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Federal Trade Commission  
Office of the Secretary  
600 Pennsylvania Avenue, N.W.  
Room H-135 (Annex I)  
Washington, DC 20580

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**Re: Evolving IP Marketplace – Comment, Project No. P093900**

Dear Commissioners:

Although I am employed as a Senior Attorney at the law firm of Drinker Biddle & Reath LLP, the views expressed herein are mine alone, and should not be attributed to the firm or any of its clients.

Since 2001, I have participated as both a consumer and a provider of services in the IP Marketplace. I began my career in IP as a Patent Agent in 2001, prosecuting patents for many different kinds of clients, from startups to multinational conglomerates. Before that I assisted with research at the University of California, San Diego, the Salk Institute, Pacific Northwest National Laboratory, and the University of Chicago as an undergraduate and then graduate research assistant in chemical physics. More recently, I have worked as the Chief Financial Officer at The Founders Fund, an early-stage consumer Internet fund in San Francisco, which counts among its portfolio companies Facebook and SpaceX. During 2008 I spent time fundraising for a private equity fund intended to offer an alternative to traditional venture capital for universities and startups with technology that has direct application to problems faced by the employees and customers of companies with already well-established capabilities for manufacturing, marketing, and distribution. The variety of experiences I have had as both a consumer and provider of services in the IP marketplace provides me with a unique view on the current problems with the system.

The Commission has identified nine questions, the answers to which may be “particularly helpful.” I begin with an answer to the ninth question because the answer to this question has relevance to all of the remaining eight. The ninth question posed by the Commission asks: “During the past five years, what new learning has furthered the understanding of the patent system and the IP marketplace?”

### Question 9: The Systems Theory of Innovation

A new consensus is emerging among scholars and practitioners: several fuzzy questions about intellectual property and antitrust law come into focus when viewed through the lens of systems theory. Because the consensus is emerging, the terminology is not settled. A few words are therefore necessary to define the systems theory. Yet as explained below, the systems theory is not new. Some scholars and practitioners have been working with systems theory for a long time.

According to systems theory, innovation emerges from iterated cycles in which data, theory, and the people who collect data and form theory constitute feedback loops, which evolve over time. Each cycle manifests as the gathering and exchange of information among a network of experts who act as gatekeepers to a set of symbolic rules and procedures. Following the terminology of Mihaly Csikszentmihalyi,<sup>1</sup> I call the network of experts a “field,” and the set of symbolic rules and procedures a “domain.” To give examples, topology, physical chemistry, and constitutional law are domains. Each of these domains is associated, respectively, with the fields of mathematicians who specialize in topology; academic and practicing physical chemists; and academics, practicing lawyers, and judges who work on constitutional law.

A domain may be nested within or overlap with another domain. Topology is a subdomain of mathematics, and physical chemistry a subdomain of chemistry. Constitutional law overlaps with many other bodies of law. Nesting and overlap of domains occurs whenever a subset of the symbolic rules and procedures associated with at least two domains are shared, and one (nesting) or more than one (overlap) add additional symbolic rules and procedures. Nesting and overlap of domains in turn may be observed as subspecialization within and interdisciplinary collaboration among fields.

Despite nesting and overlap, a coherent domain with identifiable boundaries exists whenever there is consensus in the field about the rules and procedures that constitute the domain. An individual may change a domain by convincing its associated field to add to or modify the domain. Alternatively, an individual may pioneer a new domain by demonstrating the comparative advantage of a new set of rules and procedures, thereby attracting a new field.<sup>2</sup> When the rules and procedures of a new domain include as a subset rules and procedures from a preexisting domain, then we may call the pioneering of the new domain “specialization” or “division of labor.” More generally, we may call the way that fields and domains evolve over time “innovation.”

A few additional notes may be helpful in the discussion that follows. First, according to these definitions, the number and scope of identifiable domains is dependent upon (1) the minimum number of experts that must agree for there to be consensus in the field, and (2) the

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<sup>1</sup> Mihaly Csikszentmihalyi, *CREATIVITY: FLOW AND THE PSYCHOLOGY OF DISCOVERY AND INVENTION* 27 -36 (HarperCollins 1996).

<sup>2</sup> Note that a “new set” of rules need not be made up of entirely new rules and procedures. Rather, it may be (and, in practice, usually is) drawn from rules and procedures previously associated with variety of existing domains.

minimum number of symbolic rules and procedures that the experts must agree upon. If it takes only two experts to make a consensus, and they must agree on many symbolic rules and procedures, then there may be nearly as many domains as experts. Conversely, if it takes many experts to make a consensus, but they need only agree upon a few symbolic rules and procedures,<sup>3</sup> then there may be only one or even no field at all.

Second, how a domain or field evolves depends on how information is recorded and communicated.<sup>4</sup> For example, at least since the written word has been readily available as a mechanism for recording and communicating information, fields have included both living and dead members. For the field to evolve there must be at least one living member. But with mechanisms for recording and communicating information that persist over time, a field with no living members at one moment in time may be reborn through new living members at a later moment. A related point is that a domain and field may evolve more rapidly as the frequency and geographical scale of communications increases, bringing more scrutiny on the domain and more diversity to the field.<sup>5</sup>

Last, the systems theory is not new to existing academic fields, including law and economics. Joseph Schumpeter anticipated the systems theory with his description of the “circular flow” within an economy.<sup>6</sup> The systems theory is also consistent with Schumpeter’s famous description of gales of creative destruction within an economy.<sup>7</sup> The systems theory descends from the functionalist tradition, which has been ascribed to F.A. Hayek, Alexander

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<sup>3</sup> The scenario in which many experts agree, but only on a subset of symbolic rules and procedures, is the scenario of “incompletely theorized agreements.” Cass Sunstein, *LEGAL REASONING AND POLITICAL CONFLICT* 35-61 (Oxford University Press 1996).

