, and limiting transaction costs.

The third guideline is to support reciprocity in free, open systems of innovation. 127 Where discoveries emerge from open source systems, open access and use of the discoveries by the group should be presumed. In this way the law reinforces informal rules and norms of reciprocity and reduces the payoffs from defecting from group norms. Where third parties develop inventions that rely on the work done by an open source project, they should not be allowed to block the use of the discovery by the group. Examples of situations where open access and reciprocity play critical roles include the sharing and use of research tools and fundamental scientific discoveries and systems of open source software production. In these areas, discoveries that emerge from the productive efforts of the group, either directly or indirectly, should be available for use by the group at either no cost or at a cost that is reasonable in light of the competing interests and investments of the group and the patent owner.

All three of these guidelines, but especially this last one, draw from a rich body of research that critiques the lack of safe harbors within patent law for publicly beneficial uses of patented technology, particularly where the patented technologies have been created through the use of public Organizations, NBER working paper July 2013 (examines SSO practices and debates using Elinor Ostrom’s self-governing common pool framework)

127 For thoughts on motivating reciprocity, see e.g. Stephen Leider, Markus Mobius and Tanya Rosenblat, Directed Altruism and Enforced Reciprocity in Social Networks, working paper available at http://www-personal.umich.edu/~leider/Papers/Social_Networks_Altuishm_Reciprocity.pdf.
funds. Instead of focusing on the types of uses, however, I instead focus on preserving non-market mechanisms for cooperative innovation.

These guidelines do not dictate a unique system of patent remedies, but rather provide an additional set of factors for policy makers to consider when fashioning patent remedies. They expand the range of interests that courts and legislators are required to think about in the design of patent remedies. More specifically, they are intended to reduce the conflict between patents and mechanisms of cooperation based on trust, reciprocity, intrinsic motivations and the pursuit of non-monetary benefits that play an important role in cooperative systems. The question of institutional competence is left for further discussion – the guidelines could be adopted by courts in fashioning patent remedies, they could be announced as guiding principles by agencies such as the Federal Trade Commission, the

128 See e.g. Katherine Strandburg, Patent Fair Use, n __ (arguing for the use of defenses and exemptions from infringement as a way of responding to the fact that different uses of patented technology can have different social costs and benefits).


130 But see e.g. Michael A. Carrier, Cabining Intellectual Property Through a Property Paradigm. Duke Law Journal, Vol. 54, No. 1, October 2004 (idea that propertization of patent rights can lead to the narrowing of IP, providing for limits based on development, necessity and equity).

131 Efforts have been made to provide general guidelines or principles for determining patent remedies. See e.g. John Golden, Principles for Patent Remedies, Thomas Cotter, Patent Remedies and Practical Reason, n __. I am not providing principles that govern the application of remedies generally, but rather specific guidelines that require policymakers to consider the effects of patent remedies on the viability of cooperative innovation.
Department of Justice and the International Trade Commission, and they
could also guide future changes in the patent statute made by legislators.\textsuperscript{132}
The primary goal of these guidelines is simply to provide a focal point for
all of these patent policymakers to use when fashioning their responses to
situations in which patents either are, or threaten to, impede productive
forms of cooperative innovation.

Part III uses two case studies to illustrate both the problems that
patents pose for cooperative innovation and the ways in which systematic
use of the guidelines might work to mitigate these problems.

III. TWO CASE STUDIES

A. Patent Shadows Over Open Source Software

\textit{No one "owns" the software in the traditional sense ... The result is the
emergence of a vibrant, innovative and productive collaboration, whose
participants are not organized in firms and do not choose their projects in
response to price signals.} – Yochai Benkler\textsuperscript{133}

The first case study is the struggle for market dominance between
Linux and Microsoft, which is only one manifestation of a broader struggle
between free open source and proprietary models of development.\textsuperscript{134}
Open source projects have proven to be a significant economic and social
phenomenon, particularly in the context of software development.\textsuperscript{135}

\textsuperscript{132}I focus primarily on the opportunities that the courts have for using what Burk and
Lemley have termed policy levers. The patent statute provides little guidance for
courts in how they determine patent remedies, leaving the implementation primarily to
common law. See Mark A. Lemley and Dan L. Burk, Policy Levers in Patent Law,

\textsuperscript{133}Yochai Benkler, \textit{Coase's Penguin, or, Linux and The Nature of the Firm}, 112

\textsuperscript{134}Much has been written about the free and open source software movement. For a
good overview from an IP perspective, see e.g. Vetter, G. (2009). \textit{Commercial Free
and Open Source Software: Knowledge Production, Hybrid Appropriability, and

\textsuperscript{135}See e.g. Eric von Hippel and Georg von Krogh, \textit{Open Source Software and the}
Sourceforge, which is one of the main internet sites hosting open source software projects, lists more than 4.5 million daily downloads, more than 324,000 open source software projects involving more than 3.4 million developers, and its directory connects more than 46 million consumers with these open source projects. While most of these projects are small, some, such as the GNU/Linux operating system, the Apache web server software, the MySQL database, and the Firefox web browser, are massive and now compete with established proprietary software products. The open source smartphone operating system Android, which is closely tied to Linux, was estimated to have 70% of the smartphone market in 2012, for example.

Open source software projects deviate from private proprietary models of software development in two important ways. First, most truly open source software projects are fueled by at least some software developers who are primarily intrinsically rather than extrinsically motivated to participate. People contribute to the project because they want to, whether to solve their own problems, contribute to a community that they have benefited from in the past, or as an outlet for creativity. Second, they freely reveal the software that they have developed in ways that allow other participants not only to use it but to modify and build upon


See the Sourceforge web site, last checked on January 24, 2013, at http://sourceforge.net/about.


Motivations of participants in open source/empirical studies
These characteristics are combined with organizational innovations that allow people to contribute to the software project in a massively distributed, decentralized way. Systems of open source innovation have provided us with important examples of how valuable products can be developed without relying on exclusive rights. The question becomes, can they be sustained in a world that allows for exclusive rights in the form of patents. And if they can be sustained, at what cost?

While a few open source software systems, such as Linux and its stepchild Android, have been able to compete with proprietary products, the cost of doing so in the presence of an increasing number of software patents has been large. Many open source systems shut down when confronted with one of the first signs of their success – threats of a patent suit from competitors. I use the story of Linux and the patent shadows created by Microsoft to illustrate the vulnerabilities of open source models to patents, as well as the limits and costs of the defensive measures that have been adopted by open source supporters to reduce these vulnerabilities.

Linux was one of the pioneering free and open source software projects. It has its roots in the intertwined ideologies and development models generated by early free software and open source movements, which are collectively referred to as Free and Open Source Software (FOSS).

