

THE LAW OF CREATIVITY?

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What are the barriers to progress? For decades, IP scholars had an easy answer: suboptimal private investment in public goods. Recent work on the psychology and sociology of creativity has, however, undermined this easy answer. Simply put, the level of private investment does not dictate the “Progress” of “Science and useful Arts.” As a result, IP scholars need richer models of technological and cultural progress.

This Article develops precisely such a model. I begin with the premise that new ideas and artifacts depend on old ones. Drawing from social scientific research, I then model creativity as emerging from interactions among three components: (1) a domain of existing ideas and artifacts; (2) makers who rely on those existing ideas and artifacts to generate new ones; and (3) evaluators who assess a domain’s ideas and artifacts. The primary barrier to progress is whether makers can find the existing ideas and artifacts that lay the foundation for new ones.

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This ecosystem model of creativity yields powerful insights for IP scholars. Most fundamentally, it generates radically different expectations about technological and cultural progress. The conventional wisdom is that progress is always too slow. But the historical record does not match this conventional wisdom: in some periods, progress has indeed been glacial; in others, meteoric.

Consistent with those observed variations in rates of progress, the ecosystem model suggests that progress entails three distinct phases: slow takeoff, rapid and accelerating growth, and ossification. During both the slow takeoff and ossification phases, the core problem is that makers cannot find the ideas and artifacts they need (albeit for different reasons in each phase). Rapid and accelerating growth can nevertheless occur when domain-maker-evaluator interactions increase the odds that makers find the most fruitful existing ideas and artifacts.

This novel account of progress has profound implications for IP theory, policy, and doctrine. First, the ecosystem model offers a descriptive framework that does not depend on particular normative priors about optimal rates of progress; it is therefore compatible with and suitable for use with a wide array of normative positions. Second, it reveals that innovation and cultural policy levers can influence the salience of ideas and artifacts in a domain. This salience effect is a novel dimension for policymakers to consider when choosing between IP and alterantive mechanisms for promoting progress. Finally, the ecosystem model shows how doctrines like patent law's written description requirement and copyright law's attribution right could be reformed so as to ameliorate not just economic, but also psychological and sociological barriers to progress.

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E. O. Wilson[’s] . . . death was the destruction of a library. Many younger biologists who focus on mastering new statistical and computational methods lack the organismic knowledge that older generations accrued. Knowledge-loss is real, no matter how fondly we cling to our modern expectations of eternal progress.¹

INTRODUCTION

Karl von Drais invented the bicycle in 1817.² Why did it take so long?

This might seem like a weird question—after all, it’s not like the bicycle was scheduled to arrive on a particular date in human history. But the more you think about it, the harder it is to come up with a satisfying answer.³

¹ Razib Khan, *Setting the Record Straight: Open Letter on E.O. Wilson’s Legacy*, RAZIB KHAN’S UNSUPERVISED LEARNING (Jan. 19, 2022), <https://razib.substack.com/p/setting-the-record-straight-open> [https://perma.cc/DS3L-TRH9].

² DAVID V. HERLIHY, *BICYCLE: THE HISTORY* 21 (2004).

³ The puzzle of bicycle innovation launched one of the major analytical approaches to the sociology of technology. See Trevor J. Pinch & Wiebe E. Bijker, *The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other*, 14 *SOC. STUD. SCI.* 399, 411–19 (1984) (using the bicycle as a case study to demonstrate the value of social construction of technology theory).

Consider that the basic mechanical components have been around since antiquity: Wheels date to the earliest Mesopotamian civilizations, while gears go back to the ancient Greeks. The opportunity presented by human-powered transport, meanwhile, should have been apparent: witness horses (have to be trained, require food, eventually die) and carriages (large, heavy, need horses).⁴ And don't start with smoothly paved roads—as a matter of historical fact, the bicycle came first.⁵ It seems, then, that we should have had at least a rudimentary bicycle at some point between antiquity and the Renaissance; instead, the earliest versions date only to the Industrial Revolution.⁶

For what it's worth, IP scholars have an easy answer to the bicycle question. In traditional IP models, private actors underinvest in innovation because it's a public good.⁷ The bicycle could be a paradigmatic example: It is particularly susceptible to appropriation because it's a self-disclosing invention—free-riders can easily observe and copy the bicycle's fundamental design, leaving a potential von Drais holding the bag for his initial investment in research and development.⁸

⁴ See HERLIHY, *supra* note 2, at 15 (noting Jacques Ozanam's 1696 discussion of the problem of relying on horses for transportation).

⁵ The earliest demonstration of the velocipede was in 1817. *Id.* at 26. Cyclists themselves led the 1880s political movements for smoothly paved roads. JAMES J. FLINK, *THE AUTOMOBILE AGE* 4–5 (1988).

⁶ HERLIHY, *supra* note 2, at 21–26.

⁷ See Jeanne C. Fromer, *Expressive Incentives in Intellectual Property*, 98 VA. L. REV. 1745, 1746 (2012) (describing “the dominant American theory” of IP as “providing creators with just enough incentive to create . . . by preventing certain would-be copiers’ free-riding behavior”). Like Fromer, I use the terms “IP” and “intellectual property” to refer to utility patents and copyrights; I leave related legal regimes, like design patents, trademarks, and trade secrets, for another day. I present a simplified version of traditional models in the text; for more sophisticated versions, see Rochelle Cooper Dreyfuss, *A Wiseguy's Approach to Information Products: Muscling Copyright and Patent into a Unitary Theory of Intellectual Property*, 1992 SUP. CT. REV. 195, 221–23; Wendy J. Gordon, *Fair Use as Market Failure: A Structural and Economic Analysis of the Betamax Case and Its Predecessors*, 82 COLUM. L. REV. 1600, 1610–12 (1982); William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 333–36 (1989); Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 994–99 (1997); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839 (1990). This line of research traces to Kenneth J. Arrow, *The Rand Corp., Economic Welfare and the Allocation of Resources for Invention*, in UNIVS.-NAT'L BUREAU COMM. FOR ECON. RSCH. & COMM. ON ECON. GROWTH OF THE SOC. SCI. RSCH. COUNCIL, *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY* 609 (1962).

⁸ See Katherine J. Strandburg, *What Does the Public Get? Experimental Use and the Patent Bargain*, 2004 WIS. L. REV. 81, 104–18 (defining a self-disclosing invention).

On this telling, a well-designed patent system would ensure that the bicycle's inventor captured just enough of its social value to justify investing in its creation. And, indeed, the bicycle arrived just as modern patent systems appeared; early bicycle innovators, including von Drais himself, were avid users of them.⁹ In sum, it took so long to get the bicycle because it took so long to get patent systems.

This answer, of course, is absurd. There are many plausible explanations for why the bicycle arrived long after the need was apparent and the technical accomplishment was within our grasp.¹⁰ The lack of adequate patent protection, however, is not one of them. But because traditional IP models have been rooted in the economic theory of public goods, IP scholars have historically neglected non-economic barriers to technological and cultural progress.¹¹

That neglect no longer prevails; instead, a growing literature explains how some heretofore exogenous factors can influence the path of "Progress" in "Science and useful Arts."¹² One

⁹ See SARAH BURSTEIN, SARAH R. WASSERMAN RAJEC & ANDRES SAWICKI, PATENT LAW: AN OPEN-ACCESS CASEBOOK 28–37 (version 1.1 2022) (describing the emergence of the modern American patent system in the 1800s); Christopher Beauchamp, *The First Patent Litigation Explosion*, 125 YALE L.J. 848, 853 (2016) (identifying the bicycle among the "high profile new technolog[ies]" that produced "the first patent litigation explosion . . . in the middle part of the nineteenth century").

