Texas Law Review Online

Volume 99

Article

Calculative Patents*

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Abstract

Patents are legal delinquents. A growing body of empirical evidence demonstrates that patents repeatedly fail to fulfill the responsibilities they have been assigned in fostering innovation. But I argue here that in their moments of misbehavior, we can catch a glimpse of the social roles patents play when no one is watching. Drawing on insights from the sociology of markets, I argue that patents are surreptitiously performing functions familiar from the grocery store, the vegetable stand, or the barber shop. I suggest that patents are calculative, not in the mathematical sense, but in the sociological sense of structuring and facilitating market relations. This approach to discovering the social roles of patents opens the door to a new examination of patent purposes, and to understanding some otherwise inexplicable characteristics of patent law.

Introduction

Patents are misbehaving. A growing body of evidence indicates that our conventional justification for patents, explaining them as incentives to innovate, cannot be squared with the manifest behavior of those who procure and

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enforce patents.[1] While alternative economic rationales such as patent "signaling" have been suggested, none of these seems to satisfactorily account for the characteristics and practices surrounding the patent system, either.[2] The growing gap between fervent beliefs regarding the purposes of patenting and real-world activity involving patents has prompted something approaching a religious crisis of faith in the accepted economic dogma of patent incentivization.[3]

But I suggest that this crisis of understanding is in fact an opportunity. Such moments offer us the chance to, as Bruno Latour recommends, "follow the actors" in the patent system, to observe what they are doing rather than what they are saying, to assess their purposes as revealed by their actions rather than as justified by explanations.[4] As I have argued in previous work, such peculiar instances of "loose coupling"—or perhaps complete decoupling—between the material practice of patent institutions and the stated policies of the patent system offer compelling signals as to where something interesting is going on behind the façade of patent incentives.[5] This more reflective stance leads to the realization that, rather than errors needing to be repaired, anomalous practices may instead indicate opportunities to be investigated.

Even if patents are not doing what we believe they should be doing, they are clearly doing *something* in the marketplace, and by setting aside our preconceived notions of their purpose, by looking more thoughtfully at their characteristics and associated practices, we are in a better position to discover what their actual role may be. I suggest in this paper that a key consideration in tracing the path of patent practice in this way is not so much the economics of patent functions but the overlooked sociology of patent functions. The disconnection between current patent theory and observed practice affords us the space to consider the social roles played by patents, in particular the social roles they appear to be playing in the construction of markets. I argue in particular that patents bear the hallmarks of socially "calculative devices" that render innovative concepts susceptible to market transaction.

I begin by briefly reviewing the disconnection between economic theory and observation of the patent system. This disconnection suggests that patents may be playing a role as social facilitators of innovation markets rather

1. *See* Mark A. Lemley, *The Surprising Resilience of the Patent System*, 95 TEXAS L. REV. 1, 8–9 (2016).

2. *See* Dan L. Burk, *On the Sociology of Patenting*, 101 MINN. L. REV. 421, 426–27 (2016) (discussing the mixed and inconclusive empirical evidence for the theory of patent signaling).

3. Mark A. Lemley, *Faith-Based Intellectual Property*, 62 UCLA L. REV. 1328, 1331–38 (2015).

4. *See* BRUNO LATOUR, REASSEMBLING THE SOCIAL: AN INTRODUCTION TO ACTOR-NETWORK-THEORY 12 (2005).

5. Burk, *supra* note 2, at 436.

than economic facilitators of market transactions. Specifically, I argue that patents help to render goods calculable, which is to say that patents allow innovative goods to be disentangled from the associations in one social context and moved to another. After summarizing the literature on the sociology of markets, I show how the legal and rhetorical features of patents serve to isolate, distinguish, and characterize technical concepts, thus rendering them calculable. I conclude with some thoughts on further research to be done in this vein.

I. Patent Justifications

The most common justification for the patent system is some version of an innovation incentive rationale, which holds that innovators will be unwilling to invest in new and beneficial technologies unless they are somehow guaranteed a return on their investment.[6] Because new inventions are easily appropriable, the theory predicts that they will be underproduced because they can be copied as soon as they are publicly released. Consequently, a period of legally enforced exclusivity via governmentally issued patents serves to facilitate investment in technological development. Typically, this argument is linked to economic models involving public goods. Although there will be social costs from the elevated prices and restricted output during exclusivity, the social benefits stemming from provision of new technologies are expected to outweigh such costs.

An alternative incentive theory posits patent exclusivity as an incentive to disclose valuable information that might otherwise be kept as an actual secret, or as a legally protected trade secret. The standard economic explanation offered for this version of patenting revolves around Arrow's Information Disclosure Paradox: because information is freely appropriable once disclosed, inventors will be reluctant to disclose their valuable innovations or to invest in developing valuable information that cannot be kept secret.[7] Patents are said to offer a solution to the problem: the public trades a period of exclusivity, and the associated costs, for public disclosure of innovative technology in a published document, the patent.[8] This view tends to emphasize the disclosure bargain between the public and the inventor, focusing on doctrines that ensure detailed and fulsome explanation of the invention.

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6. Dan L. Burk, *Law and Economics of Intellectual Property: In Search of First Principles*, 8 ANN. REV. L. & SOC. SCI. 397, 400–01 (2012).

7. *See* Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY 609, 615–19 (Univs. Nat'l Bureau of Econ. Research & Comm. on Econ. Growth of the Soc. Science Research Council eds., 1962).

8. Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 277–78 (1977).

And yet it seems clear that neither of these justifications matters in the least. If disclosure is the purpose, or even an important purpose of the patent document, we have to think the patent must be an abject failure in fulfilling that purpose. The proper audience for patent document disclosure has long been indeterminate.[9] There remains an ongoing debate as to whether the technical community even attempts to glean useful information from patents,[10] but in any event it seems clear that patents are simply not designed for them to do so. Patent claims, ostensibly intended to give the public notice of the scope of the rights conveyed by the patent, are drafted in a hybrid language of technical, legal, and specialty terminology. As a consequence, patents are notoriously difficult for those with technical training to read and understand. Indeed, even lawyers outside the specialized community of patent practitioners are unlikely to be able to parse the meaning of a patent's claims.[11]

Moreover, as Mark Lemley has noted in recent work, there is little empirical evidence supporting the idea that patents are successful for prompting innovation; to the contrary, some evidence suggests that patent exclusivity is actually a net impediment to innovation.[12] In separate work, Lemley notes the astonishing disjunction between the contents of substantive patent doctrine and measures of patent application, issuance, and enforcement.[13] Despite major perturbations in patent law, either from legislative enactment or judicial interpretation, quantitative metrics of the patent system show no response to such changes. Such changes in the law of patents substantially alter the features or nature of patent rights, and might be expected to impact the acquisition and enforcement of patents. But a steady increase in patent application filings, in the issuance of patents, and the filing of patent enforcement lawsuits, all seem to continue at the same rate despite changes that might make patents less desirable investments, or less reliable market signals, or less informative channels of technical disclosure.