At a general level, FOSS is software which “is liberally licensed to grant users the right to use, copy, study, change, and

\[ \text{140 See Eric von Hippel, *Open Source Software* (describes open source software development systems, refers to them as illustrations of a private-collective model of innovation that occupies the middle ground between private investment and collective action)} \]

\[ \text{141 Id.} \]

\[ \text{142 REF Cost that patents impose on open source projects} \]

\[ \text{143 REF Examples of open source projects closing down or being acquired in the face of patent litigation threats} \]

\[ \text{144 See e.g. Greg Vetter, *Commercial Free and Open Source Software: Knowledge Production, Hybrid Appropriability, and Patents*, 77 Fordham Law Review 2087 (2009); see also NR, ITLED4240 H2012: Open Source, Open Collaboration and Innovation, Chapter 2, Chapter 4.} \]
improve its design through the availability of its source code.”145 But on a closer look, FOSS refers both to a methodology for peer to peer development, which is the focus of the Open Source Movement, and to an ideology about the freedom to use, modify and share this resource, which lies at the core of the Free Software Movement. While these two camps – that of open source software and free software, share many things in common, they have different views about what FOSS requires that quickly become apparent in their responses to proprietary uses of software.146 The Free Software Movement believes that software should be free. To promote this goal and protect the free use of software, it advocates that uses of and improvements to open source software should be made available on open source terms. Beliefs about freedom, fairness and reciprocity lie at the center of the free software movement. The Open Source Software movement is more willing to allow for hybrid approaches that include proprietary use of FOSS, although in many respects the process of producing open source relies on these same characteristics of freedom, fairness and reciprocity.147 The connection between ideology and process

145 See Wikipedia Definition, see also Free Software Foundation. “What is free software?” at http://www.fsf.org/about/what-is-free-software; see also “The Open Source Definition” provided by the Open Source Initiative (OSI).
147 See e.g. Barron, Anne, Free Software Production as Critical Social Practice (May 31, 2012). Forthcoming, Economy and Society, 2013 (describes contrast between the ideological approach of the free software movement and the pragmatic approach of the subsequent open source software movement). (“Their modular arrangement, together with the meritocratic norms of conflict resolution that proceed from hacker culture, are seen as facilitating virtually horizontal decision-making structures that allow input by any participant with relevant expertise. A particular style of leadership is emphasized as crucial to coordinating this input and ensuring its quality. Central to this style is open communication and creativity (though not in the manner of the solitary Romantic genius – FOSS leaders are seen as recombining what they find in the way rather than creating from nothing, and distributing responsibility for innovation through the network rather than monopolizing it themselves); most importantly, FOSS projects are taken to show that effective ‘team’ leadership requires charisma: the ability to mobilize actors
is important in explaining both the strengths and the vulnerabilities of even large and successful open source projects like Linux.

Linux was developed pursuant to a unique collaborative development project, and it remains one of the largest systems of collaborative development in the history of computing. It encapsulates the powerful idea of software as a modular and communal internet-based effort. As described by Eric Raymond in his seminal article The Cathedral and the Bazaar, “[w]ho would have thought even five years ago (1991) that a world-class operating system could coalesce as if by magic out of part-time hacking by several thousand developers scattered all over the planet, connected only by the tenuous strands of the Internet?”

The source code of Linux is made available without charge, and without restrictions on the ability to modify and use this code, pursuant to version two of a well known free and open source copyright license called the General Public License (GPL). The licensing model provides a legal
innovation, what has been referred to as legal jujitsu, designed to use intellectual property rights to preserve the open source nature of the project.\footnote{The GNU/Linux computer operating system includes the Linux kernel, an open source project initiated by Linus Torvalds in 1991, and GNU software emerging from the free software movement founded by Richard Stallman in 1985. I focus here on the development of the Linux kernel, although the issues extend to the broader GNU/Linux operating system.}

Linux rapidly gained popularity as an alternative to Microsoft’s proprietary software operating system. In response, Microsoft began a concerted strategy to disadvantage Linux by getting the users of Linux to pay royalties to Microsoft. This included a controversial agreement between Microsoft and a company called Novell, Inc., a software company that had initially set itself up to compete with Microsoft using Linux based open source software products. The two companies signed a joint patent agreement in November 2006 in which they agreed not to sue each other over intellectual property.\footnote{See e.g. Elizabeth Montalbano, Microsoft, Novell strike Linux deal: Companies ink broad pact to make it easier for users to run both Suse Linux and Microsoft Windows on their computers, Inforworld, November 2, 2006 at http://www.infoworld.com/t/platforms/update-microsoft-novell-strike-linux-deal-718; Paul Krill, The Microsoft-Novell Linux Deal: Two Years Later, Infoworld, November 18, 2008 at http://www.infoworld.com/d/open-source/microsoft-novell-linux-deal-two-years-later-858.} Novell received large payments pursuant to this deal. Upon expiration of the Novell deal, a technology consortium led by Microsoft acquired key intellectual property assets from Novell for $450 million.\footnote{See Microsoft/Novell deal.} Members of the FOSS community criticized Novell for what they saw as a defection from group norms and a compromise of the interests of the free software community to obtain individual economic benefit. The FOSS community claimed that Novell had created revenue

\begin{flushright}
streams at the expense of the free software community and made free software more expensive. Novell was free riding on the value created by the open source community and was capitalizing on the hold-up value of patents covering inventions used by the open source community. More importantly, the deal was seen as providing unwarranted legitimacy for patent claims made against Linux, creating a cloud of uncertainty and fear for users of Linux and deterring open source developers.\footnote{See e.g. Roy Schestowitz, a freelance writer and co-editor of the Boycott Novell site; See e.g. Katherine Noyes, Microsoft’s Hand in Novell Deal Bodes Ill for Linux, NOve 22, 2010, PCWorld at http://www.pcworld.com/article/211414/microsofts_hand_in_novell_deal_bodes_ill_for_linux.html
\footnote{See e.g. John Dvorak, Microsoft’s nuisance suit strategy: The company robs the Linux community with patent infringements, Sept 21, 2011,pcmag at http://www.pcmag.com/article2/0,2817,2393361,00.asp}}

Shortly after the first agreement with Novell was signed, Microsoft began making public claims that Linux violated more than 200 of Microsoft’s patents – no fewer than 235, according to Microsoft’s general counsel at that time.\footnote{See e.g. Mary Jo Foley, Microsoft: Free and open source software violate 235 Microsoft patents, ZDNet, May 13, 2007 at http://www.zdnet.com/blog/microsoft/microsoft-free-and-open-source-software-violates-235-microsoft-patents/436; Peter Lattman, Patent Litigation’s Battle Royale: Microsoft v. Open Source, Wall Street Journal Law Blog, May 15, 2007 at http://blogs.wsj.com/law/2007/05/15/patent-litigations-battle-royale-microsoft-v-open-source/} The fact that the Linux source code is freely available allows patent holders to scrutinize the code for areas that might implicate their patents. Since that time, Microsoft has focused on securing patent licensing deals from Linux users, although it has also relied on patent infringement litigation against select users of the Linux kernel such as TomTom, a manufacturer of GPS systems.\footnote{See e.g. John Dvorak, Microsoft’s nuisance suit strategy: The company robs the Linux community with patent infringements, Sept 21, 2011,pcmag at http://www.pcmag.com/article2/0,2817,2393361,00.asp} Patent assertion entities such as IP Innovations, a subsidiary of Acacia Technologies, have also brought patent suits against users of Linux such as Red Hat. Some speculate that Microsoft backed the Acacia litigation. Red Hat, which provides services based on Linux, is often heralded as one of the open source software company success stories, making it a natural target for...
opponents of Linux. Red Hat complains of having to routinely address “attempts to impede the innovative forces of open source via allegations of patent infringement.”158