<sup>4</sup> This is an observation made by Abraham Lincoln in his *Lecture on Discoveries and Inventions* in Jacksonville, Illinois on February 11, 1859. See *ABRAHAM LINCOLN: SELECTED WRITINGS AND SPEECHES* 3-11 (Library of America 1989) (delineating stages of human progress by invention of speech, writing, printing press, and patents). Lincoln could not have anticipated the invention of the Internet in 1859, although it seems the more natural step to follow the printing press now. More recently, Thomas A. Smith’s work on the “web of law” has drawn attention to how the structure and mechanisms for communicating the domain of law affect its evolution. Thomas A. Smith, *The Web of the Law*, 44 *San Diego L.R.* 309 (2007).

<sup>5</sup> This is a corollary to the part of Robert C. Ellickson’s hypothesis that relates the “close-knittedness” of groups to the development and maintenance of norms. See Robert C. Ellickson, *ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES* 167 (Harvard University Press 1991). As Ellickson notes, it is not the size of a group, but the “close-knittedness” that determines whether norms of cooperation will form. *Id.* at 182 n.48. Even widely dispersed groups that frequently engage in interactions can constitute a field that adopts an identifiable domain, although fields may be easier to constitute from local members because frequent interactions are more likely. See also Avner Greif, *Reputation and Coalitions in Medieval Trade: Evidence on the Maghribi Traders*, 49 *J. Econ. History* 857-882 (1989) (describing formation of norms among widely dispersed eleventh century merchants).

<sup>6</sup> Joseph A. Schumpeter, *THE THEORY OF ECONOMIC DEVELOPMENT* 3-56 (Harvard University Press 1934).

<sup>7</sup> Joseph A. Schumpeter, *CAPITALISM, SOCIALISM & DEMOCRACY* 87 (Routledge 5th Ed. 1994). Traditional neoclassical economics, by contrast, is not easily reconciled with the evolution of an economy.

Bickel, Lon Fuller, and Thomas Schelling among others.<sup>8</sup> Robert C. Ellickson's theory of how cultural and legal norms evolve to maximize the aggregate welfare of a frequently-interacting group is an example of a systems theory.<sup>9</sup> Richard A. Posner's concept of "Elite, Pragmatic, Schumpeterian" democracy is premised on a systems theory.<sup>10</sup> David J. Teece's capabilities approach fits well with systems theory.<sup>11</sup>

Because it is so broadly embraced, it is worth noting that the systems theory has been expressed by philosophers, physicists, biologists, and computer scientists. W.V.O. Quine described a systems theory of epistemology when he wrote that "[t]he totality of our so-called knowledge or beliefs, from the most casual matters of geography and history to the profoundest laws of atomic physics or even of pure mathematics and logic, is a man-made fabric which impinges on experience only along the edges."<sup>12</sup> Thomas S. Kuhn used the systems theory to explain how paradigm shifts structure scientific revolutions.<sup>13</sup> Physicists Ginestra Bianconi and Albert-László Barabási have used a systems theory to explain Bose-Einstein condensation.<sup>14</sup> Steven H. Strogatz and Renato E. Mirollo have used systems theory to explain the synchronous flashing of fireflies and chirping of crickets in unison.<sup>15</sup> Biologist Carl Bergstrom and

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<sup>8</sup> Robert C. Ellickson, *ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES* 149-152, 168 (Harvard University Press 1991).

<sup>9</sup> *See id.* at 167 (Harvard University Press 1991). Ellickson's hypothesis assumes the existence of a close-knit group (the field), and of norms developed and maintained by the close-knit group (the domain). Ellickson's treatise may represent the first systems theory published within the field of law and economics.

<sup>10</sup> *See* Richard A. Posner, *LAW, PRAGMATISM, & DEMOCRACY* 143-150 (Harvard University Press 2003). According to Posner's theory of democracy, a group of elites (the field) decides the rules of government (the domain) subject to checks and balances from other elites and from the public through democratic institutions, especially voting. *Id.* at 206. ("Experts constitute a distinct class in society, with values and perspectives that differ systematically from those of 'ordinary' people. Without supposing that the man in the street has any penetrating insights denied the expert, or is immune from demagoguery, we may nevertheless think it reassuring that political power is shared between experts and nonexperts rather than being a monopoly of the former. One reason that democracies tend to be more stable than authoritarian governments is that the latter are more susceptible to 'vanguardism,' the tendency to reckless social experimentation that rule by experts fosters." Posner traces this concept of democracy from Joseph Schumpeter back to James Madison, Machiavelli, and Aristotle. *Id.* at 167.

<sup>11</sup> *See, e.g.,* David J. Teece & J. Gregory Sidak, *Favoring Dynamic Competition Over Static Competition: Implications for the Law of Mergers, Monopolies, and Patents*, draft on file with author.

<sup>12</sup> W.V.O. Quine, *Two Dogmas of Empiricism*, Reprinted in *FROM A LOGICAL POINT OF VIEW* 42 (Harvard University Press 1953).