The lack of any clear behavioral response to major doctrinal changes suggests that the actual doctrinal characteristics of patents have very little impact on the value or regard accorded to them. This has prompted Lemley in other work to compare patent law to a kind of religion, based upon fervent belief with little evidentiary basis.[14] This comparison was likely intended to equate the ostensible irrationality of supporting either patent practice or

9. Mark D. Janis & Timothy R. Holbrook, *Patent Law's Audience*, 97 MINN. L. REV. 72, 74 (2012).

10. *See* Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 574–76 (2012).

11. Dan L. Burk & Jessica Reyman, *Patents as Genre: A Prospectus*, 26 L. & LITERATURE 163, 182–83 (2014).

12. Lemley, *supra* note 3 at 1332–35.

13. Lemley, *supra* note 1 at 32.

14. Lemley, *supra* note 3 at 1336–38.

religious belief without empirical evidence. But the comparison may be more useful in a different aspect. Religious practice always looks irrational to outsiders, but this does not preclude it from playing an important and meaningful role in social life. So, too, myriad other cultural rituals ranging from the everyday handshake greeting to the exchange of flowers to elaborate atmospheric displays of colored explosives on July 4th play important if perhaps illogical roles in social conduct.

By the same logic, since acquisition of patents continues unabated, at an ever-greater volume and pace, patents must be valued for *something*—this is plain from the time, money, and effort patent owners are spending to acquire them. But it seems equally obvious that whatever makes patent acquisition attractive has little or nothing to do with the doctrinal features of patents, or at least little to do with the doctrinal features that are closely watched for their connection to the articulated purposes of patents. Patents appear to be valuable for some other hidden reason.

Indeed, I suggest that when we detect anomalous features that seem incompatible with our presuppositions about what patents are supposed to be doing, rather than worry about fixing the anomalies to align with our presuppositions, we might do well to interrogate whether our suppositions are correct by examining the roles played by the anomalous features. Such anomalies, rather than simply constituting incongruities or inconsistencies in patent practice, offer entry points into the unspoken social functions of the patent system. Rather than nonsensical and sometimes vexing examples of doctrinal breakdown, such moments of inconsistency in the patent system afford an opportunity to investigate what patents are and are not doing when we aren't watching. Indeed, sometimes such anomalies offer clues as to the hidden clandestine roles that patents play even when they are being watched closely, right under our noses so to speak.

II. Market Practices

It seems fairly clear, then, that whatever role patents are playing in our legal and social ecosystem, it cannot be quite the role we typically claim patents ought to be playing. The abject failure of patent incentive theory to explain actual behavior in regard to patenting has not gone unnoticed by patent commentators, some of whom have simply concluded that the incongruity with expectations means that the patent system is a failure and should

probably be abandoned.[15] Others have attempted to find alternative explanations for the existence of patents. In particular, a growing number of voices have suggested patents may be needed to facilitate transactions in some fashion.[16] Drawing from transactional theories of property, these latter commentators argue that the presence of exclusive rights in patented inventions lowers transaction costs between market participants, either streamlining innovation exchanges or perhaps facilitating the creation of markets for innovation.

Although such alternative explanations seem promising, like other economic theories, they lack any explanation as to how markets on which they depend are constituted and how those markets come to exist.[17] Much like the vintage joke about the economist and the can opener, economics frequently assumes the existence of markets in which preferences are revealed, exchanges occur, and surplus is gained from trade. But such markets seem to either exist magically a priori, or to spring into existence *ex nihilo*.[18] Economists tend to recognize the mechanics of exchange, to the extent that they recognize such mechanics at all, as a smattering of inconvenient and largely inchoate transaction costs, which often are simply ignored in order to simplify an otherwise unmanageable mathematical model.[19]

But in fact the convenient label "market" simply glosses over an elaborate set of social mechanisms that facilitate such outcomes. Although economic analysis seems to assume that markets simply exist, careful observation reveals that markets are created and subsequently function through extended networks of social practices.[20] Exchanges do not simply happen; they require structure in order to be acknowledged and accepted. A robust literature on the sociology of markets now recognizes that markets are not so much a matter of actors exchanging goods as they are a matter of goods exchanging one social setting for another. Markets allow goods to be detached from one set of relationships and then imbued with a new set of

15. *See, e.g.*, Lemley, *supra* note 3 at 1334-36.

16. Clark D. Asay, *The Informational Value of Patents*, 31 BERKELEY TECH. L.J. 259, 263–64 (2016); Jonathan M. Barnett, *Intellectual Property as a Law of Organization*, 84 S. CAL. L. REV. 785, 790–92 (2011); Michael J. Burstein, *Patent Markets: A Framework for Evaluation*, 47 ARIZ. ST. L.J. 507, 513 (2015); F. Scott Kieff, *IP Transactions: On the Theory and Practice of Commercializing Innovation*, 42 HOUS. L. REV. 727, 729 (2005).

17. *See* BRIAN J. LOASBY, KNOWLEDGE, INSTITUTIONS, AND EVOLUTION IN ECONOMICS 108–09 (1999).

18. Hans Kjellberg & Claes-Fredrik Helgesson, *On the Nature of Markets and Their Practices*, 7 MARKETING THEORY 137, 138–39 (2007).

19. Mark Granovetter, *Economic Action and Social Structure: The Problem of Embeddedness*, 91 AM. J. SOC. 481, 485–86 (1985).

20. Kjellberg & Helgesson, *supra* note 18, at 149–51.

relationships.[21] Specifically, in order to be "bought" or "sold," processes must operate to detach the object of the transaction from one set of associations, specifically the associations of the seller, and then reattach it to a different set of associations, specifically those of the buyer. [22]

For this to occur, the good must be conceived or modeled as the type of object that has the proper attributes for exchange, dissociation, transfer, and re-association in a new setting. The characteristics that allow the good to be traded on the market in this fashion are neither inherently present nor externally attached. They are instead constructed by the interaction of market entities via processes that render the good subject to a process of "calculation" and so allow the good to be traded across social contexts.[23] As used in this discourse, the term "calculation" has little to do with mathematics; it instead designates the social process of distinguishing among goods and among different states of the world, and then plotting potential outcomes or trajectories associated with those distinctions.[24] Definitional social processes transform objects into marketable goods, imbuing them with the perceived characteristics that are necessary to move them between social contexts, specifically from the seller's context into the buyer's context.[25]

Thus, goods with the necessary characteristics for trade are said to be "calculated" goods. Calculated goods are delimited, stabilized, and defined so as to constitute distinctive objects. They are singularized or imbued with properties that hold value for potential purchasers. The good is bounded or framed in terms of alternative or competing goods, against which it may be compared, categorized, and contrasted. These elaborate processes of isolation, classification, and association allow stabilization of the goods' perceived qualities and relationships, rendering them definite and fixed so that property rights can be applied and transferred to the discrete object.[26] The good becomes qualified as the object of market exchange, subject to qualifying social relationships.[27] Indeed, some commentators have referred to the process by the portmanteau term "qualculation."[28]

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21. Michel Callon, *Introduction: The Embeddedness of Economic Markets in Economics*, *in* THE LAWS OF THE MARKETS 1, 19 (Michel Callon ed., 1998).