In response to patent infringement threats made by Microsoft, large corporate users of Linux such as IBM, NEC, Novell, Phillips, Red Hat and Sony set up the Open Invention Network (OIN) in 2005 to acquire a portfolio of patents that could create problems for companies who might create problems for Linux – including in particular Microsoft.159 OIN is self-described as “an intellectual property company that was formed to promote the Linux system by using patents to create a collaborative ecosystem.” Patents owned by OIN are available royalty-free to any entity or individual that agrees not to assert its patents against the Linux system. In addition, Open Source Development Labs, which is the consortium that promotes and coordinates Linux development, established its own patent commons to accept donations of rights to use patents.160 The patent commons is described as creating an area of safety, “a preserve where developers and users of software can innovate, collaborate, and access patent resources in an environment of enhanced safety, protected by pledges of support made by holders of software patents.” This massive patent acquisition strategy is an ironic way for an open source community to spend its funds. It also changes the balance of power within the open source community. Other community responses to the patent threats have included Linux Defenders, an online clearing house for prior art,161 and a project called A Patent a Day, with its goal of identifying one Microsoft

158 See e.g. http://linux.slashdot.org/story/10/10/04/2148218/red-hat-settles-patent-case?sdsrc=rel
160 See e.g. Steve Hamm, Linux Marches ON, November 16, 2005, BusinessWeek.com at http://www.businessweek.com/the_thread/techbeat/archives/2005/11/linux_marches_0.html; see also The Linux Foundation, Patent Commons Project at http://www.patentcommons.org
161 See e.g. http://linuxdefenders.org
owned patent every day that Linux potentially infringes with the goal of helping to get rid of the dependency on these patents and/or get rid of the patents. \textsuperscript{162} These efforts illustrate the need for open source communities to participate in the patent system simply as a way of not participating in proprietary development, and such efforts come with a very steep price tag.

The reason that Linux has been able to respond to the challenges from proprietary competitors such as Microsoft lies in its use by large companies who can afford to challenge Microsoft on its own terms. Despite the challenges that patents, particularly software patents, have posed for open source software models, open source projects such as Linux have not only survived but flourished, becoming an established part of the business model of major participants in the software industry. \textsuperscript{163} Linux now has a presence in most IT markets and dominates many of those sectors, including the supercomputer market. More than 90% of the world’s top 500 supercomputers run Linux. \textsuperscript{164} By some estimates more than half of the companies in the Fortune 500 are thought to be using Linux in their data centers. \textsuperscript{165} Large corporate users have invested significant resources both in the development and the protection of the Linux project. \textsuperscript{166} Even

\textsuperscript{163} See e.g. Joel West, How open is open enough? Melding proprietary and open source platform strategies, 32 Research Policy 1259 (2003)(examining hybrid strategies and contrasting them with purely open and purely proprietary software alternatives); Oliver Alexy and Markus Reitzig, Private-collective innovation, competition, and firms’ counterintuitive appropriation strategies, 42 Research Policy 895 (2013)(examines role of exclusion rights for technology in competition between private-collective and other innovators).
\textsuperscript{164} See e.g. Alastair Otter, The Linux vs. Microsoft war is over, Broadband, at XX.
\textsuperscript{166} See e.g. Dan Woods, Can Intel Heal the Hadoop Open Source Ecosystem, Forbes Magazine, February 26, 2013, at http://www.forbes.com/sites/danwoods/2013/02/26/can-intel-heal-the-hadoop-open-source-ecosystem/2/ (“In the Linux community the primary contributors are those who benefit from using Linux in their business. IBM, Intel, Google, HP, Oracle all make a pile of money because Linux solves a variety of problems for them. The
Microsoft has moved to embrace open source software as a carefully controlled part of its otherwise proprietary software strategy. But while the FOSS community is responding to the problems that patents may cause, their measures are often defensive and expensive, and many FOSS projects are either priced out of this defensive game or deterred from entering in the first place. Moreover, the interests of the companies able and willing to pay for defensive patenting largely dictate the areas in which open source software flourishes.

Open source software projects are vulnerable to patents for at least five reasons, all related to the negative effects of patents on cooperation. The story above highlights these areas of vulnerability. First, open source software production typically involves incremental improvements on existing software, a form of collective production that can be impeded by existing rights holders and by fragmented property rights. Second, open source software developers are typically not making money from their contributions and cannot afford to engage in patent disputes, at least if their interests are not directly aligned with a large corporate user of the open

amount of value that they receive from this use dwarfs that captured by Red Hat or Suse, the Linux distributors. Linux thrives because the big players take part of the massive revenue from the use value and invest heavily in large development teams.”


source software. Third, strategies for deterring patent infringement challenges based on the accumulation of defensive patent portfolios are either unavailable to open source software developers, or where they are available they require a diversion of funds that increases the cost and changes the nature of the open source system. More generally, patents can turn low cost systems into high cost systems. Forth, managing the risks of patent infringement is hard in a system that relies on open, massively distributed, decentralized systems of production. The risks inherent in both the development and use of open source software make it less competitive and less attractive that it otherwise would be. Fifth, efforts to pursue hybrid models that allow for proprietary benefit from voluntary effort challenge the beliefs of the free software movement and may undermine the intrinsic motivations that support the system. For those open source software systems that persist, they are increasingly reliant upon and controlled by the needs and interests of large corporate players.

While not everybody agrees that patents are a problem for open source software, and even Microsoft has made limited efforts to work with open source software, the relationship between open source and

---

170 This is not as true for open source projects that are being supported by large companies that have a business interest in the project.
closed source software remains an uneasy one. Many members of the open source software community are skeptical that a balance of closed and open source software will survive.\footnote{174} Their concerns include the negative impact of hybrid models on the motivations supporting open source software communities, stifling effects on free innovation, the high direct and indirect costs of defensive patents strategies that pervade this hybrid world, and the threats that patents will continue to pose for open source models, particularly those not backed by large corporate users.\footnote{175} Even economic models show that being able to commit to an open source licensing model for future inventions may sometimes lead to higher industry benefits, since by foreclosing the ability to act opportunistically the investments of others to the open source community are protected.\footnote{176} Opportunities to defect to proprietary models can lead to unraveling.