¹⁰ Cf. WIEBE E. BIJKER, OF BICYCLES, BAKELITES, AND BULBS: TOWARD A THEORY OF SOCIOTECHNICAL CHANGE 19–100 (1997) (emphasizing the role that changing gender relationships had on the development of the modern bicycle). The problem of the bicycle's seemingly late arrival relates to the literature on "postmature discoveries." See Harriet Zuckerman & Joshua Lederberg, *Postmature Scientific Discovery?*, 324 NATURE 629 (1986) (describing developments that, in retrospect, seem as though they should have been achieved earlier than they actually were); see also Laura G. Pedraza-Fariña, *Patent Law and the Sociology of Innovation*, 2013 WIS. L. REV. 813, 838–50 [hereinafter Pedraza-Fariña, *Sociology of Innovation*] (explaining how specialization and authority influence progress in science and technology).

¹¹ See Laura G. Pedraza-Fariña, *The Social Origins of Innovation Failures*, 70 SMU L. REV. 377, 386 (2017) [hereinafter Pedraza-Fariña, *Social Origins*] (explaining how the public good character of information serves as the foundation for "[t]raditional justifications for granting intellectual property rights").

¹² U.S. CONST. art. I, § 8, cl. 8. For an overview of these approaches, see Stephanie Plamondon Bair & Laura Pedraza-Fariña, *The Sociology and Psychology of Innovation: A Synthesis and Research Agenda for Intellectual Property Scholars*, 60 HOUS. L. REV. 261 (2022); Christopher Jon Sprigman, *Copyright and Creative Incentives: What We Know (and Don't)*, 55 HOUS. L. REV. 451 (2017). The precise contours of the Progress Clause remain somewhat in dispute; to avoid those controversies, I use "technological and cultural progress" to refer to areas that are conventionally understood as the concern of patent and copyright law, respectively. See Sean M. O'Connor, *The Overlooked French Influence on the Intellectual Property Clause*, 82 U. CHI. L. REV. 733 (2015); Ned Snow, *The Meaning of Science in the Copyright Clause*, 2013 BYU L. REV. 259.

important strand of this literature focuses on the psychology of creative motivation.¹³ A second strand describes social structures that influence the flow of knowledge.¹⁴ A third strand, meanwhile, emphasizes that creators rely on serendipity and the freedom to play with cultural artifacts.¹⁵ This proliferating array of approaches has established that there is much more to progress than the level of private investment in public goods.

Nevertheless, public-good economics remains the organizing framework for IP scholarship.¹⁶ One reason for its continued dominance: there is no unifying narrative that describes how psychological and sociological factors jointly influence progress. We need richer models of technological and cultural progress in order to understand whether and how intellectual property law can perform its constitutional task.¹⁷

¹³ See, e.g., Stephanie Plamondon Bair, *Impoverished IP*, 81 OHIO ST. L.J. 523 (2020); Christopher Buccafusco & Christopher Jon Sprigman, *The Creativity Effect*, 78 U. CHI. L. REV. 31 (2011); Joseph P. Fishman, *Creating Around Copyright*, 128 HARV. L. REV. 1333 (2015); Jeanne C. Fromer, *A Psychology of Intellectual Property*, 104 NW. U. L. REV. 1441 (2010); Gregory N. Mandel, *To Promote the Creative Process: Intellectual Property Law and the Psychology of Creativity*, 86 NOTRE DAME L. REV. 1999 (2011).

¹⁴ See, e.g., Stephanie Plamondon Bair & Laura G. Pedraza-Fariña, *Anti-Innovation Norms*, 112 NW. U. L. REV. 1069 (2018); Dan L. Burk, *On the Sociology of Patenting*, 101 MINN. L. REV. 421 (2016); Pedraza-Fariña, *Sociology of Innovation*, *supra* note 10; Pedraza-Fariña, *Social Origins*, *supra* note 11; Jason Rantanen & Sarah E. Jack, *Patents as Credentials*, 76 WASH. & LEE L. REV. 311 (2019); Kara W. Swanson, “Great Men,” *Law, and the Social Construction of Technology*, 43 L. & SOC. INQUIRY 1093 (2018).

¹⁵ See, e.g., Roberta Rosenthal Kwall, *Inspiration and Innovation: The Intrinsic Dimension of the Artistic Soul*, 81 NOTRE DAME L. REV. 1945 (2006); Julie E. Cohen, *Creativity and Culture in Copyright Theory*, 40 U.C. DAVIS L. REV. 1151 (2007); Rebecca Tushnet, *Economies of Desire: Fair Use and Marketplace Assumptions*, 51 WM. & MARY L. REV. 513 (2009). My focus is on consequentialist approaches to IP. The deontologically-oriented IP literature is of course rather different. See, e.g., ROBERT P. MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* 3 (2011) (emphasizing the importance of a “shift from social utility to fundamental rights” as a framework for IP).

¹⁶ See Eric E. Johnson, *The Macroeconomics of Intellectual Property*, 100 WASH. U. L. REV. 1139, 1153–59 (2023) (documenting the continued ubiquity of public-good economics in IP scholarship).

¹⁷ See Andres Sawicki, *Fashion, Models, and IP*, 39 CARDOZO ARTS & ENT. L.J. 671, 676 (2021) (calling on IP scholars to “develop new models that facilitate communication about how the world works in order to continue making progress in our . . . understanding of the effect IP law has” on progress); see also Michael J. Madison, Comment, *Where Does Creativity Come From? And Other Stories of Copyright*, 53 CASE W. RESV. L. REV. 747, 764–65 (2003) (concluding that “[s]tories are powerful tools in [the] . . . process” by which “scholars, policymakers, and advocates of different positions . . . bring their best arguments to their respective tables”).

This Article offers precisely such a model. It is, by design, a synthetic project. From the creativity-oriented IP literature, my analysis builds in particular on separate contributions by Julie Cohen, Jeanne Fromer, and Laura Pedraza-Fariña, each of whom has developed IP models that draw from research on the psychology and sociology of creativity.¹⁸ I also draw heavily from a branch of the creativity literature associated with the social psychologists Teresa Amabile and Mihaly Csikszentmihalyi. Like their “confluence” or “systems” models, I characterize creativity as emerging from “interrelated forces operating at multiple levels.”¹⁹

Integrating these lines of research, the model I develop here—the ecosystem model—offers novel insights into the potential impact of IP on creativity. This ecosystem model adds to existing IP models in several ways, the most important of which is the role that the model assigns to a set of individuals and institutions that I’ll call “evaluators.”²⁰

¹⁸ Cohen, *supra* note 15; Fromer, *supra* note 13; Pedraza-Fariña, *Sociology of Innovation*, *supra* note 10; Pedraza-Fariña, *Social Origins*, *supra* note 11.

¹⁹ See MIHALY CSIKSZENTMIHALYI, CREATIVITY: THE PSYCHOLOGY OF DISCOVERY AND INVENTION 27–31 (1996) (describing the systems model of creativity); Beth A. Hennessey & Teresa M. Amabile, *Creativity*, 61 ANN. REV. PSYCH. 569, 571–72 (2010) (proposing a systems model that starts with cultural and social influences and then goes through to groups, individuals, and neurological influences); DAVID HENRY FELDMAN, MIHALY CSIKSZENTMIHALYI & HOWARD GARDNER, CHANGING THE WORLD: A FRAMEWORK FOR THE STUDY OF CREATIVITY 19–25 (1994) (proposing a framework in which interactions among “three primary subsystems”—that is, “individual, domain, and field”—result in creativity) (emphasis omitted); Mihaly Csikszentmihalyi, *Society, Culture, and Person: A Systems View of Creativity*, in THE NATURE OF CREATIVITY 325 (Robert J. Sternberg ed., 1988). For examples of other systems models, see Keith Sawyer, *The Collaborative Nature of Innovation*, 30 WASH. U. J.L. & POL’Y 293 (2009) (describing a systems model in which many small contributions distributed throughout a social network by various individuals and teams interact synergistically to produce innovation); Dean Keith Simonton, *Creative Thought as Blind-Variation and Selective-Retention: Combinatorial Models of Exceptional Creativity*, 7 PHYSICS LIFE REVS. 156 (2010) (developing a systems model in which creativity results from ideas that are blindly generated but selectively retained).