<sup>13</sup> Thomas S. Kuhn, *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* 108-110 (University of Chicago Press 1962). Kuhn's description of science as puzzle solving with paradigm shifts intervening periods of normal science is a description of how a field governing a domain evolves in response to discontinuities in the stream of data and theory available to the field.

<sup>14</sup> Bianconi, G.; Barabási, A.-L., *Bose-Einstein Condensation in Complex Networks*, *Phys. Rev. Lett.* 86: 5632-35 (2001).

<sup>15</sup> Renato E. Mirollo and Steven H. Strogatz, *Synchronization of Pulse-Coupled Biological Oscillators*, 50 *SIAM J. Appl. Math.* 1645-1662 (1990).

colleagues have using systems theory developed tools for visualizing the evolution of academic fields.<sup>16</sup> Last, but not least, using systems theory a group of computer scientists have developed a tool for automatic classification of subject matter, which has been applied to the set of published United States patents.<sup>17</sup>

From the point of view of an economist, the most important difference between systems theory and neoclassical theory may be that systems theory permits for economic actors (the field) to have preference functions (the domain) that evolve over time. As a result, although neoclassical theory is still a useful model of economic activity when changes in preferences are small within the window of time in which economic activity is observed, more generally no stable equilibrium may be reached because preferences may change during the period of observation. In addition, because systems theory need not assume that economic actors know how their preferences have or will change over time, an assumption that actors will try to match their allocation of resources to their preferences can be called “rational” only in a weak sense.<sup>18</sup> Under systems theory, whether an economic actor will engage in an activity of consumption, production, or exchange is a function of: (1) their history of preferences; (2) their history of consumption, production, and exchanges with others; and (3) the frequency of their exchanges with others.<sup>19</sup> Whereas within neoclassical theory institutions are designed to promote allocative efficiency, within systems theory institutions are designed to promote the discovery of information about preferences, and thereby the synchronization and frequency-matching of consumption and production activities through exchange and cooperation.

For example, the systems theory makes explicit the spatial and temporal dynamics<sup>20</sup> underlying the knowledge problem described by F.A. Hayek in “The Use of Knowledge in

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<sup>16</sup> Tools are available at <http://well-formed.eigenfactor.org/>

<sup>17</sup> Katy Börner, Elisha Hardy, Bruce W. Herr II, Todd M. Holloway, & W. Bradford Paley, *Taxonomy visualization in support of the semi-automatic validation and optimization of organizational schemas*, 1 J. Informetrics 214-225 (2007). The Kleinberg algorithms pioneered by Google are another example of how computer scientists have made use of systems theory to facilitate exchange of information at larger scales and with higher frequency than was possible before digital records and communication.

<sup>18</sup> Rather than maximizing stable preference functions, economic actors satisfice to subjective perceptions and forecasts of preferences. Herbert A. Simon, *A behavioral model of rational choice*, 69 Quant. J. Econ. 174-183 (1956).

<sup>19</sup> These are the characteristics of uncertainty (or “bounded rationality”), asset specificity, and frequency used by Oliver E. Williamson to classify transactions costs. See Oliver E. Williamson, *Transaction Cost Economics: The Governance of Contractual Relations*, 22 J. Law & Econ. 233 at 239 (1979). As noted by Robert C. Ellickson, these categories can be used also to classify the “social imperfections” that prevent cooperation. See Robert C. Ellickson, *ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES* at 181 (Harvard University Press 1991) (“The hypothesis predicts that departures from conditions of reciprocal power [i.e., asset-specificity], ready sanctioning opportunities [i.e., frequency], and adequate information [i.e., bounded rationality] are likely to impair the emergence of welfare-maximizing norms.”).

<sup>20</sup> The difficulties in forming accurate and useful hypotheses about the time-dependent behavior of large groups of people can be traced to the poverty of data sets granular enough to capture individual behavior, yet large enough and long-term enough to capture group behavior. Because the Internet now automatically captures trails of data about

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Society.”<sup>21</sup> With the systems theory in mind, we can identify the function of markets with their facilitation of the exchange of information and coordination of economic activity independent of central planning.<sup>22</sup> This is in stark contrast with neoclassical theory, which often identifies the function of markets with the maximization of aggregate utility based on an assumption of stable preferences<sup>23</sup> — a function that cannot be carried out by a central planner beyond a small scale. The systems theory therefore identifies markets as a mechanism for rewarding information exchange and cooperation, thereby facilitating economic growth.

Due to space considerations, this brief introduction of systems theory must serve as an answer to the Commission’s ninth question. Specific answers to the Commission’s remaining eight questions will hopefully serve to further explain systems theory and its instrumental value to patent and competition law and policy. In summary, the United States patent system, which was first put into effect by the Patent Act of 1836,<sup>24</sup> is understood within systems theory as a sophisticated, market-based mechanism for promoting the progress of innovation through a competition among inventors. The systems theory provides intellectual property and competition regulatory authorities an improved framework for understanding and analyzing the effect of institutional reforms.

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individual behavior, scientists are now able to analyze and test hypotheses about group behavior that were almost impossible to test before. *See, e.g.*, R. Dean Malmgren, Jake M. Hofman, Luis A. N. Amaral, Duncan J. Watts, *Characterizing Individual Communication Patterns*, Proceedings of the 15th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (*forthcoming*), available at <http://arxiv.org/abs/0905.0106>. Note, however, that Csikszentmihalyi and Larson had been collecting such data manually for at least a decade before the Internet was widely available. M. Csikszentmihalyi, R. Larson, *Validity and reliability of the experience sampling method*, 175 *Journal of Nervous and Mental Disease* 526-536 (1987).