22. *Id.*

23. Michel Callon & Fabian Muniesa, *Peripheral Vision: Economic Markets as Calculative Collective Devices*, 26 ORG. STUD. 1229, 1230–36 (2005).

24. *Id.* at 1231.

25. *Id.* at 1234.

26. *Id*. at 1233.

27. *Id.* at 1234; *see also* Paolo Totaro & Domenico Ninno, *The Concept of Algorithm as an Interpretive Key of Modern Rationality*, THEORY CULTURE & SOC'Y, July 2014, at 29, 30 (observing that "the concept of calculation is very general and does not necessarily imply the manipulation of numerical symbols").

28. Franck Cochoy, *Calculation, Qualculation, Calqulation: Shopping Cart Arithmetic, Equipped Cognition and the Clustered Consumer*, 8 MARKETING THEORY 15, 17 (2008).

Associative market entanglements and disentanglements do not happen in a vacuum but rather are mediated by market-associated mechanisms or "calculative agencies" that then facilitate "calculative encounters" via institutions of exchange. The movement of goods from one context, their grouping and regrouping with other objects or persons, and their association with a different context occurs by means of agencies distributed across networks of human and nonhuman actors. These may come together in a stable configuration for a single transaction or over time for multiple transactions. There is nothing neutral, natural, or spontaneous about such practices; they must be painstakingly fashioned out of social action.

Thus, the successful function of markets of any type, whether occurring via physical space, digital exchange, or documentary text, invariably rests upon extensive systems of calculative practices. This is true whether the practices in question are found in a grocery store, an open-air bazaar, an electronic trading exchange, or an internet platform. Commonly encountered market situations, such as that of the supermarket, have been studied in detail, revealing calculative processes that are so familiar that they are often overlooked.[29] Calculative agencies are familiar in physical markets once we know what to look for; labels, shopping baskets, salespeople, displays, packaging, advertisements, receipts, bar codes, wallets, debit cards, warranties, cash registers, and far more are all engaged in rendering objects as calculable goods.[30] Calculative processes in such market settings may be said to be "hidden in plain sight."[31]

The supermarket, for example, entails a variety of familiar mechanisms for detaching the goods from their association with the seller and re-attaching them to associations with the buyer. Shoppers are provided with special baskets for collecting the items they wish to purchase; they are directed to a particular exit station at which the goods are priced and bagged and currency is tendered; and from that point the goods may be removed from the physical boundaries of the shop. Failure to use the approved method, such as slipping the goods into a pocket or removing them from the premises without arranging for monetary payment—even if the potential buyer fully intends to pay later—disrupts the expected order of calculation, arousing the suspicion of the shop owner and risking an encounter with the police.

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29. *See, e.g.*, Franck Cochoy, *A Sociology of Market-Things: On Tending the Garden of Choices in Mass Retailing*, 55 SOC. REV. (SPECIAL ISSUE) 109 (2007); Franck Cochoy & Catherine Grandclément-Chaffy, *Publicizing Goldilocks' Choice at the Supermarket: The Political Work of Shopping Packs, Carts, and Talk*, *in* MAKING THINGS PUBLIC: ATMOSPHERES OF DEMOCRACY 646 (Bruno Latour & Peter Weibel eds., Amy Jacobs trans., 2005); Paul du Gay, *Self-Service: Retail, Shopping and Personhood*, 7 CONSUMPTION MKTS. & CULTURE 149 (2004).

30. *See* Callon & Muniesa, *supra* note 23, at 1235–36.

31. Philip Roscoe & Katy Jane Mason, *Who Can Start a Stock Exchange? Silent Legitimacy, Mundane Materiality, and the Genesis of Markets*, ACAD. MGMT. PROC., August 2020, https://journals.aom.org/doi/epdf/10.5465/AMBPP.2020.111 [https://perma.cc/YXD6-CCSF].

The mechanisms of calculative isolation, stabilization, and definition of products are also readily apparent in such settings. Grocery products are typically packaged and labeled at their points of production, and these characteristics help to define the products as presented and defined for transfer to consumers. But they are not conclusive or complete delimitations of grocery products; local custom and practice are critical factors. For example, carbonated beverages are routinely packaged together by the manufacturer in packages of multiple bottles or cans (usually six), but at some supermarkets, I am permitted to remove a can from a six-pack of beverages and purchase the single can as an isolated unit. At other supermarkets, this is forbidden, and I am required to purchase the entire six-pack as a unit—in such cases, my attempt to purchase the single can will be declined at the check-out register, sometimes by a disapproving human employee, or sometimes by an uncooperative automated system that is not programmed to recognize the labeling code of the single beverage can.

Neither are such rules of separation from the manufacturer's packaging easily generalizable. Even at supermarkets that allow removal of a can from a six-pack, spontaneous re-definition of the boundaries of other packaged goods will be prohibited. For example, I typically cannot open bags of flour or rice to remove a cupful that I wish to purchase. I am generally required for such products to purchase the entire bag, even if it is more than I want. This is clearly not because the business cannot make money from selling rice or flour by graduated units—many grocers sell bulk items such as grains, legumes, or flours by weight, drawn from bins in whatever amount a customer desires. In fact, this model might be economically advantageous to the seller, as selling items by graduated units rather than by quantized packaging allows price discrimination, perhaps increasing the profits of the retailer. Nonetheless, breaking open quantized packages of such products will almost certainly be frowned upon.

This is not to say that site-specific product redefinition prohibitions are necessarily economically irrational. There may be countervailing cost factors weighing against the adoption of the practice of selling some goods in graduated quantities: the extra effort of cleaning up messy spills from opened bags, or the unsightly aesthetics of opened bags that could repel other customers. But in large measure the prohibition on such sales seems to be essentially normative; it is simply not customary to sell the product in that fashion at that location; that is not how the product is conceived or defined in that setting. For whatever combination of intentional, random, or historical determinants, these products are singularized and defined in different ways: by the bag, by the six-pack, by the scoopful, or by the individual can.

III. Patent Calculation

Careful observation of market practices thus discloses the social construction of calculated goods via calculative agencies, leading to organized calculated encounters by which material objects can be socially manipulated and exchanged. Patented inventions surely meet the definition of such goods and are in fact frequently characterized as intended to be exchanged in the market.[32] The fact that such inventions are not tangible objects, and indeed (as the practice of filing speculative "paper patents" demonstrates) might never be more than a textual description,[33] does not preclude them from calculation or calculated exchange. We must of course be careful not to confuse *physicality* with *materiality*.[34] Material objects in the sense that concerns us are those items entailing qualities or characteristics that are coherent and objectified; they "hold together" as an integral social artifact.[35] But they are not necessarily tangible.

To date, patent scholarship lacks the careful studies that have been done in supermarkets, fish markets, stock exchanges, and other trading venues to define the calculative processes that undergird routine commercial activities.[36] To be certain, there are numerous legal expositions about the designation of inventions as "property" and the legal rules that accrue to intellectual property once it has been claimed as such.[37] But the label of property, whether for tangible or intangible objects, simply glosses over the complex suite of practices that are foundational to the application of the label. The property label requires some defined entity for attachment, and as I have described, such entities do not occur naturally; they must be made. Calculative processes make the shorthand of property possible and so deserve careful explication in their own right. As yet no such systematic field study has been taken of patent calculation.