²⁰ The ecosystem model builds on these and other contributions in several ways, the most important of which is the role that the model assigns to “evaluators.” See *infra* Part II.B.3. In addition, unlike Cohen, I draw a sharp distinction between the makers who produce ideas and artifacts and the ordinary individuals who consume them. See Cohen, *supra* at 15, at 1179 (describing her conception of “situated users” and the resulting “model of cultural participation” as “very different” from those “framed by the conventional dichotomies between author and consumer”). While Pedraza-Fariña focuses on sociology and Fromer on psychology, I aim to integrate both influences on creativity into a single model. Finally, although my project here is aimed at constructing a theoretical framework for understanding IP, it is motivated and informed by two essential empirical projects. See GOVERNING KNOWLEDGE COMMONS (Brett M. Frischman, Michael J. Madison & Katherine J. Strandburg eds., 2014) (applying Elinor Ostrom’s commons-based

A brief sketch will illustrate their role. Creativity starts with a domain: a set of existing ideas and artifacts.²¹ An individual learns about a domain and searches it for things that interest her. Eventually, she makes a new idea or artifact by improving on or combining existing ones. Other individuals and institutions then evaluate that new idea or artifact; if those evaluators deem it worthy, they make it more salient in the domain. From here, the process repeats, with subsequent makers building primarily on the ideas and artifacts that evaluators have made most salient in the domain.

The ecosystem model accordingly characterizes creativity as emerging from interactions among these three components: (1) the domain that serves as the repository of existing ideas and artifacts; (2) the makers who generate new ideas or artifacts by improving on or combining existing ones; and (3) the evaluators who assess ideas or artifacts, making some more and others less salient in the domain.²²

This model generates radically different expectations about progress as compared to conventional IP theory. On conventional accounts, actual progress is a gradual, persistent fade from an ideal state.²³ Because inventors and authors always lack adequate incentives to generate new works, society always accumulates ideas and artifacts more slowly than would be desirable. As time passes, the gap between the number of works

framework to the governance of scientific and cultural knowledge); JESSICA SILBEY, *THE EUREKA MYTH: CREATORS, INNOVATORS, AND EVERYDAY INTELLECTUAL PROPERTY* (2015) (using qualitative fieldwork to understand how IP influences artists and inventors).

²¹ Each of the components of the model has an analogue in existing IP theory. See *infra* Part II.B (distinguishing the domain from the public domain, the makers from authors and inventors, and evaluators from gatekeepers). The term “ideas” refers broadly to intangible concepts, impressions, abstractions, information, thoughts, intuitions, and so on; “artifacts” are objects made by humans. See *infra* note 126 (distinguishing ideas and artifacts from inventions and expressive works). I thank Jessica Roberts for the suggestion to use the term “ecosystem” to name the model, in order to emphasize how the overall phenomenon emerges from the interactions among the components.

²² CSIKSZENTMIHALYI, *supra* note 19, at 27–31 (1996) (arguing that “[c]reativity occurs when a person, using the symbols of a given domain . . . has a new idea or sees a new pattern, and when this novelty is selected by the appropriate field for inclusion into the relevant domain”).

²³ As explained *infra* text accompanying notes 177–84, “actual progress” in conventional accounts refers to progress in the absence of government intervention like intellectual property law. For an important exception to conventional accounts, see Pedraza-Fariña, *Social Origins*, *supra* note 11, at 399–406 (identifying social obstacles to domain formation).

we should have and the number we actually have steadily widens.

But this conventional account is contradicted by the historical record, which reveals that the rate of progress frequently varies over time. Some domains, like mechanical computation, make almost no progress at all for centuries, even after the crucial foundations have been laid.²⁴ Bursts of rapid progress, meanwhile, figure prominently in several domains—think Impressionist art in the late 1800s or nuclear physics in the first half of the 1900s.²⁵ But, as these examples also indicate, rapid progress doesn't last forever; growth eventually slows again as domains get larger.

Consistent with that historical record, the ecosystem model describes three phases of technological and cultural progress: slow takeoff, rapid and accelerating growth, and ossification.²⁶ Domains grow slowly at first because the few ideas and artifacts of a small, nascent domain are sparsely distributed throughout the world, so they are hard to find in the first instance. Makers in the slow takeoff phase therefore cannot amass enough existing ideas and artifacts to generate new ones.

After some threshold, however, domains grow quickly because creativity is combinatorial. Any new idea or artifact is an improvement on or combination of existing ideas and artifacts. Evaluators can organize the ideas and artifacts of small domains so as to make potential combinations more apparent to makers. As a domain grows, then, each addition to it generates many more opportunities for new ideas and artifacts. These new opportunities fuel a period of rapid and accelerating growth.

This does not, however, continue indefinitely. Progress depends on makers finding the existing ideas and artifacts that match with their particular characteristics. While domains are not too large, makers can find the best matches simply by interacting with most existing ideas and artifacts. Eventually, however, they must rely on evaluators organizing the domain such that the most fruitful ideas and artifacts are also the ones that are most easily found. When evaluators perform this task well, domains can continue to grow. Nevertheless, domains

²⁴ See *infra* text accompanying notes 194–200 (offering the long delay between the Antikythera mechanism and Pascal's Calculator as an example of the slow takeoff period).

²⁵ See *infra* text accompanying notes 201–06 (offering examples of rapid and accelerating growth, including Impressionist art and nuclear physics).

²⁶ See *infra* Part III.B (describing the dynamics underlying each period).

ultimately get so large that evaluators also cannot assess the overwhelming number of ideas and artifacts in them. At this point, progress slows again.

This novel depiction of progress has profound implications for IP policy. Consider the question when to use IP as compared to prizes, grants, subsidies, or other innovation and cultural policy levers. Existing literature frames this as a choice among various strategies for (1) inducing makers to invest in knowledge goods; and (2) setting the terms under which consumers can access those goods.²⁷ This framing, however, ignores a third consideration: the institutions that implement innovation and cultural policy levers can be evaluators—that is, they can assess the merit of ideas and artifacts and raise the salience of those they deem worthy.

To illustrate how this works and why it matters, I revisit an open question of innovation policy: To what extent did a French prize for food preservation, ostensibly set by Napoleon in 1795 and won by Nicolas Appert in 1810, catalyze progress during the Industrial Revolution?²⁸ For its champions, this is a key existence proof for the proposition that government-set pecuniary rewards can be superior to market-driven IP rights; for skeptics, it reveals that government-set pecuniary rewards inevitably tend towards incompetence and corruption. The core of the disagreement concerns whether the prize could have motivated Appert's investments in his method of sterilizing food.

Contrary to both sides of the existing debate, however, it may not matter at all whether the prize induced Appert's investments. Instead, the most important consequence of the prize could have been its effect on the domain. The prize-awarding institution—the Société d'Encouragement pour l'Industrie Nationale—was an evaluator, structuring the domain of food preservation technology so as to increase the salience of Appert's invention. As a result, the prize may have catalyzed a period of rapid and accelerating growth by making a particularly fruitful set of ideas and artifacts more accessible to subsequent makers, ultimately paving the way for Louis Pasteur's development of his eponymous pasteurization process. More generally, this historical episode appears to be an existence

²⁷ See generally Daniel J. Hemel & Lisa Larrimore Ouellette, *Innovation Policy Pluralism*, 128 *YALE L.J.* 544 (2019) (developing a “framework for the study of pluralistic innovation policy arrangements” that characterizes IP and non-IP alternatives as “innovation incentives” and “allocation mechanisms”) (emphasis omitted).