<sup>21</sup> F.A. Hayek, *The Use of Knowledge in Society*, 35 *Am. Econ. Rev.* 519-30 (1945).

<sup>22</sup> This function of markets was given extended treatment by F.A. Hayek. *See, e.g.*, *THE ROAD TO SERFDOM* 33-104 (Routledge 2001).

<sup>23</sup> This distinction parallels the distinction drawn by Robert C. Ellickson between what he calls “welfare maximization” and what Richard A. Posner calls “wealth maximization.” Robert C. Ellickson, *ORDER WITHOUT LAW* 170 n. 13 (Harvard University Press 1991).

<sup>24</sup> Prior to the Patent Act of 1836, there was no field or domain because patents were not generally examined or published under the Patent Act of 1793. Sheldon W. Halpern, Craig Allen Nard, Kenneth L. Port, *FUNDAMENTALS OF UNITED STATES INTELLECTUAL PROPERTY LAW* 196 (Kluwer Law 2d Ed.); *see also* Patent Act of 1793, Ch. 11, § 1, 1 Stat. 318-323 (1793) (providing for registration); Kenneth W. Dobyns, *THE PATENT OFFICE PONY: A HISTORY OF THE EARLY PATENT OFFICE* 50 (“[Patent Office Commissioner William] Thornton said that it had not been the practice of the Patent Office to give out copies of patents without permission of the patentee except in cases where suits in law had rendered it necessary.”). In fact, the establishment of a patent system through the examination and publication of patents may have resulted also in the emergence of trade secrets as intellectual property rights. *See* Mark A. Lemley, 61 *Stan. L. Rev.* 311 at 315 (2008) (“American courts first recognized a cause for damages for misappropriation of trade secrets” in 1837.). Or as Alfred North Whitehead put it, “[t]he greatest invention of the nineteenth century was the invention of the method of invention.” *SCIENCE AND THE MODERN WORLD* 96 (Simon & Schuster 1997 Ed.).

Question 1: *How has the IP marketplace changed in the past five to ten years? What changes are expected in the future? What aspects of the patent system drive those changes? What is the impact of those changes on innovation?*

There have been many major changes to the rules and procedures of the patent system in the past five to ten years. Consistent with systems theory, all have had an impact, although the impact of particular changes may not be as readily observable because of the low frequency of certain events. The federal judiciary is a system that is relatively isolated from the rapid changes that have occurred in most of the markets within which the inventors and companies who use the patent system operate. Yet as Oliver Wendell Holmes, Jr. argued over one-hundred years ago,<sup>25</sup> the rules of the common law evolve to address the conflicts presented to judges, and the understanding by litigants and judges of the underlying sources of those conflicts. Although the Federal Circuit rules have evolved far more rapidly over the past five to ten years than has most common law over the course of the history of Anglo-American jurisprudence, the markets governed by the Federal Circuit rules evolve still more rapidly.<sup>26</sup> The difference in the rate at which systems evolve should be considered in institutional reforms.

To accommodate differences in the rate of evolution, the Federal Circuit and Congress should adopt rules that shift decisionmaking authority, whenever possible, to competent and trustworthy private authorities, such as standards making bodies or administrative agencies subject to accountability enforced by transparency.<sup>27</sup> In addition, attention should be given to the fact that many new contributions to technical domains come from new entrants, including individuals and startups. As much as possible, the rules of intellectual property and competition law should be balanced so that no incumbent field can take a new contribution without giving reward or recognition to its inventor. Such short-circuits of the cycle of innovation discourage new contributions, and hence growth. We should be concerned, for example, with the fact that economies of scale govern the prosecution of patent infringement lawsuits because of the high and inelastic cost of legal fees. Although contingency fee counsel are available to small entities in some instances, the incentives of these counsel are not always well-aligned with the system's goal of promoting the progress of innovation through rewards to inventors commensurate with the value of their contribution to the domain.

Consideration should be given also to how market actors are deterred from undertaking private measures to solve problems when the variable of government influence on the market

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<sup>25</sup> Oliver Wendell Holmes, Jr., *THE COMMON LAW* 1 (Little Brown & Company 1881) (“The life of the law has not been logic; it has been experience. The felt necessities of the time, the prevalent moral and political theories, intuitions of public policy, avowed or unconscious, even the prejudices which judges share with their fellow men, have had a good deal more to do than the syllogism in determining the rules by which men should be governed. The law embodies the story of a nation's development through many centuries, and it cannot be dealt with as if it contained only the axioms and corollaries of a book of mathematics.”)

<sup>26</sup> It is best conceptually to consider each market as a separate system, coupled by low-frequency but strong interactions with the federal judicial system.

<sup>27</sup> Granted that “[r]esolution of issues of comparative institutional competence is of course notoriously difficult. . . .” Cass Sunstein, *Cost-Benefit Analysis and the Separation of Powers*, 23 *Ariz. L. Rev.* 1267,1270 (1981).

cannot be fixed. While the common law is a more adaptable mechanism for addressing market problems than legislation, this particular consideration militates against continued interventions in favor of a single, concerted reform effort in Congress that is then respected by the courts as the rules of the game for competition in the marketplace for intellectual property.