\textit{Applying the Guidelines: Affordable Use in Open Source}

Efforts by open source community members to use contract to limit the risks created by patents have had limited success. Disagreement within the FOSS community about how intellectual property rights should be handled has increased as the threat of patenting has increased.\footnote{177} Some members of the open source software community have suggested abolishing software patents, others are more optimistic about the use of

\footnote{174}{See FN 184 (Vetter); see also Shah, Sonali K., Motivation, Governance & the Viability of Hybrid Forms in Open Source Software Development (September 2005). Available at SSRN.}

\footnote{175}{See e.g Arnold Polansky, \textit{Is the General Public License a Rational Choice}? 55 Journal of Industrial Economics 691 (2007) (Polansky, shows that proprietary licensing can lead to a hold up problem which may terminate a sequence of innovation prematurely, and that free open source licensing may be able to avoid this).}


\footnote{177}{See e.g. Clark D. Asay, \textit{The General Public License Version 3.0: Making or Breaking the FOSS Movement}? 14 Mich. Telecomm. Tech. L. Rev. 265 (2008).}
hybrid strategies that allow for a mix of open and closed source production. Some commentators have proposed ways of opting out of the patent system through measures to create a more robust public domain. Still others have suggested that the open source software community should be using patents defensively, opting into the patent system in order to limit the effects of patents on free and open source software. Examples of this approach include revisions to the General Public License to sweep in limits on the assertion of patent rights.

In many ways open source software systems have everything that makes patents problematic – cumulative production, collective design in which individual contributions are hard to disentangle, free contributions of discoveries, and reliance on intrinsic motivations and norms of trust and reciprocity. They rely on the ability to keep costs and risks low. Patents challenge all of these characteristics. I argue that building concepts of trust, reciprocity and benefit sharing into the determination of patent remedies, taken in combination with strict enforcement of any express and implied patent license obligations attached to use of open source software, may reduce the negative effects of patents on open source software systems. Protecting trust and enforcing reciprocity involves enforcing both express and implied contractual obligations strictly, limiting the benefits from deviating from open source norms of sharing, limiting the availability of injunctive relief where there is widespread collective use of the patented technology, and preventing the private appropriation of collective value. Protecting reciprocity and improving benefit sharing involves limiting free riding on the benefits of the group and finding ways to reflect the benefits conferred by open source contributions in determining the remedies available to resulting discoveries.

178 See e.g. Clark D. Asay, A Case for the Public Domain, Working Paper 2013 (argues that the FOSS, Creative Commons, and other open license movements would be better served by abandoning IP rights and fully embracing a public domain approach to innovation).
Applying the three guidelines to patent remedies in the open source software context leads to the following changes. [I will expand here to apply each guideline separately, identifying specifically mechanisms that are threatened and how I think threat is resolved or mitigated.] First, where the patent owner seeks injunctive relief, an analysis similar to that discussed for standard essential patents should apply, with strict rules of equitable estoppel and protection of the reliance interests of open source software communities. Respect for the beliefs and practices of open source communities may reinforce mechanisms of trust and reciprocity that sustain open source systems. The GPL illustrates the use of the language of a license and the concepts of contract to support a community vision of sharing and freedom to use. It embodies the idea that legal concepts have both legal and expressive impact and can be used to reinforce internal norms. The GPL emphasizes the fact that in a world where volunteer communities offer significant value, we cannot afford to neglect the expressive implications of the law.

In addition, the significant value of preserving open source software as a competitor to proprietary software should be reflected in the equitable determination of whether injunctive relief is available, weighing against injunctive relief. This will reduce the strategic use of patents by proprietary software competitors to shut down open source systems and will protect the reliance of users on continued access to open source software. This change in approach would not block injunctive relief in situations of blatant copying of an independent proprietary product for the purpose of making it open source, but it would limit injunctive relief in situations such as the patent threats made by Microsoft to Linux users. Given the vulnerability of open source software systems to patent suits, limits on patent rights are needed to level the competitive playing field.

Second, damages that limit the tax on collective value can be used to support benefit sharing and reduce free riding and incentives to defect from the group. Where a member of an open source community, or even a third party, makes a discovery that benefits from the contributions of the

---

community, any damages that the patent owner might receive should be reduced by some measure of the value contributed by the community. In the determination of reasonable royalties, contributions from both sides, not just the value of the patented technology, should be reflected. Royalties should also be limited to the incremental value of the patented discovery prior to its integration into a larger open source system, preventing the private appropriation of collective value. This leads to greater benefit sharing, bolsters beliefs about the fairness of the system, and reduces incentives of group members to defect from the group when they make an invention as part of their activities as a group member.

Third, preserving limited kinds of open use of discoveries that emerge from open source software may be useful in sustaining volunteer based systems, particularly those most vulnerable to transaction costs and those least able to engage in defensive measures. Members of the open source community might have the right to continue the use of patented inventions that have emerged from reciprocal open source software licensing arrangements even when the patents are assigned to new users. Estoppel and implied license concepts would be broadly construed. They would limit the strategic assertion of patent rights by industry members who know about and/or benefit from the open source software system. In addition, where the patentable discovery builds on the cumulative contributions of the open source community, there should be some continued use rights by the open source community – at the very least, to allow the chance to design around the patented discovery. This reduces the incentive to defect from the community and provides some measure of reciprocity and benefit sharing. If certain modes of non-commercial use were preserved, then tensions between patents and non-market motivations for innovating might be reduced.

These ideas about the challenges that patents pose for cooperative innovation and the role of the guidelines in mitigating the problems are further explored in the second case study, that of crowd science.
B. Crowding Out Crowd Science

This is a story about how patents may block the growth of massively distributed citizen science. The story starts with the creation of a video game that anybody can play, a game called Foldit.\textsuperscript{181} Within ten days of their start on December 16, 2010, the players of a new online protein folding game called Foldit were able to solve the protein structure of a retrovirus similar to HIV, a structure that had eluded scientists for over ten years.\textsuperscript{182} The results provided scientists with important insights into the treatment of AIDS and were published in a scientific journal with the video game team players as co-authors.\textsuperscript{183} This is only one of a number of scientific advances made by the Foldit players. Other contributions by Foldit players include the discovery of a unique enzyme “backbone” configuration for the development of novel enzymes. Scientists have described this discovery as the most detailed remodeling of a protein structure by humans working through a computer-based process.\textsuperscript{184} This work moves beyond protein folding, which is critical for understanding how the human body works, and into the realm of protein design, which holds promise for advancing drug discovery. The protein design results were published in Nature Biotechnology, a mainstream scientific journal, with Foldit Players again in the author list.\textsuperscript{185}

\textsuperscript{181}See the foldit home page at http://fold.it/portal/.
\textsuperscript{183} Id.
\textsuperscript{184} See Nature, January 2012; see also Recent Exciting Discoveries by Foldit, on Foldit website, at http://fold.it/portal/node/989576; More amazing FoldIt results and new flu virus challenges, at http://fold.it/portal/node/989769.
\textsuperscript{185} See Eiben, C. B. et al. Increased Diels-Alderase activity through backbone remodeling guided by Foldit players, Nat. Biotech. 30, 190-92 (2012) http://dx.doi.org/10.1038/nbt.2109 (2012) (includes Foldit Players on the publication list; reports the use of game-driven crowdsourcing to enhance the activity of a computationally designed enzyme through the functional remodeling of its structure).
Foldit was started in 2008 by David Baker, a protein research scientist at the University of Washington, together with Zoran Povic and Seth Cooper, computer-scientists at the same university. It was developed and supported through a collaboration between the Department of Biochemistry and the Center for Game Science at the University of Washington.\textsuperscript{186} Participants in the game, most of who have little or no background in biochemistry, are introduced to some basic concepts of protein folding and then engaged in games designed around specific protein structure problems that have been identified but not solved by scientists. The players collaborate with teammates while competing with other players to obtain the highest scoring (lowest-energy) models. The game allows for two different rankings, one for soloists who work on their projects alone, and one for evolvers who work on and improve solutions that have been shared with other people. At the start of 2012 the game had 240,000 registered players, 2,200 of them active within the last week.\textsuperscript{187} The game continues to expand not just its number of players, but also the reach of its problem solving power. Most recently the creators of the game have their eyes on the design of new therapeutic enzymes and even small molecule design, taking the crowdsourcing approach into the realm of drug development.\textsuperscript{188}