²⁸ See *infra* Part IV.A.1.

proof for the proposition that innovation policy can ameliorate the problems that characterize the slow takeoff phase.

The ecosystem model also identifies underexploited opportunities for doctrinal reform.²⁹ Because the binding constraints on progress change over time, IP doctrines could target the different kinds of problems that dominate each phase. As an example, consider how copyright law might disrupt the ossification that results from evaluators' biased or mistaken assessments. Copyright law and attribution practices in the music industry reinforce Matthew Effects, a process by which makers who achieve early fame receive a disproportionate share of subsequent attention—of the many makers involved in writing and recording any given song, the already well-known ones receive most of the subsequent credit.³⁰ Formal attribution requirements could demand that all of the makers associated with a song be more readily identified; this would help subsequent makers find overlooked contributions in a large domain because they could more easily track down related ideas and artifacts.³¹

This Article proceeds as follows. Part I begins by justifying my focus on the psychology and sociology of creativity. While there is broad (though not universal) agreement that IP law should promote creativity, it's less clear that IP should focus specifically on creativity's psychological and sociological determinants; I accordingly offer some explicit grounding for this emphasis by documenting the Supreme Court's long-standing interest in these factors.³² Part II then develops the ecosystem model. I first motivate the model by using it to reevaluate a prominent historical example of creativity, that of Vincent van Gogh; next, I refine the model's core components and relate them to existing concepts in IP theory. Part III elucidates

²⁹ *Infra* Part IV.B.

³⁰ *Infra* text accompanying notes 282–92.

³¹ *Infra* text accompanying notes 293–94.

³² See Cohen, *supra* note 15, at 1151 (“Creativity is universally agreed to be a good that copyright law should seek to promote”); Fromer, *supra* note 13, at 1508 (asserting that “the main accepted goal of patent and copyright law is to stimulate creativity in scientific and engineering endeavors as well as the arts”); Mandel, *supra* note 13, at 1999 (“Because innovation usually requires some form of creativity as an antecedent, intellectual property law generally should also promote, and certainly should not impede, creativity.”). *But see* Michael J. Madison, *Beyond Creativity: Copyright as Knowledge Law*, 12 VAND. J. ENT. & TECH. L. 817, 824 (2010) (arguing that “although creativity should not be excluded from copyright, copyright should be conceived primarily as a system for producing, distributing, conserving, sharing, and ensuring access to knowledge.”).

the model's implications for IP theory—instead of the persistently slow rate of progress predicted by existing IP models, the ecosystem model predicts a fluctuating rate of progress that fits better with the historical record. Part IV then applies the model's insights to concrete questions in IP law and policy. The Conclusion situates this Article within the larger project of understanding IP's impact on creativity.

I

THE PSYCHOLOGY AND SOCIOLOGY OF CREATIVITY IN IP

I begin with a brief overview of contemporary creativity research, highlighting its emphasis on interactions between individuals and society. I then turn to the Supreme Court's development of the originality requirement in copyright law and the nonobviousness requirement in patent law. As I'll show, this jurisprudence reflects the Court's understanding of the psychology and sociology of creativity; IP scholars thus need a compelling model of how these factors influence creativity in order to subject the Court's cases to rigorous theoretical scrutiny.³³

A. Creativity's Psychological and Sociological Determinants

People have long speculated about the nature and determinants of creativity. From the Middle Ages until the Enlightenment, the dominant strain in European thought associated creativity with the divine.³⁴ At first, an individual "with special talent or unusual ability" was understood as a "conduit" of a divine spirit; later, "great artists and artisans" were seen as having "divine attribute[s]" themselves.³⁵

The modern era of creativity research was ushered in by J.P. Guilford's 1950 address to the American Psychological Association.³⁶ After Guilford bemoaned psychologists' "appalling" neglect of creativity,³⁷ the discipline focused on creativity as a

³³ Cf. Fromer, *supra* note 13, at 1457–59 (explaining why the creative process matters for utilitarian, Lockean, and Hegelian justifications of IP).

³⁴ See Mark A. Runco & Robert S. Albert, *Creativity Research: A Historical View*, in *THE CAMBRIDGE HANDBOOK OF CREATIVITY* 3, 6 (James C. Kaufman & Robert J. Sternberg eds., 2010).

³⁵ *Id.*

³⁶ See J.P. Guilford, *Creativity*, 5 *AM. PSYCH.* 444 (1950); Mark A. Runco, *Creativity*, 55 *ANN. REV. PSYCH.* 657, 659 (2004) (asserting that Guilford's 1950 presidential address played a key role in "convincing individuals of the possibility of being scientific about creativity").

³⁷ Guilford, *supra* note 36, at 445.

psychological phenomenon in its own right. Individual intellectual and personality traits quickly emerged as the leading candidates for explaining creativity.³⁸

More recently, however, research has turned to causal mechanisms at the interface of individuals and society.³⁹ Contemporary research defines creativity as requiring both novelty and appropriateness.⁴⁰ Then, in order to determine whether any given product or process is creative, researchers need both substantive criteria (i.e., something that specifies what makes a thing novel and appropriate) and procedural tools (i.e., a method that can be used to determine whether the substantive criteria are satisfied).

The substantive criteria for “novelty” are relatively straightforward. Novelty refers to the presence of something different from what existed before. In some instances, our perspective on novelty is subjective (new to the individual who produced it); in others, it is objective (new by reference to some external standard).⁴¹

The substantive criteria for “appropriateness” or “fit,” however, are more complex. The intuition underlying the “appropriateness” requirement is that, in order to qualify as creative, “a novel product, idea, or problem solution” must have “value to the individual” or to “the larger social group.”⁴² There are all sorts of novel works that do not seem to be creative.⁴³ If I hit random notes on a piano, I might produce something novel in the sense that no one has hit those notes in that order at that

³⁸ See Runco, *supra* note 36, at 660, 671–73 (noting shift from a creativity literature review published in 1981 that focused on individual intelligence and personality to early 2000s creativity literature that situated individual factors alongside environmental and social ones).

³⁹ Hennessey & Amabile, *supra* note 19, at 571–72; CSIKSZENTMIHALYI, *supra* note 19, at 23 (arguing that “creativity does not happen inside people’s heads, but in the interaction between a person’s thoughts and a sociocultural context,” with the result that creativity “is a systemic rather than an individual phenomenon”).

⁴⁰ See Hennessey & Amabile, *supra* note 19, at 572 (noting consensus on criteria of novelty and appropriateness); Dean Keith Simonton, *Taking the U.S. Patent Office Criteria Seriously: A Quantitative Three-Criterion Creativity Definition and Its Implications*, 24 CREATIVITY RSCH. J. 97, 97 (2012) (“By far the most common statement entails some version of the two-criterion definition: Creativity requires (a) novelty or originality and (b) utility or usefulness.”).

⁴¹ For more on the novelty criterion, see Mark Batey & Adrian Furnham, *Creativity, Intelligence, and Personality: A Critical Review of the Scattered Literature*, 132 GENETIC, SOC., & GEN. PSYCH. MONOGRAPHS 355, 358–60 (2006).

⁴² Hennessey & Amabile, *supra* note 19, at 572.

⁴³ See Mark A. Runco & Garrett J. Jaeger, *The Standard Definition of Creativity*, 24 CREATIVITY RSCH. J. 92, 92 (2012) (identifying the problem of random or nonsensical novelty).

rhythm before. Still, it would be a stretch to call the resulting composition creative. The “appropriateness” criteria, then, serves a simple function: exclude these senseless contributions while still including meaningful ones.