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32. *See* sources cited *supra* note 16.

33. *See* John F. Duffy, *Reviving the Paper Patent Doctrine*, 98 CORNELL L. REV. 1359, 1366–71 (2013) (describing the doctrine of "constructive reduction to practice" for uninstantiated paper patents).

34. *See* Callon & Muniesa, *supra* note 23, at 1233.

35. *Id.*

36. *See, e.g.*, Ian Domowitz & Ananth Madhavan, *Open Sesame: Alternative Opening Algorithms in Securities Markets*, *in* THE ELECTRONIC CALL AUCTION: MARKET MECHANISM AND TRADING 375 (Robert A. Schwartz ed., 2001); Marie-France Garcia-Parpet, *The Social Construction of a Perfect Market: The Strawberry Auction at Fontaines-en-Sologne*, *in* DO ECONOMISTS MAKE MARKETS?: ON THE PERFORMATIVITY OF ECONOMICS 20–21 (Donald MacKenzie, Fabian Muniesa & Lucia Siu eds., 2007); Alan Kirman, *Market Organization and Individual Behavior: Evidence from Fish Markets*, *in* NETWORKS AND MARKETS 156 (James E. Rauch & Alessandra Casella eds., 2001).

37. *See, e.g.*, Frank H. Easterbrook, *Intellectual Property is Still Property*, 13 HARV. J.L. & PUB. POL'Y 108, 109–12 (1990) (analogizing patent law to the law of trespass to real property).

However, even in the absence of field studies, we can consider who the relevant actors may be, how they have reshaped activities in their particular sphere, what methods they have employed to do so, and in particular what account of their actions might comprehend the practices they have developed.[38] We can glean numerous evocative clues from the patent document itself and from the constellation of processes that surround the production, certification, and interpretation of the document. The patent document may be examined as a type of social artifact, which like any human artifact displays features and characteristics that are typical of the social functions it is intended to perform.[39] Alternatively but relatedly, it might be viewed as a collective knowledge product of the particular knowledge community—or really, communities—from which it originates. The patent constitutes a rhetorical artifact embodying the social action of a particular set of communities, indicating the practices associated with the passage of the document through those communities.[40] This includes the specialized community of legal practitioners who draft patents, the specialized body of federal bureaucrats who certify patents, and, in the United States, a specialized court that reviews patents.

The rhetorical structures indicating calculative practices are immediately apparent on the face of the resulting patent document.[41] The cover page of the patent document is filled with indexing information that categorizes and distinguishes the subject matter of the patent by its filing date and issuance date, by a Patent Office serial number, by a descriptive title, by a technological-art category, and by the names of the inventors who conceived it.[42] The cover page also lists the "prior art" references that are cited in the text of the document.[43] The patented invention is framed and qualified in terms of such prior art—that is, in terms of the existing technologies to which the claimed invention is compared and from which it must be distinguished. These rhetorical structures reflect the technical affordances of the claimed invention.[44] The prior art description provides the ground against which the figure of the invention is illuminated.

Indeed, the text of the document is typically arranged around a "problem–solution" narrative in which the prior art is described and characterized

38. *See* LATOUR, *supra* note 4.

39. *See* Jan Engberg & Ismael Arinas Pellón, *The Secret to Legal Foretelling: Generic and Inter-Generic Aspects of Vagueness in Contracts, Patents and Regulations*, 11 INT'L J. ENG. STUD. 55, 58, 61 (2011).

40. *See* Burk & Reyman, *supra* note 11.

41. *Id.* at 169.

42. *Id.*

43. *Id.*

44. *See* Dan L. Burk, *Patent Silences*, 69 VAND. L. REV. 1603, 1619 (2016).

as incomplete or unsatisfactory.[45] The new invention is then described in terms that frame it as an answer or solution to the deficiencies of the prior art.[46] This positions the claimed invention so as to satisfy the doctrinal statutory requirements of novelty, utility, and nonobviousness, which are themselves all largely concerned with distinguishing and categorizing the patented invention.[47] Such statutory thresholds for patent eligibility and patentable characteristics may or may not perform their ostensible task of culling candidate inventions to find the most socially and economically valuable specimens. But they undoubtedly perform the task of reducing candidate inventions to a set of definitionally uniform categories, the better to isolate and reify their subjects as objects for calculated exchanges.

We may further observe that the patent is a governmentally promulgated and certified artifact, and calculative practices are frequently advanced by governmental intervention. Market formation is often assisted by official standard setting for goods to be exchanged; uniform weights and measures, packaging and product definitions, and similar state-sponsored regularities help to frame goods as calculable entities. So, too, with calculated inventions. The statutory and regulatory requirements for patenting, combined with the ongoing tacit practices of patent drafters and Patent Office bureaucrats, provide a common language, a common format, and a common set of categories for potentially marketable inventions. These written and unwritten requirements serve to standardize inventions, imposing a uniform code for description and presentation as well as minimum characteristics of novelty, utility, and nonobviousness.

IV. Calculative Doctrines

As embodied in the patent document, patent doctrine—whether intentionally or not—seems also strongly oriented toward the isolation, categorization, definition, and framing of calculated inventions. For example, to demonstrate the necessary statutory attribute of novelty, the claimed invention cannot have been identically disclosed in previous prior art technological references.[48] Demonstrating novelty thus requires definition of the invention in its relevant aspects and comparison of that definition to the objects of description in prior art references. In essence, novelty distinguishes the textual parameters of the patent text from the objects in previous texts. This process

45. Burk & Reyman, *supra* note 11, at 169.
46. *Id.* at 169–70.
47. *Id.*
48. 35 U.S.C. § 102 (2018).

of establishing that the claimed invention is not found in the prior art necessarily isolates it from prior texts, categorizes it as something different than anything in the prior art, and defines its characteristics as something unique or distinctive.

Patent calculation is also furthered by related legal requirements. Beyond simple novelty, a patentable invention must entail an additional level of "nonobviousness": not only can the claimed invention not have been identically described in the prior art, it must be sufficiently distinctive from the sum of the prior art that a person of ordinary skill who knew the prior art would not have found the invention obvious.[49] This requirement raises the level of distinction advanced by the patent disclosure. Additionally, nonobviousness is judged against "analogous art"—that is, against technologies that are either judged to exist in the same field as the claimed invention, or technologies in a different field that the inventor would have considered in order to solve the problem that the claimed invention addresses.[50] Judging nonobviousness thus once again requires assigning the claimed invention to a technical category and then separating prior technologies into those that are analogous and those that aren't.