Question 2: *What are the new business models involving intellectual property? What has motivated the development of these business models? What is their impact on innovation?*

Since the Bayh-Dole Act of 1980, many of the inventors who used to work on basic science within large companies like AT&T and IBM have moved into academia. I knew and worked for one of these inventors. W.E. Moerner spent part of his early professional career at IBM's Almaden Research Center, where he pioneered and patented single-molecule spectroscopy. In the early 1990s, he moved to the University of California at San Diego, where I met and worked with him as an undergraduate research assistant. He is now a Professor at Stanford University. Over the course of his career, he has continued patenting and publishing his work on chemical physics, including most recently his discovery with Adam E. Cohen of an Anti-Brownian Electrokinetic trap (ABEL trap) capable of trapping and manipulating individual fluorescent molecules in solution at room temperature.<sup>28</sup> W.E. Moerner is one of a host of researchers who at one time found industry to be the best home for their work, but who now prefer the culture and environment of academia.

From a systems theory view, the most promising new business models for the development and commercialization of IP are built around the observation that the best new ideas are being generated by universities and startups that provide the culture in which people like W.E. Moerner and his students feel the most comfortable. Patent and competition law should continue to evolve to foster research and development collaborations<sup>29</sup> among people like W.E. Moerner and his former colleagues in industry who do more applied research and product development.

The recent announcement of the Bio-Energy Institute at the University of California at Berkeley provides a concrete example of how such collaborations might look.<sup>30</sup> Working with others at Berkeley, at the University of Illinois Urbana-Champaign, and at British Petroleum, Carol Mimura was able to negotiate and close a deal that successfully brought together inventors in academia and researchers in industry who can take the most innovative new ideas from inventors and turn them into products for consumers — all without the many transactions costs and delays (such as carried interest and investment banking fees) associated with a traditional venture capital pipeline. This type of deal will not be possible for every field, but it demonstrates what is possible when people are willing to cooperate and contract around the

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<sup>28</sup> A.E. Cohen and W. E. Moerner, *Suppressing Brownian motion of individual biomolecules in solution*, 103 PNAS 4362-4365 (2006).

<sup>29</sup> It should be noted that Congress has already enacted reforms to the patent law for fostering research and development collaborations. See CREATE Act; Pub. L. 108-453, 118 Stat. 3596 (2004).

<sup>30</sup> See Testimony of Carol Mimura at the FTC Hearings on May 4, 2009.



many uncertainties that exist under patent and competition law now. Because it streamlines the process and eliminates many of the intermediaries that are traditionally required to facilitate technology transfer, this deal represents the future of the IP marketplace. Regulatory authorities could do worse than by following the simple rule of thumb in considering new policies: Would this type of rule make it easier or harder for that type of deal to occur in the future?

*Question 3: What economic evidence is relevant when analyzing whether to grant a permanent injunction following a finding of infringement? What proof have courts required? How should the analysis take into account the incentives to innovate provided by the patent system and the benefits of competition? What is the appropriate remedy when the court has denied a permanent injunction after a finding of infringement?*

Before addressing this question directly, it is worth noting that the systems theory distinguishes between patent trolls and non-practicing entities. Like Adam Smith,<sup>31</sup> the systems theory recognizes that a division of labor between inventors and others in society has social benefit. Demanding that inventors also develop skill in entrepreneurship or investment before receiving their rewards makes inventing less desirable as a profession, and fewer talented individuals will choose to work as inventors so long as those additional skills are required.<sup>32</sup> There is thus a socially beneficial role for non-practicing entities to acquire rights to inventions with intent only to sell or license rights without themselves practicing any inventions. Universities are an example of such non-practicing entities. By contrast, a patent troll is an entity that has made no contribution to any domain, but that nonetheless manages to obtain legal rights and demand rewards.<sup>33</sup> The distinction between patent trolls and other non-practicing

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<sup>31</sup> Adam Smith, *THE WEALTH OF NATIONS* 6 (Methuen & Co. 1904) (noting that the invention of machinery used for manufacturing probably results from a division of labor between inventors and others).

<sup>32</sup> Note how many of the most successful startups have been founded by inventors with an interest in and talent for business. It is a commonplace among Silicon Valley venture capitalists that “ideas are cheap, execution is everything.” This is a commonplace because of how often the same intellectual property is simultaneously pitched by multiple teams to venture capitalists around the valley. According to systems theory, there would be a greater variety of intellectual property, and hence a broader distribution in the outcomes in startups, should a division of labor between inventing and other business roles be established. Indeed, it is doubtful as to whether venture capital would be available to pharmaceutical startups at all without the division of labor between inventing and commercialization facilitated by strong patent rights in that market since incumbents generally possess the same or better capabilities as startups for manufacturing, marketing, and distributing pharmaceuticals.