This presents a problem, though, for the procedural tools. The problem arises because “meaning” is often domain-specific: Contributions that appear senseless to outsiders can be meaningful to those who know the domain well. So we need a method that distinguishes senseless from meaningful novelty while accounting for the domain-specificity of meaning.

The standard laboratory measure of creativity, Teresa Amabile’s Consensual Assessment Technique (“CAT”), solves this problem by calling directly on domain-specific expertise.⁴⁴ In the CAT procedure, participants create products—poems, drawings, mathematical proofs—according to some instructions.⁴⁵ Experts in the relevant domain—professional poets, artists, mathematicians—are then asked to rate the creativity of those products.⁴⁶ The experts do not confer with each other, are not given detailed criteria for evaluating creativity, and do not explain or defend their judgments.⁴⁷ This procedure results in a relative measure of creativity that compares one item in the experiment to other items in that same experiment.⁴⁸

The CAT procedure exemplifies the contemporary view that creativity is an emergent social phenomenon. We cannot determine whether a work counts as creative without reference to a deep body of knowledge. And, crucially, we rely on particular individuals to access that knowledge and make the corresponding assessment of creativity. As a result, “there is no reliable way to decide whether the claims of a self-styled creative person are valid” unless those claims are evaluated by someone with expertise in the relevant domain.⁴⁹ Creativity accordingly occurs only when an individual discloses a novel

⁴⁴ See Teresa M. Amabile, *Social Psychology of Creativity: A Consensual Assessment Technique*, 43 J. PERSONALITY & SOC. PSYCH. 997 (1982) (proposing the Consensual Assessment Technique); John Baer & Sharon S. McKool, *Assessing Creativity Using the Consensual Assessment Technique*, in HANDBOOK OF RESEARCH ON ASSESSMENT TECHNOLOGIES, METHODS, AND APPLICATIONS IN HIGHER EDUCATION 65, 66 (Christopher S. Schreiner ed., 2009) (describing the Consensual Assessment Technique as “a well validated tool for assessing creativity” that “has been called the ‘gold standard’” in “research settings”).

⁴⁵ Baer & McKool, *supra* note 44, at 68.

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ CSIKSZENTMIHALYI, *supra* note 19, at 6.

idea or artifact in a social context that is prepared to receive it as appropriate given some set of domain-specific criteria.⁵⁰

B. Creativity in the Supreme Court's IP Jurisprudence

Courts have traditionally followed scholars in treating IP as a way to ameliorate the problem of suboptimal investment in public goods;⁵¹ nevertheless, the psychology and sociology of creativity have also influenced IP jurisprudence. To illustrate the point, I focus on the Supreme Court's development of two doctrines at the heart of intellectual property: (1) the originality requirement in copyright law; and (2) the nonobviousness requirement in patent law. These doctrines are the threshold barriers to their respective regimes—each one establishes a minimum hurdle that a person must clear in order to obtain the exclusive rights that IP offers. As I'll show here, when the Supreme Court has grappled with these doctrines, it has been influenced by its understanding of the psychology and sociology of creativity.

1. Originality

Begin with *The Trademark Cases*.⁵² The Court there took up the question of whether the first federal trademark statute was constitutional.⁵³ The government defended the statute's constitutionality by, *inter alia*, analogizing "property in the use of trade-marks" to property in copyrights; congressional authority to enact trademark laws could therefore be found in the same place as congressional authority to enact copyright laws: Article I, Section 8, Clause 8.⁵⁴

The Supreme Court rejected this argument. The word "Writings" in the Progress Clause had not been limited to books, essays, and other textual works; instead, "Writings" had been construed liberally to include visual designs of the kind that are

⁵⁰ *Id.*

⁵¹ *Mazer v. Stein*, 347 U.S. 201, 219 (1954) (describing the "economic philosophy behind" the Progress Clause); Lemley, *supra* note 7, at 993 ("Intellectual property is fundamentally about incentives to invent and create.").

⁵² *Trade-Mark Cases (The Trademark Cases)*, 100 U.S. 82 (1879). This case was the first to "firmly establish[] the constitutional nature of the [originality] requirement." Diane Leenheer Zimmerman, *It's an Original! (?): In Pursuit of Copyright's Elusive Essence*, 28 COLUM. J.L. & ARTS 187, 200 (2005).

⁵³ *The Trademark Cases*, 100 U.S. at 85, 91–92.

⁵⁴ *Id.* at 86. The government's primary argument relied on the Commerce Clause; the Court rejected that argument because the statute was not limited to activity that bore some relationship to interstate commerce. *Id.* at 94–99.

often used as trademarks. Nevertheless, the Court reasoned that “Writings” in the constitutional sense were limited to those designs that “are original, and are founded in the *creative powers of the mind*. The writings which are to be protected are the fruits of intellectual labor”⁵⁵ Because trademarks did not “depend upon . . . any work of the brain” and did not require any “fancy or imagination, no genius, no laborious thought,” the Progress Clause could not authorize Congress to enact a general trademark statute.⁵⁶

The key point is that, in the Court’s view, distinctive psychological processes demarcated the outer boundaries of copyright’s domain. Copyrightable material arose from “the creative powers of the mind,” “the fruits of intellectual labor,” and the “work of the brain.”⁵⁷ Absent “fancy” or “imagination” or “genius” or “laborious thought”—that is, absent evidence that the work at issue resulted from the mental processes associated with creativity—there could be no copyrightable content.

The Court elaborated on this requirement five years later, in *Burrow-Giles Lithographic Co. v. Sarony*.⁵⁸ Napoleon Sarony alleged that Burrow-Giles infringed a photograph Sarony took of Oscar Wilde.⁵⁹ In its defense, Burrow-Giles argued that photographs could not be “Writings” of “Authors” because they were mere “mechanical reproduction[s] of the physical features or outlines of some object.”⁶⁰

The Court disagreed. First, an author in the constitutional sense was anyone “to whom anything owes its origin; originator; maker; one who completes a work of science or literature.”⁶¹ Writings, meanwhile, “include[d] all forms of writing, printing, engravings, etchings, [et]c., by which *the ideas in the mind of the author are given visible expression*.”⁶² Because photographs could be “original intellectual conceptions of the author,” the Constitution authorized Congress to include them within the scope of copyright law.⁶³ For *Burrow-Giles* as for *The Trademark Cases*, then, the answer to the copyrightability question

⁵⁵ *Id.* at 94 (emphasis added and omitted).

⁵⁶ *Id.*

⁵⁷ *Id.* (emphasis omitted).

⁵⁸ *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53 (1884).

⁵⁹ *Id.* at 54.

⁶⁰ *Id.* at 59.

⁶¹ *Id.* at 57–58.

⁶² *Id.* at 58 (emphasis added).

⁶³ *Id.*

depended on whether the artifact was the result of distinctive psychological processes.⁶⁴

That changed with *Bleistein v. Donaldson Lithographing Co.*⁶⁵ George Bleistein had produced three lithographs advertising a circus; Donaldson Lithographing Company copied those images.⁶⁶ In its defense, Donaldson argued that the lithographs did not fall within the scope of the copyright statute; if they did, the statute was unconstitutional.⁶⁷

The Court rejected Donaldson's defenses. Contrary to the insistence in *The Trademark Cases* and *Burrow-Giles* that a work must result from particular psychological processes, *Bleistein* demanded that a work reflect "the personal reaction of an individual upon nature."⁶⁸ This view of the originality requirement reflected Justice Oliver Wendell Holmes's view of American transcendentalist philosophy, especially that of Ralph Waldo Emerson.⁶⁹ At the risk of being reductive, Emerson's notion of "personality" was something akin to a person's soul.⁷⁰ This suggests a more attenuated relationship between copyright's originality requirement and the psychology of creativity—a work must bear some relationship to the creator's soul, but it need not have any particular relationship to the creator's mind.⁷¹

⁶⁴ As applied to the facts in *Burrow-Giles*, the answer was yes. *Id.* at 59–60 (concluding that the photographs were copyrightable because the evidence demonstrated that there was "intellectual production, . . . thought, and conception" in the production of the photographs).