Each of these definitional doctrines requires a comparison between the prior art and the invention claimed in the patent, meaning the textual definition found at the end of the document in long statements called the "claims." These texts are key components in the objectification of the invention, their purpose oriented again toward distinction and definition. The claims are required by statute to particularly point out and distinctly claim the invention with enough detail to give the person of ordinary skill reasonable notice as to what is covered by the patent and what is not.[51] The claims are thus considered to constitute textual limitations on the rights of the patent owner, stating the technological boundaries to which the patent extends. They are often analogized to the "metes and bounds" setting out the borders of real property in deeds to land.[52] As with any border, they attempt to distinguish an inside and an outside; they both delineate the perimeter of the patent and help to differentiate it from other technology that lies beyond its scope.

The text of the patent claims constitutes a portion of the overall disclosure of the invention in the document—an additional statutory requirement that is effectuated across the sum of the document's parts. The patent statute mandates a "written description" of the invention, which courts have held

49. *Id.* § 103.

50. *In re* Clay, 966 F.2d 656, 658–59 (Fed. Cir. 1992).

51. *See* 35 U.S.C. § 112 (2018); Nautilus, Inc. v. Biosig Instruments, Inc., 572 U.S. 898, 910 (2014) (holding that a patent's claims must delineate the scope of the invention with reasonable certainty).

52. Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1744 (2009).

must communicate to those of skill in the art that the inventor had "possession" of the invention.[53] Possession here is a term of art that does not necessarily entail physical possession, as evidenced by the practice of reciting hypothetical prophetic examples.[54] Rather, possession entails a degree of understanding or cognitive appreciation of the invention. This requirement again supports the calculation of the invention; by formalizing the claimed invention in terms of the document's written description, the invention is objectified and singularized so as to take on defined properties. The claimed invention must materially "hang together" well enough to be described in enabling detail.

Calculative mechanisms are similarly apparent in the contested doctrines surrounding patentable subject matter. Under the U.S. patent statute (as well as the patent laws of other nations), products or laws of nature are excluded from patent-eligible subject matter, whereas the products of human ingenuity are intended to fall within patent eligibility.[55] Given that all inventions are in some sense drawn from natural materials and are based upon the operation of natural processes, courts have struggled to delineate when a set of claims defines something patent-eligible and when it does not.[56] But understanding the function, or at least *a* function, of the patent as rendering a particular good calculable casts subject matter doctrines in a new light. The subject of the patent must be constructed as a calculated good, meaning it must be isolated and classified in such a way as to permit its association and reassociation in the marketplace. To say that a claimed invention constitutes a "law of nature" or "natural phenomenon" is, in effect, to say that it has been insufficiently detached from its previous associations with the scientific order of the universe to constitute a calculable good.

"Abstract ideas" have been identified as an additional category of unpatentable subject matter.[57] Patent claims are often written to encompass a range of potential embodiments rather than the specific instantiation that the inventor has created (or, in the case of prophetic examples, imagined). This practice sometimes leads to the mistaken trope that patents propertize ideas.[58] To the contrary, abstract ideas constitutes a category among subject matter that the Supreme Court has held to be forbidden territory for patents—they

53. 35 U.S.C. § 112(a); *see, e.g.*, Tronzo v. Biomet, Inc., 156 F.3d 1154, 1158 (Fed. Cir. 1998)

54. *See* Janet Freilich, *Prophetic Patents*, 53 U.C. DAVIS L. REV. 663, 671–75 (2020); Janet Freilich & Lisa Larrimore Ouellette, *Science Fiction: Fictitious Experiments in Patents*, 364 SCI. 1036, 1036–37 (2019).

55. 35 U.S.C. § 101 (2018).

56. *See* Dan L. Burk, *The Curious Incident of the Supreme Court in* Myriad Genetics, 90 NOTRE DAME L. REV. 505, 520–25 (2014).

57. Mayo Collaborative Servs. v. Prometheus Lab., Inc., 566 U.S. 66, 70 (2012).

58. *See, e.g.*, Ayn Rand, *Patents and Copyrights*, *in* CAPITALISM: THE UNKNOWN IDEAL 130, 130 (1966).

lack the definite implementation that patentable subject matter requires. Thus, the proper subject of the patent lies somewhere between the overly abstract and the overly particular.

This formulation of patent eligibility calls for closer consideration of the term "abstraction" as it is used, respectively, in patent law and in the sociology of markets. As in the case of "materiality," there is some risk of confusion among differing disciplinary uses of this term, but distinguishing these uses offers important insights. We have noted that abstraction, in the sense of overly diffuse subject matter, is in patent law generally something to be avoided. In contrast, abstraction in the context of calculative devices denotes the process of differentiation—of "abstracting" one item from the context in which it originally resides.[59] This meaning does not necessarily connote the insubstantiality or indeterminacy that is to be avoided in patent-eligible subject matter. However, abstraction in this sense offers a useful indication as to what purpose patent-subject-matter rules play in defining the calculated invention.

If the subject of the patent is to be defined and singularized so that it may be disentangled from its origins and moved through commercial channels, we would expect patent doctrine to preclude from its ambit artifacts that remain undefined and intractably entangled—that is, inventions that, in the calculative sense, remain insufficiently abstracted from their origins. And indeed, the litany of categories excluded from patentable subject matter—abstract ideas, mental processes, laws of nature, products of nature—share the commonality of being too diffuse or conceptually unrefined to escape their natal matrix. Often they are processes or phenomena that are too ubiquitous to be disentangled from general practices, or too far upstream in the course of research and development to constitute fully isolated or singularized developments.

The restriction against patents drawn to overly diffuse or conceptual inventions is in fact a common thread among several different patent doctrines. Subject matter restrictions function along with other doctrines, such as utility and written description, to deny patent designation to technologies that are too far "upstream" in the development process. Thus, for example, the Supreme Court has held that patentable inventions must entail a specific and substantial use in order to qualify for a patent—as the Court puts it, the patent is not a "hunting license" to investigate possible downstream applications of the technology.[60] Similarly, as noted above, claims drawn to broad classes of anticipated embodiments that the inventor did not "possess" are said to fail the written-description requirement even if the foreseen embodiments are

59. Fabian Muniesa, Yuval Millo & Michel Callon, *An Introduction to Market Devices*, 55 SOC. REV. (SPECIAL ISSUE) 1, 4 (2007).

60. Brenner v. Manson, 383 U.S. 519, 536 (1966).

plausible. Such doctrines have been justified by the Supreme Court as preventing patent applicants from "preempting" too broad a swath of future developments.[61] This rationale on its own has never made much sense, as it is common for pioneering patents that open up new technical areas to broadly dominate later discoveries that they enable. And from an incentive perspective, it might make good sense to reward with broad exclusivity fundamental discoveries that catalyze broad, new swaths of technology. But these doctrines make better sense from a calculative viewpoint, , as they restrict the remit of inventions that have been insufficiently singularized to be distinguishable from other goods, so as to be calculable in the marketplace.