The vision behind Foldit is one of enabling public participation in large scale distributed science. The project “aims to predict, design, and understand biochemical structures, and study how humans and computers can best work together to further these aims” through a growing community of game-developed expert volunteers.\textsuperscript{189} Three years into the

\textsuperscript{186} See University of Washington Center for Game Science home page at http://centerforgamescience.com/site/
\textsuperscript{187} See Jessica Marshall, 22 January 2012, Victory for crowdsourced biomolecule design: Players of the online game Foldit guide researchers to a better enzyme. Nature, January 2012.
\textsuperscript{189} See Foldit Terms and Conditions of Use, Version date: 12/17/2012.
life of the Foldit games, there is clear evidence that this massively
multiplayer online game, which enlists players worldwide to solve
challenging protein-structure prediction problems, offers improvements
over the computational models currently being used by scientists.190
“Obsessive gamers’ hours at the computer have now topped scientists’
efforts to improve a model enzyme, in what researchers say is the first
crowd sourced redesign of a protein.”191 The use of games in particular
offers valuable new ways for engaging citizen scientists, drawing on the
vast amounts of free time that people are willing to devote to problem
solving just because they want to. “[T]he average person in a country with
a strong gaming culture spends a total of 10,000 hours playing video games
by the time they reach the age of twenty-one, and that World of Warcraft
gamers have collectively spent 5.93 million years online solving the
“virtual problems” of that particular game world.”192 Foldit harnesses this
energy to solve difficult and data-intensive problems, serving as the
flagship game for the concept of using crowds to solve complex scientific
problems.193

Out of this collective effort have come publishable results and
novel discoveries. The Foldit website now boasts a number of scientific
publications that include Foldit game players as co-authors. In some cases
the Foldit players have been listed under their team names, at their own
request.194 While scientific publications co-authored by video game

190 See Seth Cooper, Firas Khatib, Adrein Treuille, Janos Barbero, Jeehyung Lee,
Michael Beenen, Andrew Leaver-Fay, David Baker, Zoran Popovic and FOldit
191 Jessica Marshall, 22 January 2012, Victory for crowdsourced biomolecule design:
Players of the online game Foldit guide researchers to a better enzyme. Nature
192 See Jane McGonigal, TED Talk
193 See e.g. Rock, Paper Shotgun, a web site devoted to PC gaming, discussing the
foldit game in the wake of results on the winners of the 15th Annual Independent
Games Festival which is well known in the video game industry, suggesting it should
be recognized, The Horace Award for Actually Advancing Science, at
http://www.rockpapershotgun.com/2013/01/08/the-inaugural-horace-awards-for-
forgotten-igf-entrants/
194 See e.g. author list for: Crystal structure of a monomeric retroviral protease solved
by protein folding game players. Firas Khatib, Frank DiMaio, Foldit Contenders
players may seem unusual, this could become the norm if crowd science continues to progress at its current rate. While publications can handle collaborative credit, however, patents may be less well equipped to manage and respect collective rights. The software used to make the game work (called the Rosetta software) was developed at the University of Washington through the support of a variety of government and foundation grants and is made available at no cost for use by academic and non-profit research institutions for non-profit research projects. The Foldit game itself was not created with the idea of producing and commercializing inventions, and during its first few years the Foldit website provided little information on intellectual property ownership. In response to queries, the site administrators/founders stated that the “Foldit project was initiated with the goal of democratizing science, and we stand behind that. The process of discovery and the eventual results of game play will all be open domain.”

In line with the original game philosophy of democratic science, the founders of the game have asked the game participants for their views on intellectual property ownership. Developer chat discussions in 2012 were used to flesh out what a Foldit IP ownership policy should look like. These community discussions raised a number of important issues. Some developers argued that Foldit was a public, volunteer driven process and that all ideas and contributions should remain public. Others


See license terms for the Rosetta software at http://c4c.uwc4c.com/express_license_technologies/rosetta.

See Entry from Zoran, as member of administrating team, 11/10/2007 at http://fold.it/portal/node/267249

See e.g. foldit Developer Chat, June 1, 2012, at http://fold.it/portal/node/992849

See e.g. one post dealing with the discussion of the foldit IP policy, at http://fold.it/portal/node/992792 “That which is created by the public should remain in the hands of the public for the benefit of all human kind. Scientific discovery - even if it's just a molecular recipe - should be used by and available to all who seek the knowledge.”
focused more on the practical challenges of benefit sharing in a system that works best when it is collaborative and invites cumulative refinements of ideas by competing members of the game. Issues raised included the complexity of benefit sharing in this context of cumulative contributions, conflicts between open science and patents, and concerns about contributions from employees with preexisting obligations to their companies.

Ultimately, the Foldit administrators proposed the following ownership provision, guided no doubt by the University of Washington:

“All significant scientific discoveries (such as structures, algorithms, etc) made in-game will be made publicly available. Discoveries will be governed by U.S. patent law and handled by the University of Washington Center for Commercialization. Individual players who contributed to the discovery will be considered inventors for the purposes of discovery ownership.”

The University of Washington has an active technology transfer center and its intellectual property policies reflect traditional assumptions about patenting and technology transfer. Its policies are “intended to show the University’s positive attitude toward the transfer of results of its research to the private sector” and are based on the assumption that “it is generally in the best interest of the University and the public that patents be obtained and/or licenses granted….”

While accepting this approach as the appropriate way to handle patentable discoveries emerging from Foldit, the Foldit developers have let the Foldit community know that they have committed to assign all proceeds from any patents on inventions that they discover back to the development of the Foldit community. Other Foldit players as IP owners will be free to choose how they use the proceeds from any inventions that they discover.

---

199 See announcement of draft ownership policy on June 4, 2012 at http://fold.it/portal/node/992792. An interesting question arises as to whether this kind of process will generate discoveries that are eligible for patent protection, or whether they will instead provide valuable but non-patentable insights that lead to patentable applications.