⁶⁵ *Bleistein v. Donaldson Lithographing Co.*, 188 U.S. 239 (1903).

⁶⁶ Diane Leenheer Zimmerman, *The Story of Bleistein v. Donaldson Lithographing Company: Originality as a Vehicle for Copyright Inclusivity*, in *INTELLECTUAL PROPERTY STORIES* 77, 84–85 (Jane C. Ginsburg & Rochelle Cooper Dreyfuss eds., 2006).

⁶⁷ *Bleistein*, 188 U.S. at 249–51.

⁶⁸ *Id.* at 249–50.

⁶⁹ See Barton Beebe, Bleistein, *The Problem of Aesthetic Progress, and the Making of American Copyright Law*, 117 *COLUM. L. REV.* 319, 366–71 (2017) (describing the origins of this requirement in American transcendentalism).

⁷⁰ See *id.* at 368 n.263 (describing transcendentalism's idea of personality as something that distinguishes "other creatures and men" and that connects each individual "with the Universal Spirit") (quoting George Willis Cooke, *INTRODUCTION TO THE POETS OF TRANSCENDENTALISM: AN ANTHOLOGY* 1, 6 (George Willis Cooke ed., 1903)).

⁷¹ Courts subsequently interpreted this to establish a requirement that could be met as easily by the inadvertent twitch of an illustrator's pen as by the deliberate execution of an elaborately conceived mental image. See *Alfred Bell & Co. v. Catalda Fine Arts, Inc.*, 191 F.2d 99, 105 (2d Cir. 1951) (reasoning that a "copyist's . . . defective musculature, or a shock caused by a clap of thunder, may yield sufficiently distinguishable variations").

Later in the opinion, however, the sociology of creativity came to the fore. In *Bleistein's* most influential passage, the Court established the principle of judicial aesthetic neutrality:

It would be a dangerous undertaking for persons trained only to the law to constitute themselves final judges of the worth of pictorial illustrations, outside of the narrowest and most obvious limits. At the one extreme, some works of genius would be sure to miss appreciation. Their very novelty would make them repulsive until the public had learned the new language in which their author spoke. . . . At the other end, copyright would be denied to pictures which appealed to a public less educated than the judge. Yet if they command the interest of any public, they have a commercial value—it would be bold to say that they have not an aesthetic and educational value—and the taste of any public is not to be treated with contempt.⁷²

Apparently drawing on his personal experiences, Justice Holmes here articulates a sociology of creativity not unlike the prevailing view in contemporary creativity research. As Rebecca Curtin has explained, Justice Holmes's wife, Fanny Bowditch Dixwell Holmes, was a groundbreaking artist who attained "fame and distinction" because of "her destruction of the barrier between the decorative arts and the fine arts."⁷³ Justice Holmes was accordingly keenly aware of the varying social functions that different artists and art works can perform. His opinion in *Bleistein*, and especially the judicial aesthetic neutrality principle, reflects that awareness.

I want to be careful not to overstate the case because the point here is a bit subtle. *Bleistein* did not make the sociology of creativity directly relevant to the doctrinal originality inquiry—to the contrary, post-*Bleistein* courts could and did

⁷² *Bleistein*, 188 U.S. at 251–52. Courts and scholars had long understood this as the justification for the easily met constitutional originality standard articulated earlier in the opinion. See *Bucklew v. Hawkins, Ash, Baptie & Co.*, 329 F.3d 923, 929 (7th Cir. 2003) (justifying the undemanding originality standard on the grounds that judges are not competent to make aesthetic judgments); Oren Bracha, *The Ideology of Authorship Revisited: Authors, Markets, and Liberal Values in Early American Copyright*, 118 *YALE L.J.* 186, 200 (2008) (connecting the reduction of the "originality requirement to almost nothing" with Holmes's "stance of judicial abdication"). More recent work argues that the aesthetic neutrality principle was part of the Court's separate analysis of the progress requirement. See Beebe, *supra* note 69, at 364–71.

⁷³ Rebecca Schoff Curtin, *The Art (History) of Bleistein*, 69 *J. COPYRIGHT SOC'Y* 395, 395 (2022).

ignore entirely the social context associated with an artifact.⁷⁴ Instead, my point is that Justice Holmes applied his understanding of the sociology of creativity to resolve the doctrinal questions in *Bleistein*—the contours of the originality requirement reflected what Justice Holmes thought about the way social factors influence cultural progress.

Thus, for example, Justice Holmes established the judicial aesthetic neutrality principle because he thought that the social position judges occupy renders them ill-suited to making aesthetic judgments; this is a social role better performed by other actors.⁷⁵ *Bleistein* accordingly illustrates how the Court's understanding of the sociology of creativity has influenced its originality jurisprudence. In a similar vein, consider Donaldson's argument that the constitutional originality requirement excluded real-world subject matter from the scope of copyright law; Justice Holmes rejected that argument because he knew that contemporary arts critics highly valued works that represented a "subject with lively accuracy."⁷⁶ This analysis accordingly deferred to the views of domain experts in deciding what counts as creative.

Finally, in its most recent case on the issue, the Supreme Court again relied on the psychology of creativity to shape the contours of the originality requirement. In *Feist Publications, Inc. v. Rural Telephone Service Co.*, the Court held that Feist did not infringe Rural's telephone directory because Rural's selection and arrangement of names and numbers was not original.⁷⁷ Building primarily on *The Trademark Cases* and *Burrow-Giles*, the Court described originality as the constitutionally mandated "*sine qua non* of copyright."⁷⁸ This originality requirement could only be satisfied if a "work was independently created by the author (as opposed to copied from other works)" and possessed "at least some minimal degree of creativity."⁷⁹

⁷⁴ See, e.g., *Catalda*, 191 F.2d at 103 (permitting almost any observable difference between works to be sufficient to establish originality).

⁷⁵ See *id.* at 413–17 (explaining how references to Goya and Manet suggest that Justice Holmes well understood how critical evaluations can fluctuate over time).

⁷⁶ See Curtin, *supra* note 73, at 401–02 (noting that "the ability to represent nature [wa]s critically recognized as a hallmark of value"). Justice Holmes refers to Velázquez and Whistler to justify this conclusion; the pairing of Velázquez and Whistler is "not surprising" because "art critics [of the time] praised Whistler's work explicitly in comparison with Velázquez's portraits." *Id.* at 400.

⁷⁷ *Feist Publ'ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 362–64 (1991).

⁷⁸ *Id.* at 345–47.

⁷⁹ *Id.* at 345.

This is not a demanding standard.⁸⁰ But, crucially for our purposes, it turns on whether a work was the result of particular psychological processes. Repudiating a long line of cases that adopted a “sweat of the brow” theory of copyrightability, the Court reasoned that intellectual “hard work” was insufficient for obtaining copyright protection; instead, only those works that displayed a “creative spark” were eligible.⁸¹ Thus, although *Feist* did not flesh out the details of its creativity requirement, the case nonetheless affirmed that a work is copyrightable only if it results from the distinctive psychological processes associated with creativity.