<sup>33</sup> Note that under this definition, a patent troll could, in principle, be a practicing entity. A practicing entity that (1) copied an invention from another company, and (2) patented and filed lawsuits for infringement of the copied invention, would fall within the systems theory definition of “patent troll.” Systems theory focuses attention on the inventors and on what the inventors taught the field, either directly or indirectly, through their disclosure and post-filing activities (both public and private). A related point is that at least some patent trolls enforce claims that are too broad because their supporting disclosures or teachings were never accepted by any field, and not for want of trying by their inventor. This kind of patent troll should be distinguished from the kind that deals only with “inventors” who are really system insiders (such as patent lawyers), and never attempted to teach or gain recognition from any field. The former seek recognition in addition to reward; the latter, reward alone.

entities thus is located in whether an entity has honored its part in the *quid pro quo* of patenting — namely, the contribution of patentable knowledge to a domain.<sup>34</sup>

The Supreme Court in *eBay* rejected the Federal Circuit’s rule that an injunction should be available to any patentee who can prove infringement on the grounds that the patent law had not adequate reasons to be considered differently by the common law of injunctions.<sup>35</sup> Aside from a general inclination to keep the federal common law of injunctions consistent and coherent, the Supreme Court’s ruling was motivated by the perception that injunctions were being used to extort settlements by patent trolls who were not part of any field and had made no contribution to any domain. The evidence for this motivation is found in the Supreme Court’s caveat that injunctions may still be granted to “university researchers or self-made inventors.”<sup>36</sup> The Supreme Court thus recognizes the distinction drawn by systems theory between patent trolls and other non-practicing entities.

Although many have argued that the distinction between practicing and non-practicing entities should be used in determining what remedies are available to patent owners, the distinction offered by systems theory is more consistent with the ruling and reasoning followed by the Supreme Court. Like the Supreme Court, systems theory recognizes that not all non-practicing entities should be refused the negotiating leverage that a threat of injunction can provide a new entrant whose ideas have been copied by established large companies.

According to systems theory, the better way to locate the distinction between “patent trolls” and others is in how much the inventors taught the field through the disclosure of their invention, *both* through the notice provided by specifications and drawings filed at PTO, *and* through papers, talks, or other forms of collaboration that happen faster than they otherwise might without the security of patent rights. Systems theory recognizes that it is not through the disclosure of the specification and drawings alone, but also through the exchange of information facilitated by the security that patent rights provide, that new inventions are taught to a field, and become recognized as part of its domain. Depending on the field, this exchange may occur much faster than the eighteen-month publication, much less the period before a patent can be issued.

*Question 4: Do the legal rules governing patent damages result in awards that appropriately compensate patentees? Are there circumstances in which they result in overcompensation or undercompensation of patentees? What evidence is there of the extent of these problems? What*

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<sup>34</sup> This *quid pro quo* has been recognized at law since at least 1816 in England, and at least since the Patent Act of 1836 in the United States. See *Liardet v. Johnson*, 1 Stark 199, 201-2 (1816) (Mansfield, J.) (“The meaning of the Specification is that others may be taught to do a thing for which the patent is granted, & if the specification [is] false, the patent is void for the meaning of the Specification is that after the term [of the Patent] the public shall have the benefit of the discovery.”); Patent Act of 1836, 5 Stat. 117, Ch. 357, §§ 5-7.

<sup>35</sup> *eBay v. Mercexchange*, 547 U.S. 388 (2006)

<sup>36</sup> *Id.* (“For example, some patent holders, such as university researchers or self-made inventors, might reasonably prefer to license their patents, rather than undertake efforts to secure the financing necessary to bring their works to market themselves. Such patent holders may be able to satisfy the traditional four-factor test, and we see no basis for categorically denying them the opportunity to do so.”)

*information would be helpful to better assess whether damage awards appropriately compensate patentees? Are courts and juries able to make damages determinations with sufficient accuracy? To the extent that there are problems resulting from the determination of damages for patent infringement, how should they be addressed?*

Before answering this question directly, it should be noted that within systems theory, the costs of a misapportionment of damages may be small compared to the social benefits that result from the more rapid development and dissemination of knowledge. The biggest issue for patent reform in terms of social impact is what F.A. Hayek called “the knowledge problem.”<sup>37</sup> As any society grows, the dispersed bits of knowledge held by its members must be coordinated at ever larger geographical and longer time scales. Without coordination, organizations cannot grow through commerce and other forms of cooperation. The patent system that was perfected (if not invented) in the nineteenth century in the United States is the most sophisticated system ever known for coordinating the creation and sharing of knowledge. Although it is important for patent damages to be allocated fairly, the costs of mistakes in damages apportionment are probably much less than the massive social costs of redundant inventing, excessive secrecy, fear of idea theft, translation and language barriers, and other impediments to the sharing of ideas that the patent system is meant to remove.

To that caveat, I add that within systems theory, a measure of damages may be flawed unless it reflects how the cost of any non-infringing alternative (or alternatives) changes over time. When a company makes a decision to build a product that includes a particular part, depending on how many other companies are buying the part (and how much of it, and for what purpose), the market price of the part may go up or down as a result of the company’s decision to use the part. Increases or decreases in the market price of the part over time will be a function of the liquidity in the market for the part. The floor on the measure of damages should be set at the time-integrated sum of the difference in price between the claimed invention and the best non-infringing alternative available at each increment of time. These differences should also be discounted by the cost of capital to the accused infringer at each increment of time.

*Question 5: How have changes in willfulness doctrine changed the behavior of patentees and potential infringers? Do recent changes in the law adequately address the concerns with willfulness doctrine identified in the October 2003 FTC IP Report?*

Because of the changes to the law of willfulness made by the Federal Circuit in *Seagate* and *Knorr-Bremse*,<sup>38</sup> the threat of liability for willful infringement is not as much of an impediment to large companies in dealing with the patent system as it used to be. But a systems theory of the economics of innovation reveals how these changes to the law of willfulness are both overinclusive and underinclusive.

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<sup>37</sup> See the discussion of F.A. Hayek and the knowledge problem under Question 9 above.