200 See e.g. University of Washington intellectual property policy at http://www.washington.edu/admin/rules/policies/PO/EO36.html
Unfortunately, the successes of this game may bring with them difficult questions about how to handle the intellectual property ownership of discoveries made by participants in the game. As this kind of system continues to evolve, tensions between a system of volunteer contributions and sharing on the one hand and patenting and revenue sharing on the other hand, are likely to increase. One of the remarkable features of the Foldit community is the willingness of game players to share the recipes that they develop to solve protein structure puzzles.\textsuperscript{201} Who will want to be an evolver, however, working on solutions shared with the Foldit community, if soloists stand to capture most of the reward? Who will be willing to reveal the game strategies, including the software code that enables these strategies, if there is a chance that a third party will take this information and use it to make proprietary discoveries that are not in turn shared with the group? How will inventorship be determined if contributions to the discovery are cumulative and build on each other, and how will those who have contributed significant discoveries that are not patentable be rewarded? What will happen if volunteers see that their contributions, although not patentable, lead to commercially lucrative patentable inventions that benefit others? Will volunteers be deterred from participating? It remains to be seen whether the University will be able to balance the needs and interests of the game with this traditional view of technology transfer, and whether the chance to obtain a patent will change or deter participation by game players. Although the idea of defensive patenting to keep contributions open has not been broached by FoldIt, at least not publicly, pursing a defensive strategy might alleviate some but not all of these concerns and would be accompanied by a steep price tag. Moreover, universities have typically not been either able or willing to

\textsuperscript{201} As one high scoring player of Foldit explained during an interview, “I shared BF [blue fuse tool] fully because Foldit is so much more than a game—the competition is serious and fierce, but we are also trying to improve the understanding of huge biological proteins. We collaborate and compete at the same time.” See Researchers Uncover Foldit Gamers’ Strategies, November 8, 2011 at http://www.dddmag.com/news/2011/11/researchers-uncover-foldit-gamers’-strategies
pursue such strategies. Time will tell whether this kind of collaborative approach to science can be sustained, or whether it will be crowded out.

The ways in which patent law may impact crowd science, as well as other forms of open science, have attracted very little attention from patent policymakers. Disputes over open source publishing between open science advocates and traditional academic presses have raised the legal profile of open science, but not in ways that press patent policymakers to respond. Although the costs that patents may impose on crowd science are hard to discern, that is not grounds for ignoring the value of opportunities missed and paths not taken. As described by Yochai Benkler, “[w]e have now … almost two decades of literature in experimental economics, game theory, anthropology, political science field studies, that shows that cooperation in fact does happen much more often than the standard economics textbooks predict, and that under certain structural conditions non-price-based production is extraordinarily robust. The same literature also suggests that there is crowding-out, or displacement, between monetary and non-monetary motivations as well as between different institutional systems: social, as opposed to market, as opposed to state.” Patent law and policy remain anchored to a traditional market based, producer driven paradigm and the trends in patent use and abuse threaten to crowd out innovation that falls outside of this paradigm.

Crowding out occurs when one approach to incentivizing participation has a negative impact on another. “Crowding out, or the non-separability of social preferences from the introduction of explicit extrinsic motivation, poses a systematic challenge to using traditional incentives-based mechanisms, both private and public, for eliciting desirable

---

202 For a discussion of universities and their role in the downstream management of their inventions, including legal restrictions on what strategies they have available, see my discussion in Universities as Guardians of their Inventions, 2013 Utah Law Review __.
behavior.”\footnote{See discussions of intrinsic versus extrinsic motivations and the crowding out effects of carrot and stick approaches in Daniel H. Pink, \textit{DRIVE: THE SURPRISING TRUTH ABOUT WHAT MOTIVATES US.}} One of the most widely debated examples of crowding out is the use of payments to encourage blood donations, which pits an economic framework for blood donations against a system of altruistic unpaid donors.\footnote{See e.g. Bruno Frey and Margit Osterloh, \textit{MANAGEMENT BY MOTIVATION: BALANCING INTRINSIC AND EXTRINSIC MOTIVATIONS} (2002); Elinor Ostrom, \textit{GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION} (1990).} The possible crowding out of intrinsic motivations, such as intellectual interest and desire to contribute to an issue of social importance, by extrinsic motivations, such as receiving a share of royalties on a patent, is an undeniable threat to open source, volunteer driven models of innovation.\footnote{See e.g. Richard Titmuss, \textit{THE GIFT RELATIONSHIP. From Human Blood to Social Policy}, ed. 2, expanded New Press (1997); Alena Arrow and M. Buyx, \textit{Blood Donation, Payment, and Non-Cash Incentives: Classical Question Drawing Renewed Interest}, 36 \textit{TRANSFUS MED HEMOTHER} 329 (2009) (explores strategies for creating well designed non-cash incentives which cut across rigid dichotomy of altruistic donation vs payment).} Crowding out can occur in a variety of different ways, including internal displacement of intrinsic motivations and disruptions of the system through the actions and pressures of participants from outside of the system.\footnote{See e.g. Bruno Frey and Margit Osterloh, \textit{MANAGEMENT BY MOTIVATION: BALANCING INTRINSIC AND EXTRINSIC MOTIVATIONS} (2002); Elinor Ostrom, \textit{GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION} (1990).}

One of the biggest threats to the sustainability and growth of open, collaborative systems of citizen science like Foldit is that they will be crowded out by traditional, proprietary systems of science and the commercialization of science. Patents introduce market based concerns and pressures into these open and collaborative innovation systems in ways that they may not be equipped to deal with. The costs of such crowding out of cooperative innovation for society could be large. Foldit is only one example of crowdsourcing, the use of outsourcing tasks to a distributed group of people, and only one of a number of emerging citizen science...
projects which share similar features and similar susceptibilities to crowding out. The power of collaborative gaming to solve complex data intensive problems has been illustrated in areas as diverse as finding planets, deciphering ancient texts, and building climate models. Beyond well known examples such as the SETI@home project, which involves analyzing astronomical data for signs of extraterrestrial intelligence, and Audobon Society’s Christmas Bird Count, are projects involving the pollination habits of bees, studies of the surface of the moon, and the early development stages of dinosaurs. These divergent crowd science projects share a common foundation built upon cooperation between many heterogeneous participants with diverse motivations, motivations that may not be consistent with a price based system. They illustrate the opportunities that cooperation without coordination offer for scaling up the collection and analysis of large amounts of data. Unfortunately they also share common vulnerabilities to a patent system that is not designed with them in mind.

Applying the Guidelines: Remedies that Respect Crowds

[I will expand to discuss each guideline separately in the context of the Foldit model.] Many of the problems faced by systems of crowd

---

209 Gaming for the greater good.
210 eBird, launched in 2002 by Cornell Lab of Ornithology in collaboration with the National Audubon Society, collects bird abundance and distribution data and enlists public participation in analyzing the over 80 million observations.
211 The Great Sunflower Project was started by a single academic researcher interested in examining the pollination activities of bees, and now has 90,000 registered volunteers planting sunflowers and taking observation samples.
212 See e.g. Moon Zoo, one of the collection of Zooniverse projects, at https://www.zooniverse.org/project/moonzoo
213 See Open Dinosaur Project, or ODP for short (http://opendino.wordpress.com/)
214 See e.g. Carl Sharky, TED talk, open software, implications for government.
science are similar to those faced by open source software, and the proposals discussed in the context of open source software have application to crowd science. But there are additional concerns that arise in the context of crowd science, concerns about the ability to preserve the free and open use of knowledge for non-commercial purposes and to respect and protect the openness of voluntary contributions by people with diverse and often unselfish motivations. There have been some interesting private initiatives to carve out spaces of open access and use in science that borrow from and build on the open source software models of reciprocal licensing and patent pooling.\textsuperscript{215} Examples include BIOS and the HapMap project.\textsuperscript{216} These organizations make patented and non-patented research materials and research tools freely available on the condition that any discoveries made using these resources be made similarly available. Unfortunately, while offering interesting approaches to the protection of certain domains of open science, these approaches entail administrative and enforcement costs and ultimately have limited ability to prevent parasitic patenting. Many crowd science projects will not be able to sustain the administrative costs involved here, and the rules may deter participants.