V. Calculative Definition

Patent experts typically speak of the suite of definitional doctrines as ensuring that the invention is sufficiently valuable and meritorious to justify the restraint on trade granted under the patent, and as ensuring that the patent document advances available knowledge by "teaching" the use of the invention to those of skill in the art.[62] Certainly the Supreme Court has often said that proper patent disclosure is intended to confer sufficient information to enrich or benefit those of skill in the art.[63] But, in general, legal commentators are correct not to get too caught up in what courts say, but to look rather at what they mean, what they do, or what actually occurs after they are done saying whatever they have to say. And to say that the features of the invention must be disclosed so as to be comprehensible to one of ordinary skill in the art articulates a legal standard for disclosure, not necessarily a teleological *intent* for disclosure. We might say that the instructions on a consumer product must be comprehensible to someone reading at a sixth-grade level, but that does not necessarily mean that the product was intended to be used by sixth graders.

Thus, disclosure sufficient to inform one of ordinary skill in the art need not necessarily be intended for one of ordinary skill in the art; it may well be the level of disclosure necessary to fully frame a patented invention for, let us say, business exchange, or enforcement for litigation. Whether the disclosure doctrines are accomplishing their ostensible goal of enabling disclosure or not (and it is entirely possible that they are not), they appear well-suited to the additional or alternative function of rendering the invention calculable. It may be that the patent and its attendant legal standards play the role that

61. Katherine J. Strandburg, *Much Ado About Preemption*, 50 HOUS. L. REV. 563, 569–70 (2012).

62. Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 131 (2006).

63. *See, e.g.*, Nautilus, Inc. v. Biosig Instruments, Inc., 572 U.S. 898, 910 (2014).

physical packaging, labeling, shelf placement, and advertising play in the supermarket: defining and separating the goods in order to render them calculable in the marketplace. The singular and objectified subject of the patent is separated from the prior art, detached from its technical associations by the imposition of unique and nonobvious characteristics, and made ready for a new set of commercial associations.

Considered in this light, it seems clear that the typified action crystalized in the patent document includes calculative action. As suggested above, we should not expect that the mechanisms that allow and facilitate calculation were necessarily intended to do so. We have said that the creation of intellectual property is ostensibly intended as an incentive for innovation, or perhaps for disclosure, and we have said that the property label may be a shorthand for certain aspects of calculation. Where the practices for constructing legal property are coterminous with the activity needed for construction of calculated objects, explicitly intended features of the patent document may be serving the purpose intended. But, just as often, we should expect that the forms of property have been repurposed to other ends or that calculation is enabled by patent structures that are simply there supporting the patent's ostensibly intended purpose.

Incorporating concepts of calculability into an understanding of patent function also proves to be highly useful in comprehending an ongoing debate within patent law related to the problem of "prophetic examples." This is a general debate regarding the degree of clarity or distinction needed to constitute patent disclosure, and in particular to constitute the boundary definition constituting the claims.[64] Economic analysis grounded in incentive theory insists that the documentary boundaries of the claimed invention must be defined with precision. Tangible property is typically considered to be bounded by some unambiguous physical boundary, edge, or surface. Thus, the paradigm comparison for patent-claim precision is to the boundaries of a physical object or of real estate. However, the object contemplated by the patent, the claimed invention, is defined rhetorically by a text. Patent scholars have shown that the type of linguistic precision extolled in comparisons to physical property is both practically and functionally impossible.[65] The capacity for textual ambiguity sets the stage for considerable furor over the vagueness or precision of patent claims.

64. *See* Burk & Lemley, *supra* note 52 (describing the peripheral patent claiming approach, which conceptualizes patent claims as defining the outer boundaries of a property right conferred on the patentee).

65. *See id.* at 1799; Jeffrey A. Lefstin, *The Formal Structure of Patent Law and the Limits of Enablement*, 23 BERKELEY TECH. L.J. 1141, 1223–24 (2008); *see also* John F. Duffy, *Counterproductive Notice in Literalistic Versus Peripheral Claiming*, 96 B.U. L. REV. 1197, 1216–17 (2016) (arguing that neither the bounds of peripheral patent claims nor real property metes and bounds were ever precise).

Economic analysts rather stridently proclaim that if an object's boundaries are not certain, it cannot function as property.[66] But even a few moments' reflection reveals the falsity of this proposition. Often, goods will be definite in some respects and indeterminate in others. Consider the paradigm case of legal property, that of real property, which is all too often held up for comparison to the legal functionality of patents.[67] Real property tends to be very precisely defined in some dimensions but left ambiguous or indistinct in others. For example, residential sales contracts are typically quite precise about the borders of the parcel of land, the structures and outbuildings, and even sometimes the fixtures to be transferred in the deal. But they virtually never attempt to specify the ambiance, character, or charm of the property being transferred. Nonetheless, it is frequently these vague or undefined characteristics, which real estate agents term the "curb appeal" of the home, that prompt the sale and that are among the property's features most desired by the buyer.

It is these inchoate features of the property that drive sales, but they need not be legally specified in order to add value or to perform their function. This is not unusual. In general, an object may be imbued with characteristics that are malleable or variable; it may even be defined by its indeterminacy. Thus, it is apparent that not all boundaries or characteristics of an object need to be definite in order for transactions to occur; often the most valuable aspects of a calculated object may be left indefinite. It follows that in order to facilitate the attachment of property rights to real property, *some* boundaries of the calculative good must be precise and definite but other critically important boundaries need not be.[68] Rather, calculated goods are bounded and defined by those characteristics that are needed for passage through a market.

In a similar manner, consideration of patents as calculated goods suggests that the boundaries of the qualified patent good need only be sufficiently isolated and defined to allow calculated exchanges via calculative mechanisms. Although the construction of calculable goods requires market definition in the form of singularization and objectification, we must not make the mistake of assuming that the framing, the packaging, and the positioning of the patented invention necessarily require precision or certainty, particularly linguistic certainty, in order to move through the market. To the contrary, if patents are fulfilling social functions other than the transfer or policing of the economic boundaries that need to be precise, then they need

66. *See* JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATION AT RISK 46 (2008).

67. *See* Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEXAS L. REV. 1031, 1031–32 (2005).

68. *See* Michel Callon, *An Essay on Framing and Overflowing: Economic Externalities Revisited by Sociology*, *in* THE LAWS OF THE MARKETS 244, 253–55 (Michel Callon ed., 1998) (observing that legal relationships rely on context-specific "tangible and intangible elements").

be no more definite than those other social functions require. Indeed, such functions might be disabled or disrupted by doctrinal tinkering intended to heighten incentive or disclosure functions that patents in action may not actually serve. Calculability requires sufficient definition to objectify the invention, but definition should not be mistaken for definiteness.

VI. Patent Boundaries

Our exercise of thoughtfully reviewing the patent document and its associated affordances suggests that patent features help effectuate patent policy, but perhaps not in the way we generally expect. Patent calculation advances the goal of innovation by structuring inventions as goods for passage through the market. But note that innovation does not involve a single idealized economic market; rather, the process requires the invention to traverse a number of social milieux in order to reach commercial end use.[69] It must leave the hands of the scientist or engineer who pioneered its creation and pass into the hands of the patent expert who frames, positions, and packages the creator's work into a discrete documentary exposition. Legal experts may again be involved in creating the licensing structures that transfer the patented invention into the hands of another, probably corporate owner. It comes then to a group of business experts who decide on the costs, marketing, and production strategies needed to transfer embodiments of the invention to end-use buyers. Ultimately it must find its way back into the hands of a different type of engineer who determines how a particular embodiment of the invention will be structured, manufactured, and assembled. And additional designers, engineers, managers, and overseers will be called on to determine its packaging, advertising, shipping, maintenance, sales, and servicing.