2. *Nonobviousness*

Turn now to patent law’s nonobviousness requirement. The Supreme Court first articulated this requirement in *Hotchkiss v. Greenwood*.⁸² Faced with a patent claiming a door-knob made of porcelain rather than the traditional wood, the Court held that the novelty of a device wasn’t enough to entitle its maker to a patent.⁸³ Instead, the difference between the claimed invention and the state of the art must reflect “ingenuity,” rather than mere “judgment.”⁸⁴

This “ingenuity” standard seems to make psychological processes relevant to the nonobviousness analysis. Indeed, the Court apparently distinguished between two kinds of psychological processes: “ingenuity” on the one hand and “judgment” on the other. If ingenuity were required to produce a new device, it could qualify for a patent; but if mere judgment were sufficient, the new device would not be patentable.⁸⁵ Still, *Hotchkiss* did no more than set up this contrast, leaving courts and lawyers to tease out what it meant by “ingenuity” or “judgment.”

⁸⁰ *Id.* at 345 (describing the “requisite level of creativity” as “extremely low”).

⁸¹ *Id.* at 352–59.

⁸² *Hotchkiss v. Greenwood*, 52 U.S. (11 How.) 248 (1851); cf. Ryan T. Holte & Ted Sichelman, *Cycles of Obviousness*, 105 IOWA L. REV. 107, 118–23 (speculating that *Hotchkiss* was drawing on the requirements imposed by the patent system of Renaissance Venice).

⁸³ *Hotchkiss*, 52 U.S. at 265–66.

⁸⁴ *Id.* at 266–67.

⁸⁵ *Id.* at 266; see Laura G. Pedraza-Fariña & Ryan Whalen, *A Network Theory of Patentability*, 87 U. CHI. L. REV. 63, 78 (2020) (identifying questions that *Hotchkiss* left open about the nature of the cognitive dimensions of the nonobviousness inquiry).

The sociology of creativity was also relevant to the *Hotchkiss* standard. The baseline against which to measure whether a claimed invention required ingenuity or judgment was the “ordinary mechanic acquainted with the business.”⁸⁶ Crucially, this means that nonobviousness is not measured against the sum total of human knowledge. Instead, each invention arises in a social context, and the nonobviousness analysis must measure what the invention contributed in that context.

The psychology of creativity took on a more robust role in the Court’s most infamous nonobviousness decision, *Cuno Engineering v. Automatic Devices Corp.*⁸⁷ The patent there claimed a cigarette lighter incorporating a thermostatic spring, a concept that had been applied to items like toasters and coffee machines, but not to cigarette lighters.⁸⁸ The Court held that this device was not patentable because it did not “reveal the flash of creative genius.”⁸⁹ Unlike *Hotchkiss*, *Cuno* did not draw a categorical distinction between the patentable “ingenuity” of an inventor and the unpatentable “judgment” of an ordinary mechanic; instead, *Cuno* framed the issue as a matter of degree—although “[i]ngenuity was required to” develop the claimed device, it was insufficient because it was “no more than that to be expected of a mechanic skilled in the art.”⁹⁰

Cuno quickly proved controversial.⁹¹ Its “flash of creative genius” formulation was seen as departing from *Hotchkiss* in two ways. First, many courts thought the “flash of creative genius” language imposed a more demanding standard than did the “ingenuity” language in *Hotchkiss*; second, courts understood *Cuno* to require an investigation into the subjective psychological experience of the patentee, rather than the objective psychological process that an “ordinary mechanic” would have had to employ to achieve the invention.⁹²

⁸⁶ *Hotchkiss*, 52 U.S. at 267.

⁸⁷ *Cuno Eng’g Corp. v. Automatic Devices Corp.*, 314 U.S. 84 (1941).

⁸⁸ *Id.* at 88–89.

⁸⁹ *Id.* at 91.

⁹⁰ *Id.* at 91–92.

⁹¹ *Graham v. John Deere Co.*, 383 U.S. 1, 15 (1966) (“It also seems apparent that Congress intended by the last sentence of § 103 to abolish the test it believed this Court announced in the controversial phrase ‘flash of creative genius,’ used in *Cuno Corp.*”) (quoting *Cuno*, 314 U.S. at 91).

⁹² *Id.* at 1; John H. Barton, *Non-Obviousness*, 43 IDEA 475, 485–87 (2003) (describing contemporaneous reaction to *Cuno*’s articulation of the “flash of genius” standard); Pedraza-Fariña & Whalen, *supra* note 85, at 79–80 (describing *Cuno* as “embodying the subjective approach” to the psychological inquiry set

Congress repudiated those interpretations when it passed the 1952 Patent Act, reaffirming the *Hotchkiss* line of precedent that prevailed before *Cuno*.⁹³ When the Court first applied the 1952 Act in *Graham v. John Deere Co.*, it explained that the statutory nonobviousness inquiry requires “a comparison between the subject matter of the patent . . . and the background skill of the calling.”⁹⁴ This is an objective inquiry: Would an ordinary individual working in the relevant domain been able to produce the invention?⁹⁵ The assessment of nonobviousness must, accordingly, be sensitive to the invention’s social context. In addition, courts evaluating whether an invention satisfied the nonobviousness requirement would be conducting an essentially psychological inquiry, not unlike the one required for “negligence and scienter.”⁹⁶

It’s worth acknowledging here that creativity is not the only thing that matters in nonobviousness jurisprudence. For example, *Graham* refers several times to an economic rationale justifying the nonobviousness requirement.⁹⁷ Again, however, my point is simply that the psychological and sociological underpinnings of creativity have mattered to the Court as it has developed key IP doctrines; I do not claim that these have been the only influences on the Court’s jurisprudence. And *Graham* is consistent with this view, even as it also reflected the Court’s concern with other determinants of creativity.

Finally, the Court’s most recent engagement with non-obviousness made the psychology and sociology of creativity central to the doctrinal inquiry.⁹⁸ In *KSR International Co. v. Teleflex Inc.*, the Court first affirmed that the nonobviousness analysis “can take account of the inferences and creative steps

up by *Hotchkiss* and contrasting it with other cases that adopted an objective approach).

⁹³ *Graham*, 383 U.S. at 12–15.

⁹⁴ *Id.* at 12.

⁹⁵ *Id.* at 17–19.

⁹⁶ *Id.* at 18.

⁹⁷ See *id.* at 7–10 (summarizing Thomas Jefferson’s articulation of the “social and economic rationale of the patent system”).

⁹⁸ See *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). For a related argument that *KSR v. Teleflex* justifies a socio-historical approach to innovation, see Pedraza-Fariña, *Sociology of Innovation*, *supra* note 10, at 823–30 (concluding that “the Court’s ‘real-world’ approach compels an analysis of how real-world inventions are developed,” including an “understanding [of] those factors intrinsic to how scientific research and innovation more broadly are done that affect which research projects are undertaken and which are not, and that explain why some innovations, when viewed in retrospect, took a long time to develop given the then-existing knowledge in the art”).

that a person of ordinary skill in the art would employ.”⁹⁹ As a result, the key question is whether the skilled artisan would have been capable of applying the psychological process of creativity to produce the invention.

KSR also devoted significant attention to the social context in which creativity arises. The Court noted that, in some settings, individuals will spell out in detail obvious variations on existing knowledge; in others, a general awareness of user needs will drive improvements.¹⁰⁰ And it is possible that the social context will render obvious an invention that was not in fact obvious to the actual inventors—“any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed,” even if the combination was not obvious to the patentee herself.¹⁰¹

Perhaps most strikingly, *KSR* recognized that a nonobviousness analysis ought to focus on interactions between the psychological and sociological dimensions. The Court rejected the Federal Circuit’s assumption that “a person of ordinary skill attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem.”¹⁰² Instead, as “[c]ommon sense teaches, . . . familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.”¹⁰³ In other words, information may be embedded in the artifacts of a domain, and the way in which an ordinary artisan interacts with those artifacts is not limited to the way in which the information is presented; instead, she might bring her own mental efforts to bear in rearranging existing information. As a result, courts must remember that a “person of ordinary skill is also a person of ordinary creativity.”¹⁰⁴

In sum, the Supreme Court has relied on its understanding of the psychology and sociology of creativity to shape the contours of key IP doctrines. This does not establish that

⁹⁹ 550 U.S. at 418.