Instead of relying on private initiatives such as these, carving out certain areas of open access and use through the use of patent law may serve the public interest. Proposals to introduce concepts of patent fair use into patent law are more compelling now than they may have been in the past.\textsuperscript{217} As has been suggested in prior proposals of this nature, patent fair use should be based upon a set of context-based considerations designed to


\textsuperscript{216}See e.g. International HapMap Project, http://www.hapmap.org/abouthapmap.html

separate desirable from undesirable unauthorized use of a patent.\textsuperscript{218} Allowing for certain kinds of research use, or use by members of a group that contribute valuable non-patentable knowledge, or uses that further non-competing innovation goals, may all be facilitated by a fair use concept in patent law.\textsuperscript{219} The guidelines proposed in Part II work together to preserve a kind of patent fair use that promotes both perceptions that the system is fair to volunteer participants and areas of free access and use that sustain mechanisms of sharing. The first guideline encourages respect for group norms, and in the area of crowd science these norms involve open access and sharing of information. The second guideline limits the private appropriation of collective value, which protects the value that emerges from the many incremental contributions made by participants in crowd science projects. The third guideline enforces reciprocity in free, open systems of innovation. Crowd science projects rely on the open and free sharing of information, often for non-commercial purposes, and these are the kinds of activities that would be reinforced.

\textbf{IV. Confronting the Costs of Contextualizing Remedies}

"Many ideas grow better when transplanted into another mind than the one where they sprang up." - Oliver Wendell Holmes

While applying patent remedies with cooperation in mind does not perfectly align private and public interests, it comes much closer to doing so by incorporating collective interests in cooperative innovation into determinations of patent remedies.\textsuperscript{220} This proposal to modify patent

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{218} See e.g. Strandburg, Patent Fair Use, supra __..
\item \textsuperscript{219} Maureen O'Rourke was an early advocate of a patent fair use concept as a means of addressing the tension between patent laws and rapidly changing, cumulative processes of innovation. See Maureen A. O'Rourke, Toward a Doctrine of Fair Use in Patent Law, 100 COLUM. L. REV. No. 5 (2000) (argues that new technology has put pressure on patent laws that increasingly interfere with follow on innovation, and proposes a doctrine of fair use in patent law to relieve some of this pressure).
\item \textsuperscript{220} See e.g. Dan L. Burk, Intellectual Property in the Cathedral, available on ssrn (argues for taking a much broader range of entitlements into account when considering remedies, including but not limited to greater use of compulsory
\end{itemize}
\end{footnotesize}
remedies through guidelines that incorporate collective interests is not without its costs and risks, however.

First, strong patent rights may facilitate coordination among many different market players by reducing transaction costs, solving problems of incomplete contracting, signaling firm value, or facilitating bargains over use of the patent rights. Patents can also enhance collaborations between companies and facilitate specialization by solving problems created by incomplete contracts, imperfect information and relationship specific investments. The guidelines that I have suggested would weaken patent rights in situations of cooperative innovation by limiting the ability of patent owners to obtain injunctive relief and by reducing the damages that they are likely to get when their patents are infringed. Moreover, they may influence ex ante license negotiations, decreasing the willingness of potential infringers to obtain a license. Proponents of patents as facilitating cooperation will worry that limiting patent remedies will limit the effectiveness of patents in coordinating market players. Moreover, to the extent that the guidelines increase the uncertainty associated with patent remedies, the result could be an increase in ex ante transaction costs among technology producers and users. 


While these concerns with the effectiveness of patents in supporting cooperation cannot be ignored, they also should not be overstated. The study of how patents support cooperation has remained largely confined to market driven coordination between rational, selfish economic actors. This approach to cooperation is too narrow, and it excludes the kinds of non-market based systems of cooperation that are the focus of the guidelines. The guidelines are focused on removing the systematic disadvantages that some forms of cooperative innovation face, and as such they can be viewed as removing market distortions and allowing for freer competition across innovation regimes. They are designed to incorporate the contexts within which the invention is being produced and used in ways that limit the reach of patents only as necessary to protect the viability of competing innovation systems. In other words, they are intended to support cooperation only when patents are not already accomplishing this goal and only to the extent that patents are impeding this goal.

Second, any approach that weakens the interests of the patent owner, particularly changes that introduce uncertainty, brings with it the risk of weakening the incentives that patents provide to inventors and innovators within the market place. Moreover, the measures that I am suggesting involve broader considerations by courts and Congress of how patents impact relationships that are important to innovation. This injects discretion, and therefore potential uncertainty, into the patent system, further impacting the incentives of market participants. I suggest that these costs are likely to be limited and to be outweighed by the benefits, however. Any negative effects on individual incentives to innovate arising from the curtailing of patent remedies need to be compared to the very real, although difficult to measure, harms from discouraging alternative systems.

223 But see e.g. Robert Merges, From Medieval Guilds to Open Source Software: Informal Norms, Appropriability Institutions, and Innovation, Conference on the Legal History of Intellectual Property, November 13, 2004; Rochelle Dreyfuss, IP without IP; Peter Lee, Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer,100 CAL. L. REV. (2012)(explores the significant role of tacit, uncodified knowledge in effectively exploiting patented academic inventions.).
of cooperative innovation if remedies are not curtailed. Moreover, the use of widely accepted guidelines may actually decrease the uncertainty that already exists as a result of trends among legislators and the judiciary to consider broader interests in the determination of patent remedies. Certain judges and lawmakers have already expressed interest in realigning patent laws and, in particular, patent remedies, with the public interest. This effort is likely to continue, but the lack of a clear understanding about how patents impact innovation leaves judges to determine for themselves how to balance public and private interests within patent law difficult. The guidelines provide a focal point for how patent remedies should be adjusted and limit the areas in which they are to be adjusted.