<sup>38</sup> *In re Seagate Technology, LLC*, 497 F.3d 1360 (Fed.Cir. 2007) (*en banc*); *Knorr-Bremse Systeme Fuer Nutzfahrzeuge GmbH. v. Dana Corp.*, 383 F.3d 1337 (Fed.Cir. 2004) (*en banc*).

The rule of *Seagate* prevents companies whose products are accused of patent infringement from being found liable for trebled damages for not taking affirmative steps to avoid infringement or confirm noninfringement or invalidity (for example, with formal advice of counsel). But the rule of *Seagate* was also underinclusive in that many companies still refuse to conduct prior art searches prior to filing for their own patents because of a concern that such searches may result in a finding of willful infringement. Some exclusion for information found in prior art searching should be added to the patent law to distinguish patents found in prior art searching from patents found in clearance searching. The fact that the searches are conducted by the same people at many organizations should not prevent the law from providing the protection to the organizations that are large enough to have a division of labor between these functions, which are substantially different.

The rule of *Seagate* was overinclusive because it made it so much harder for patent owners to obtain findings of willful infringement in circumstances where the intent was there, but there is little circumstantial evidence of it remaining because of the time delays between litigation and notice, turnover in the employees of the accused infringer, and so on. In practice, findings of willfulness are so rare that they are not a credible threat for patent owners in negotiating with infringers, even copyists.<sup>39</sup>

*Question 6: How will changes in patent law rendered by Supreme Court and Federal Circuit decisions of the past five years affect the value of patents? How will these changes affect the operation of the IP marketplace? How will they affect innovation and competition?*

The most important insight offered by systems theory to this question is that the rate of changes to the law itself has an affect on how the marketplace evolves. As noted above, attention should be given to the fact that market actors are deterred from undertaking private measures to solve problems when the variable of government regulations of the market cannot be fixed. While the common law is a more adaptable mechanism for addressing market problems, this consideration militates against its continued interventions in favor of a single, concerted reform effort in Congress that is then respected by the courts as the rules of the game for competition in the marketplace for intellectual property.

*Question 7: How does uncertainty regarding the validity and scope of patents affect the operation of the IP marketplace? Does the current system adequately fulfill the notice function of patents? How does uncertainty influence the operation of the IP marketplace? What are the sources of uncertainty that affect the value of patents and the operation of the IP marketplace? What could be done to address them?*

It is in response to these questions that the systems view of patent law really surpasses the understanding provided by existing theories. What systems theory demonstrates is how mechanisms for recording, publishing, searching, and sharing information have a drastic impact on how much and how fast a domain and field evolve over time. The pervasive influence of

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<sup>39</sup> See Testimony of Martin J. Simpson, Jr. at the FTC Hearings in Berkeley on May 5, 2009.

these mechanisms on how the system functions as a whole can be illustrated by the following examples.

First, complaints from the software field that the patent system is broken can be explained as a consequence of how programming languages and algorithms evolve over a period of months<sup>40</sup> — faster even than a patent can be issued in the best of circumstances given PTO resource constraints. In addition, the one-sentence English-language claims of patents do not follow the symbolic rules and procedures adopted by the field of software engineers as their domain. Conversely, part of the praise of the patent system from the pharmaceutical field can be explained as a consequence of patents issuing faster than the rate of FDA approval, and of how inventions are claimed as chemical structures, using the same rules and procedures of nomenclature pharmaceutical researchers to report their work generally.

Second, when information is recorded using symbolic rules and procedures unfamiliar to a given field (such as the legalese of patent specifications and claims), that information is less valuable (maybe even worthless) to other fields as a source of knowledge because it must be (at best) translated back into the language of the field before it can be assessed as a contribution. Prudent patent prosecutors often delete much of an inventor's description of the background of the invention because it can limit the scope of the claims.<sup>41</sup> But background information is included in other technical documents, such as academic publications or whitepapers, because it is useful in understanding the work. Similarly, although permitting a wider variety of formats for the disclosure of inventions might increase the burden on PTO resources, it is unclear why the patent system does not permit inventors to explain their inventions using audio and video, and other forms of digital media. Again, the rule of thumb should be that the rules and procedures for describing the invention should track the rules and procedures of the domain of the invention, not the rules and procedures of the PTO. With appropriate reforms in place, examiners might spend more of their time reviewing applications for compliance with enablement requirements, and less with mechanical checks for compliance with format restrictions on specifications and drawings, which were more appropriate in an era in which the marginal costs of publishing were much higher.

Third, when the Supreme Court ruled that patent applications should be considered prior art from the day of filing because, in principle, a patent application might be examined and published on the same day it was filed that was an impossibility.<sup>42</sup> Thanks to modern technology, it is no longer. At the very least, there is no reason that applications should remain confidential for the first eighteen months after filing. Applications should be published immediately so that users of the patent system can determine immediately whether there are others who are doing similar work prior to making investments of time or money.

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<sup>40</sup> See Testimony of Michelle Lee at the FTC Hearings in Berkeley on May 5, 2009 (3-month development cycle for some software products).

<sup>41</sup> See, e.g., *Revolution Eyewear, Inc. v. Aspex Eyewear, Inc.*, 2008-1267, -1376 (Fed. Cir. April 29, 2009).

<sup>42</sup> *Alexander Milburn Co. v. Davis-Bournonville Co.*, 270 U.S. 390 (1926) (Holmes, J.) (“The delays of the patent office ought not to cut down the effect of what has been done.”).