The passage of the patent through multiple, sequential domains of activity is typical of innovational social systems.[70] Social activity, especially in modern interconnected societies, is seldom confined to the boundaries of a single domain or social world. As used in this sense, social worlds constitute bounded communities that are defined by their common disciplinary practices, collective specializations, and shared controversies.[71] They are sometimes equated with communities of practice.[72] Often a social world is

69. *See* Burk, *supra* note 44, at 1606.

70. *See* Jacqueline Holzer, Patricia Wolf & Pierre-Yves Kocher, *The Usage of Boundary Objects for the Construction of Organisational Innovation Processes*, 5 INT'L. J. INNOVATION & SUSTAINABLE DEV. 119, 122 (2011).

71. *See* David R. Unruh, *The Nature of Social Worlds*, 23 PAC. SOC. REV. 271, 275–76 (1980).

72. Susan Leigh Star, Geoffrey C. Bowker & Laura J. Neumann, *Transparency Beyond the Individual Level of Scale: Convergence Between Information Artifacts and Communities of Practice*,

organized around common physical spaces or common technologies.[73] While the boundaries of a social world may be dynamic or mutable as commonalities evolve, participants in the community tend to share a primary common activity and a network of communication or exchange.[74]

Because social activities are rarely completed within the confines of a given social world, and yet at the same time the expectations and practices among social worlds differ, there must be some mechanism allowing passage and interaction between social worlds—points of commonality where disparate communities can collaborate and where contested meanings can be negotiated. One such mechanism takes the form of artifacts or entities that function at the boundaries, or the overlap, between different social worlds. These "boundary objects" exist at the intersection of different communities, inhabiting different domains without fully belonging to any of them.[75] As Donna Haraway observes:

> [C]onsider the case of many sciences which require extensive interdisciplinarity, such as between engineers and software folks and physicists, who are literally forced to work with each other in order to achieve something, but who at a radical level do not share a common language or practices—there are certain kinds of entities which circulate among this community, call them boundary objects. Such objects are stabilized enough to travel recognizably among the different communities, but flexible enough to be molded by these different communities of practice in ways that are close enough to what the practitioners already understand how to do, in order for them actually to do something.[76]

In order to function in different social environments, boundary objects are stabilized in certain dimensions, so as to provide a common reference point among social domains, but at the same time they must retain enough indeterminacy to acquire differing values or meanings in each of the domains

in DIGITAL LIBRARY USE: SOCIAL PRACTICE IN DESIGN AND EVALUATION 241, 243 n.2 (Ann Peterson Bishop, Nancy A. Van House & Barbara P. Buttenfield eds., 2003).

73. Anselm Strauss, *A Social World Perspective*, 1 STUD. SYMBOLIC INTERACTION 119, 122 (1978).

74. Rob Kling & Elihu M. Gerson, *Patterns of Segmentation and Intersection in the Computing World*, 1 STUD. SYMBOLIC INTERACTION 24, 26 (1978).

75. Susan Leigh Star & James R. Griesemer, *Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39*, 19 SOC. STUD. SCI. 387, 411 (1989).

76. *Nature, Politics, and Possibilities: A Debate and Discussion with David Harvey and Donna Haraway*, 13 ENV'T & PLAN. D: SOC'Y & SPACE 507, 516 (1995).

that they border.[77] An artifact functioning as a boundary object acquires local meaning as each social world infuses the artifact with significance. They have a tightly structured role and meaning within any given social world, but they are also sufficiently loosely structured that they can be imbued with other meanings in other social worlds. This differs from simply being viewed differently in different contexts—that is a common occurrence with any object that is contemplated from different social worlds. Rather, according to Star and Griesemer, who famously originated the concept, boundary objects "are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites."[78]

Because of these qualities, boundary objects serve as a reference point for divergent views. They facilitate communication and cooperation among social domains, allow resolution of disparate interests that potentially conflict, and serve as passage points for interaction between separate social worlds. But this does not mean that the transborder resolutions facilitated by boundary objects necessarily entail consensus. Rather, the alignment of interests via boundary objects permits different interests to coexist without conforming to one another. Different communities are able to imbue the object with their own content and interpretations, allowing different constituencies to collaborate on shared work while retaining differing and even conflicting interests. [79]

Patents have been shown to display the modulation between abstraction and specificity that is necessary to boundary objects, allowing them to function at the overlapping margins of different social worlds, and critically, to serve as a passage point for information between social worlds.[80] For example, commentators have categorized a wide variety of artifacts, ideas, and processes that may serve as boundary objects.[81] Of particular interest here is an identified and well-understood category of boundary object, the "ideal type" or "Platonic object," which offers a description of an object that does not actually exist in any given social world. It is instead abstracted from the commonalities found among classes of objects inhabiting different social worlds. The prototypical object so conceived offers a kind of common map

77. John Finch & Susi Geiger, *Of Goods as Boundary Objects and the Cyborgs Who Manage Them*, 22ND IMP CONFERENCE (2006), https://www.impgroup.org/uploads/papers/5685.pdf [https://perma.cc/EDM5-2QP6].

78. Star & Griesemer, *supra* note 75, at 393.

79. *See* Elaine K. Yakura, *Charting Time: Timelines as Temporal Boundary Objects*, 45 ACAD. MGMT. J. 956, 967–68 (2002).

80. *See* Burk, *supra* note 44, at 1626.

81. *See* Pascale Trompette & Dominique Vinck, *Revisiting the Notion of Boundary Object*, 31 REVUE D'ANTHROPOLOGIE DES CONNAISSANCES (SPECIAL ISSUE) 5 (2009) (tracing the history and use of the boundary object concept).

or framework from which all relevant parties can work.[82] And not coincidentally patents frequently describe their subject matter as just such idealized or prototypical categories that may encompass numerous specific embodiments—including hypothetical "prophetic examples"—that need not have been physically constructed or practiced.

Despite the sizeable body of literature lamenting the fuzziness or indeterminacy of "the invention" in the context of the patent document,[83] such indeterminacy is likely a necessary feature to imbue the document with sufficiently multivalent affordances to accommodate different social meanings. Thus, as numerous legal commentators have observed, the presence of indeterminate or expansive language in patent claims may be intended as a drafting strategy to capture the broadest property boundaries, and so the greatest legal advantage, for the patentee.[84] This, however, does not prevent the language from performing other, possibly more important functions, such as imbuing the document with sufficient global plasticity to function as a boundary object. Following Leigh Star,[85] we might say that the patent document must be sufficiently weakly framed to have global currency across the social worlds that it inhabits but must simultaneously be sufficiently robustly framed to have local currency in particular social worlds: the courtroom, the marketing office, the negotiation table, the factory floor.