Third, as antitrust law reminds us, not all forms of cooperation are good. Collusion among industry incumbents may reduce social welfare. Cooperation among producers of potentially competing substitutes may reduce socially beneficial competition. The impact of patents on competition is a complicated one, however. In some cases strong exclusive rights may facilitate market entry, in other cases they may

226 See e.g. Christopher Leslie, Trust, Distrust, and Antitrust, 82 Texas Law Review 515 (2004)(analyzes cartels as forms of a prisoner’s dilemma and suggests that antitrust law may sometimes prevent cartelization by “sowing the seeds of distrust among cartel members.”)
preclude entry. Some forms of cooperation benefit competition, as the competition between Linux and Microsoft illustrates. Some forms of cooperation may limit competition, such as the use of patent pools by dominant industry players as entry barriers for potential entrants who lack patent portfolios. The guidelines that I propose do not protect all forms of cooperation, nor do they create systematic advantages for some forms of innovation over others. Rather, they simply seek to reduce some of the systematic disadvantages that patents create for some systems of cooperative innovation over others by focusing on the presence of non-market mechanisms of cooperation that are vulnerable to patents.

Fourth, the guidelines may interfere with alternative, and perhaps more effective, market responses to the problems that patents create for emerging modes of innovation. Commentators and policymakers will suggest that they have not been blind to the changing landscape in innovation. Rather, with the exception of the patent trolls, they have been optimistic about the ability of private rights holders to self-correct any problems created by the current allocation of patent rights via contract and other forms of private ordering.228 Experiments with making patents more cooperative are already taking place outside of the courts and the legislature.229 Patents are used as focal points by universities in license negotiations with pharmaceutical companies, with university patents as bargaining tools for obtaining license provisions that address issues of open access to patented drugs by developing countries.230 Patent licenses modeled on the copyleft strategy of open source software are used to protect the openness of open science.231 Patent pools are formed to

228 See e.g. Mattioli, Communities of Innovation, supra n. __ (examines question of whether patent sharing reflects a form of market self-regulation, and critiques view that private ordering can always correct for excessive apportionment of patent rights).
229 See e.g. Robert P. Merges, A New Dynamism in the Public Domain, supra n. __ (examines private efforts to self-correct for excesses of patents).
231 REF Use of patents to protect open science
facilitate research and development of drugs for neglected disease.\textsuperscript{232} These initiatives are only a few of the many examples of private orderings used to promote open, collaborative exchange. But while private markets can and do correct for some kinds of cooperation failures, private orderings do not always achieve socially desirable outcomes. In many cases, the private measures are inherently incomplete, such as when groups rely on contracting to preserve openness. They are inherently defensive in nature, and often extremely expensive.\textsuperscript{233} In some cases the strategies used to preserve openness may even backfire. Patents purchased defensively by an open source organization may later become litigation tools in the hands of a patent troll. In addition, changes in patent law may have beneficial effects that are absent from private efforts to circumvent the effects of the law. As work by nobel prize winner Elinor Ostrom and others on the management of common pool resources has shown, external legal rights that control allocations within the group may interfere with valuable non-market forms of cooperation that could achieve better collective outcomes.\textsuperscript{234} In addition, changes in the law may have expressive effects that affirm or weaken group norms and values.\textsuperscript{235}

\textsuperscript{232} REF Patent pools to address development of and access to drugs for neglected diseases (Medicines patent pool, pool formed by GSK)
\textsuperscript{233} See e.g. Clark Asay, The Case for the Public Domain (describing the costs involved in trying to preserve open systems of knowledge exchange through private orderings).
\textsuperscript{234} See e.g. Hess, Charlotte, and Elinor Ostrom, eds. 2007. Understanding Knowledge as a Commons: From Theory to Practice. Cambridge, MA: MIT Press (includes design principles for managing the production of knowledge, viewed as a common pool resource, emphasizes importance of trust and reciprocity in sustaining cooperative systems, also emphasizes role of locally designed rules).
\textsuperscript{235} See e.g. Timothy R. Holbrook, The Expressive Impact of Patents, 84 WASH. U. L. REV. 573 (2006) (explores the expressive impact that patent law can have, looking at how the grant of a patent could communicate a message of inferiority to groups whose identity is tied to their biology); Jeanne C. Fromer, Expressive Incentives in Intellectual Property. 98 Virginia Law Review 1745 (2012)(explores role of expressive incentives, those that express solicitude for and protect a creator’s strong personhood and labor interests, in patent law); William Hubbard, Inventing Norms, 44 Connecticut Law Review 369 (2011)(argues that patent law has an important role to
Ultimately, the extent to which the benefits of these guidelines outweigh the costs will depend largely on how closely and how carefully they are tied to the goal of equalizing the playing field for alternative forms of innovation. The objective behind these guidelines is not to privilege certain kinds of innovation over others, but only to limit the ways in which patents may foreclose socially valuable forms of innovation. More generally, the guidelines provide a way of making patent law responsive to the very different needs of a broad range of socially beneficial forms of cooperation without significant changes to the existing patent system.

CONCLUSION

Heated debates among policymakers, including public debates among judges, about what to do in the smartphone wars have pushed seemingly technical questions about patent law and its impact on cooperation around technology standards into the daily news and even into late night comedy, increasing the need for a clear and systematic policy response to patent problems. The needs of cooperative systems that depart even further from the traditional innovation model that patent law serves, while often ignored, similarly require an informed policy response. Microsoft, once the arch enemy of Linux, joins the open source bandwagon in a limited way, but open source communities continue to play in supporting “inventing norms” and that these inventing norms should be incorporated into traditional patent law analysis).

236 See e.g. Debate between Judge Posner and Judge Michel, supra __.
237 See e.g. Conan Obrien’s spoof on the multi-billion dollar patent battle between Samsung and Apple at http://www.digitaltrends.com/apple/conan-obrien-gives-his-comedic-take-on-the-apple-samsung-proceedings/.
238 See e.g. John M. Golden, Principles for Patent Remedies, 88 Texas L. Rev. 505 (2010)(describes contours of heated debate over patent remedies, advocates five principles to guide courts and other policymakers on contemporary patent remedy questions such as whether to grant injunctive relief or prospective damages); Thomas F. Cotter, Patent Remedies and Practical Reason, 88 Texas Law Review 125 (2010)(argues for reliance on practical reason to guide policymakers in approaches to patent remedies).
worry about patent threats and spend money on defensive patenting strategies. Foldit continues in full force, with new games targeting the design of protein drugs. But as the gamers move closer to potentially patentable and commercially lucrative discoveries, they will be forced to confront more directly the role of proprietary rights in a model based on the free sharing of ideas. While some forms of open, collaborative innovation persist in the face of patent law threats, many do so only at great cost and with uncertainty about their future sustainability. To these costs and uncertainties we must add the social loss from missed opportunities and innovation paths not taken because of patent roadblocks to cooperative innovation.

Concerns about the crowding out of non-market systems by market based incentives could be reduced, I suggest, if patents were understood and applied in ways that respected socially valuable forms of cooperation. Patents that recognize collective values through preserved use rights may be less likely to undermine non-market systems of creating value, reducing the likelihood of crowding out of these systems. More generally, by understanding and explaining patent law and policy in broader terms, as a balance of individual and community interests that takes community norms and customs into account, policymakers may be able to improve the relationships that innovative communities have to patent law. By implementing patent law in ways that take the interests and needs of a community of innovation into account, and by limiting the use of patents to tax or block the collective value of cooperation, we may finally come up with a patent system that respects cooperation.