In further considering the question of notice within the framework of systems theory, it may be useful to compare the patent system to another institution in our society that is addressed to a similar problem — the system of peer review in academia. The peer review process for scientific literature is an example of an institution that is designed to promote the healthy evolution of a domain. In the case of peer review, the goal is to ensure that very little false information makes it into the literature. Peer-reviewed journals are often considered more reliable because the institution of peer review tends to reject some good contributions in error in order to avoid bad contributions. In this sense, peer review might be considered a conservative model for promoting innovation. Rewards and recognition within academia go to the individuals whose contributions repeatedly clear the bar of peer review.

The patent system, by contrast, is founded upon a more liberal approach to promoting the evolution of a domain. Under the patent system, the rewards for an innovation are not determined by a subset of experts in the field, and not even by a consensus among the entire field. Rather, the rewards of the patent system are determined by whether people who are probably not experts at all are willing to pay for the innovation.<sup>43</sup>

The patent system is more aggressive than the peer review system in the sense that there is not as much concern with false positives. Under the patent system, inventors are encouraged to disclose their work early and often. In fact, it is safer to file a patent application before the invention is reduced to practice because a sale or public use of the invention can trigger a loss of rights. To be sure, under the patent system applications are examined for compliance with both procedural and substantive rules by an examiner skilled in the relevant domain. But nobody would confuse a patent examination with peer review.

Yet replacing the patent system with a peer review system would not be a great improvement. Because the rewards of patenting are ultimately determined by the market, there is no need to filter carefully the applications filed. Although many claimed inventions are a complete boondoggle because better solutions for the same problem are already available, even worthless claims may be supported by a valuable disclosure of technology useful in making other inventions. So long as such disclosures are organized and searchable, they may in principle be useful in the future, if nothing else than as negative results. Because under the patent system the market performs the function of determining the rewards for patenting, the focus of patent examination should be almost entirely upon the requirements of § 112 (i.e., upon the requirements of specific, clear claims that are supported by a comprehensive and understandable disclosure).

Note that this is already how the patent system functions with respect to pharmaceuticals. If a company wants to market or sell a drug, it can look in the Orange Book and see whether it is already patented. Examiners in this domain are also known to be sticklers for enablement, requiring multiple examples when the enablement is in doubt.

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<sup>43</sup> In this sense, the patent system bears many similarities to the Schumpeterian democracy described by Richard A. Posner in *Law, Pragmatism, & Democracy*. See note above.

By comparison, the peer review system is better at enforcing a social norm among scholars that prior publications must be read and cited as part of any offering of a purportedly new contribution. Scholars who fail to comply risk being labeled dilettantes or cranks. These norms are quite effective at reducing the amount of redundant work in the academy. This norm should be reinforced by the patent system too because, from a social perspective, time and money are wasted whenever more than one company invests in producing the exact same invention. Multiple inventions cannot always be avoided. Sometimes new tools or information will suddenly make multiple inventions inevitable.<sup>44</sup> But the default rule should be for engineers and scientists to consult the literature before spending time and money (either theirs or another's) on inventing. The conventional wisdom among some right now is that independent invention should be a defense to patent infringement because the patentee made no contribution to the infringer's independent work. The conventional wisdom is not wrong in that under our current system, many patents offer no benefit to the public, including any independent inventors. What the conventional wisdom ignores is that society loses whenever two or more companies spend money inventing the same thing. With a few reforms, the patent system would be uniquely well-suited to avoid that loss. Unfortunately, if some current proposals for reform are adopted, we may have instead a system in which patents are irrelevant to most fields. Inventors have no incentive to disclose; companies have no incentive to read their disclosures.

*Question 8: How transparent is the current IP marketplace? Can it be made more transparent? Is that desirable?*

Continuing with the comparison to peer review, the patent system, unlike the peer review system, can provide the benefit of market prices to help in identifying valuable contributions. Paradoxically, that information is not available to the public now. Whereas the PTO could be a clearinghouse for information about the market value of inventions post-issuance, it is instead now a recording office and collector of maintenance fees. Disclosing the details of transactions involving patents should be part of the quid pro quo for patenting. Market price is the most compact indicator of the value of an invention to society, and both buyers and sellers would benefit from that information being public.

To be sure, market prices are not a perfect indicator of the value of a contribution.<sup>45</sup> But market prices are better than any alternative now available. Liquidity in patent rights is not going to improve significantly until price information is readily available to any even casually interested buyer because without that information being public, the transactions costs will always be a strong function of the legal fees associated with doing diligence on a portfolio.

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<sup>44</sup> See John F. Duffy, *A Timing Approach to Patentability* available at [http://www.aipla.org/Content/ContentGroups/Speaker\\_Papers/Spring\\_Meeting/200812/Duffy-paper.pdf](http://www.aipla.org/Content/ContentGroups/Speaker_Papers/Spring_Meeting/200812/Duffy-paper.pdf)

<sup>45</sup> The current debates over mark-to-market accounting rules promulgated under Financial Accounting Standard 157 are another illustration of how market prices coordinate a diverse set of subjective valuations. According to systems theory, assets should be marked to market only at the frequency with which they are typically bought and sold or an amplification of volatility may result.

Through these extended comments, I hope to have provided the Commission with an illustration of the merits of using systems theory to understand how the IP marketplace is evolving. I am excited about the prospect of reforms to intellectual property and antitrust law that will foster innovation, which is so vital to the future of the United States.

Kind regards,

/s/

Michael F. Martin