This type of multivalency is compatible with, and probably integral to, the market calculation of the invention. I have argued that the object of the patent must be sufficiently isolated and singularized to allow calculated exchanges but have also observed that it need not be fully defined in all dimensions—only those necessary to exchange in a given social world. To pass between social worlds, some shared dimensions of calculability are likely needed. But indeterminate characteristics that offer flexibility across social worlds allow entanglement and disentanglement of the invention in different social worlds, facilitating calculative processes.

Neither does the patent document exist in isolation; it may rather be integral to an extended assemblage that allows its role as a boundary spanning artifact. Frost, Reich and Fujisaki argue that both human and nonhuman actors can perform the function of boundary objects.[86] The patent practitioner,

82. Susan Leigh Star, *The Structure of Ill-Structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving*, *in* 2 DISTRIBUTED ARTIFICIAL INTELLIGENCE 49 (Les Gasser & Michael N. Huhns eds., 1989).

83. *See, e.g.*, Janet Freilich, *Patent Clutter*, 103 IOWA L. REV. 925, 927 (2018); Oskar Liivak, *Finding Invention*, 40 FLA. ST. U.L. REV. 57, 59 (2012).

84. *See* Burk & Lemley, *supra* note 52, at 1752–53.

85. Star, *supra* note 82.

86. Laura Frost, Michael R. Reich & Tomoko Fujisaki, *A Partnership for Ivermectin: Social Worlds and Boundary Objects*, *in* PUBLIC-PRIVATE PARTNERSHIPS FOR PUBLIC HEALTH 87, 92 (Michael R. Reich ed., 2002); *see also* Barbara Simpson & Brigid Carroll, *Re-viewing 'Role' in Processes of Identity Construction*, 15 ORG. 29, 41 (2008).

as Kara Swanson observes, is a hybrid, straddling both technical and legal domains.[87] Patent practitioners thus partake of the roles and qualities that Martin Wood, following Donna Haraway, dubs "cyborg": pluralistic and multivalent, synthesizing partial and sometimes contradictory voices, inhabiting the boundaries of contiguous social worlds, assimilating the situated knowledges drawn from two or more constituent fields.[88] The patent practitioner in her role as patent drafter and interpreter constitutes a type of living boundary object, a passage point between the technical and the legal, connected to each while remaining isolated from either, neither fully at home with lawyers nor with scientists. It is the patent practitioner who explains science to her fellow lawyers, law to her fellow scientists, and both to anxious venture capitalists. Her translational role places her squarely within all these social worlds, while barring her from fully integrating into the cultural practices of any of them.

The boundary position of the patent practitioner corresponds to the otherwise anomalous features of the patent document.[89] Robin Feldman, observing correctly that no ordinary reader could possibly be expected to parse the language of patent claims, calls for them to be drafted in "plain language."[90] But this prescription of course assumes either that ordinary readers ought to be able to parse patent claims, or at a minimum that nothing important would be lost impeded by reformulating patent claims to be comprehensible to ordinary readers. As in the case of prophetic examples, there is an obvious, palpable gap between what the document is manifestly designed to do and what we claim to be the document's purpose for existence. And while the language of the claims is ill-suited to informing the ordinary public, it seems instead well suited to positioning the patent practitioner as the passage point between social worlds that must cooperate in order for innovation to occur.

Bill Rankin offers a similar observation with regard to the uniform and stylized conventions of patent drawings. Patent drawings entail, and are often required by the rules of the Patent Office to entail, deliberate ambiguities and artificially formal graphical conventions. [91] Were the purpose of such

87. Kara W. Swanson, *The Emergence of the Professional Patent Practitioner*, 50 TECH. & CULTURE 519, 547–48 (2009); *see also* Finch & Geiger, *supra* note 75 (describing as a "cyborg" the managerial actor who is a hybrid and straddles domain boundaries).

88. *See* Martin Wood, *Agency and Organization: Toward a Cyborg-Consciousness*, 51 HUM. REL. 1209, 1223 (1998); *see also* Donna Haraway, *A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century*, *in* SIMIANS, CYBORGS, AND WOMEN: THE REINVENTION OF NATURE 149, 150 (1991) ("The cyborg is a condensed image of both imagination and material reality, the two joined centres structuring any possibility of historical transformation.").

89. *See* Swanson, *supra* note 87, at 522.

90. Robin Feldman, *Plain Language Patents*, 17 TEX. INTELL. PROP. L.J. 289, 290 (2009).

91. *See* William J. Rankin, *The "Person Skilled in the Art" is Really Quite Conventional: U.S. Patent Drawings and the Persona of the Inventor, 1870–2005*, *in* MAKING AND UNMAKING

drawings to communicate technical information to a general audience, something more like engineering drawings might be expected, and would certainly be more effective. The drawings instead appear to serve less to communicate technical information and more to define the character of the fictional person of ordinary skill in the art. Thus, they appear purposely devised to define the border between the initiated and uninitiated reader, placing the initiated reader—such as the patent practitioner—in a boundary-spanning position.

Conclusion

Patents are manifestly not playing the roles that we have scripted for them. It seems increasingly clear that we have long been engaged in a kind of sustained economic cosplay, in which we dress various components of the patent system up as "rational actors" or "public goods" in order to impersonate the fancies of neoclassical economists. But a growing body of evidence indicates that in their ordinary lives, patents behave quite differently; their activities offstage, out of costume, in no way match the expectations laid out for them by conventional legal or economic policies. This should not entirely surprise us, because, as William Gibson very nicely put it, "[T]he street finds its own uses for things."[92]

I suggest that these secret lives of patents may have gone undetected, but they are not invisible. In those moments when the mask slips, or they are caught out of character, we catch a glimpse of the roles they are in fact playing in performing innovation. Such moments are not simply outtakes on the blooper reel of progress; that stance presupposes a particular form or purpose into which the patent anomaly ought to fit. The very fact that patent features do not fit neatly into our presuppositions is the signal that something rather more interesting is going on. Rather than offering instances to chide patents for their indiscretions, or posing behavioral problems to be solved, or displaying rough patches to be smoothed over, patent anomalies present opportunities to "follow the actors" in the sociology of patents and learn how patents are in fact behaving behind the scenes.

I have further suggested here that one of the more interesting things that patents surely must be doing, if they are indeed intended to foster markets for innovation, is to facilitate the type of calculative activity that enables the operation of such markets. As I have shown, the patent document and its attendant doctrines show every sign of such calculation. I am in no way suggesting that patent doctrine has been designed or intended with such calculative processes in mind. But patents manifestly cannot accomplish their

INTELLECTUAL PROPERTY: CREATIVE PRODUCTION IN LEGAL AND CULTURAL PERSPECTIVE 55, 64 (Mario Biagioli, Peter Jaszi, & Martha Woodmansee eds., 2011).

92. WILLIAM GIBSON, BURNING CHROME 186 (1986).

purpose of promoting innovation unless they entail such features; patents that could not be calculated simply could not be propertized, commercialized, and exchanged. The features that allow patent calculation may be features intended for other purposes that have been repurposed, or more likely they are the necessary adjuncts to any commodified object, allowing it to circulate in the marketplace.