¹⁰⁰ See *id.* at 419 (noting that in “many fields[,] it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature, will drive design trends”).

¹⁰¹ *Id.* at 420.

¹⁰² *Id.* (citing *Teleflex, Inc. v. KSR Int’l Co.*, 119 Fed. App’x 282, 288 (2005))

¹⁰³ *Id.*

¹⁰⁴ *Id.* at 421.

promoting creativity is a normatively desirable aim for IP law.¹⁰⁵ But it does show that the psychology and sociology of creativity has exerted a longstanding influence on IP jurisprudence. IP scholars therefore need a parsimonious descriptive account of the ways in which IP and creativity might interact. At a minimum, such an account will give scholars better tools for evaluating whether courts are resolving IP questions consistent with our best understanding of how creativity works.

II

THE ECOSYSTEM MODEL

In this Part, I develop a model of creativity—the ecosystem model—that emphasizes interactions between individual and social determinants of creativity.¹⁰⁶ The overall process looks something like this. Makers search a domain of existing ideas and artifacts. Contingent on what they find, makers then generate new ideas and artifacts by improving on or combining existing ones. Next, evaluators assess at least some of the ideas and artifacts that makers generate. For the subset of ideas and artifacts they deem worthy, evaluators make some more and others less prominent in the domain.

This view of creativity has two important implications. First, makers are more likely to find—and, crucially, build on—the ideas and artifacts that evaluators valorize at any given moment in time. Second, because this is a dynamic process—that is, evaluators constantly revisit ideas and artifacts and adjust their relative salience as a result of those reassessments—the ideas and artifacts most likely to serve as the foundations for new ones regularly change over time.

Note that this is a model of what the creativity literature calls Big-C and Pro-c creativity. Big-C creativity refers to creativity that has “changed our culture in some important respect”;¹⁰⁷ Pro-c refers to the kind of work associated with “professional-level

¹⁰⁵ Cf. *Dastar Corp. v. Twentieth Century Fox Film Corp.*, 539 U.S. 23, 37 (2003) (contrasting trademark law’s “foundations (which were *not* designed to protect originality or creativity),” with “copyright and patent laws (which *were*)”).

¹⁰⁶ A comprehensive understanding of IP’s effect on creativity requires a model that incorporates these factors and considers the possible effects that IP might have on them. See Tushnet, *supra* note 15, at 515 (“Psychological and sociological concepts can do more to explain creative impulses than classical economics.”); see also Cohen, *supra* note 15, at 1153 (sketching a model in which “it is neither individual creators nor social and cultural patterns that produce artistic and intellectual culture, but rather the dynamic interactions between them”).

¹⁰⁷ CSIKSZENTMIHALYI, *supra* note 19, at 26.

creators . . . who have not yet attained . . . eminent status, but who are well beyond little-c creators . . . in knowledge, motivation, and performance.”¹⁰⁸ Big-C and Pro-c creativity are contrasted with little-c creativity, which comprises the novel and appropriate contributions that all sorts of people make every day; think of finding a new commute to school or a better way to organize your closet.¹⁰⁹ While there is much of general interest in little-c creativity, the focus of IP is on Big-C or Pro-c creativity.¹¹⁰ The model here is accordingly designed to characterize those phenomena.

In the next Section, I will motivate the ecosystem model by viewing the story of Vincent van Gogh through its lens.¹¹¹ The story will emphasize how domain-maker-evaluator interactions made van Gogh’s work possible and amplified its eventual influence. I will then take each of the model’s three core components in turn, explaining how we can use them to understand the psychological and sociological processes that give rise to creativity. As I do so, I will situate the model’s core components in the context of existing IP literature.

A. An Illustration: Vincent van Gogh

In the popular conception, Vincent van Gogh was a genius, consumed by his artistic vision and misunderstood by his contemporaries. But because the paintings he produced *ex nihilo* were so undeniably brilliant, the world eventually recognized his greatness and his work achieved its inevitable, enduring fame.¹¹²

This popular conception is wrong—van Gogh’s place in the canon of Western visual art is better understood as a contingent result of domain-maker-evaluator interactions. First, van Gogh’s work did not come from nowhere; instead, the domain made possible the directions that van Gogh took. Second, it

¹⁰⁸ Aaron Kozbelt, Ronald A. Beghetto & Mark A. Runco, *Theories of Creativity*, in THE CAMBRIDGE HANDBOOK OF CREATIVITY, *supra* note 34, at 20, 23–24.

¹⁰⁹ *Id.* at 23.

¹¹⁰ See Cohen, *supra* note 15, at 1153 n.4 (noting that creativity “extends well beyond the traditional domain of copyright”).

¹¹¹ Cf. Madison, *supra* note 32, at 836–42 (using van Gogh’s study of Jean-François Millet as an illustration of how copyright should work as knowledge law).

¹¹² See CSIKSZENTMIHALYI, *supra* note 19, at 30–31 (“The usual way to think about this issue is that someone like van Gogh was a great creative genius, but his contemporaries did not recognize this.”); JAMES BOYLE, SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY 91 (1996) (referring to van Gogh as the personification of the Romantic conception of the original author).

was not only the intrinsic worth of van Gogh's paintings that made them so influential; instead, concrete decisions by specific evaluators reorganized the domain such that subsequent makers became more likely to find and build on works painted by van Gogh.

Focus first on van Gogh's interactions with the domain of visual art before he produced his most influential works. As a child, van Gogh did not display any particular interest in or aptitude for art. He took the first apparent steps in that direction when his uncle—also named Vincent van Gogh, now known as Uncle Cent—got him a job at Goupil & Cie, an art dealer of which Uncle Cent was a part owner.¹¹³ Van Gogh therefore had unusually good access to the ideas and artifacts that evaluators deemed worthy because he happened to be the nephew of one such evaluator.

After a brief, failed stint as a clergyman, van Gogh began studying art at The Hague in the early 1880s. This was not pure chance; instead, he went because his cousin, Anton Mauve, was a well-established painter there.¹¹⁴ The Hague was a specific location in the domain of visual art, and the fact that van Gogh went there influenced his work—the darker color tones that typified the realist work of the Hague School can be seen in van Gogh's (mostly unremarkable) paintings from that period.¹¹⁵

Van Gogh then joined his brother Theo in Paris. Theo was also an art dealer at Goupil & Cie, and he was instrumental in that firm's decision to buy and promote the work of French Impressionists.¹¹⁶ Paris in general and Theo's social circle in particular was yet another specific location in the domain of visual art. And because van Gogh had privileged access to that location, he interacted with the ideas and artifacts readily accessible there.

To make the implication explicit, van Gogh did not solely of his own volition seek out work by Impressionists like Monet and Pissarro because he was dissatisfied with the Hague School; instead, he saw the Impressionists largely because his brother was an evaluator steeped in the ideas and artifacts of that movement. And only after his interactions with Impressionist ideas and artifacts did van Gogh develop the distinctive

¹¹³ STEVEN NAIFEH & GREGORY WHITE SMITH, VAN GOGH: THE LIFE 68 (2011).

¹¹⁴ *Id.* at 240 (explaining that van Gogh “had come to The Hague primarily to see one person: his cousin by marriage Anton Mauve”).

¹¹⁵ *Id.* at 241.

¹¹⁶ *Id.* at 543.

colors and visual patterns we see in his most celebrated works.¹¹⁷ Counterfactuals are hard, but it seems unlikely that van Gogh would have produced the artifacts for which he has attained his reputation had Monet's and Pissarro's artifacts not been included in the domain.

It's worth emphasizing here that by "included in the domain," I mean not simply that some Impressionists painted their works before van Gogh did; rather, I mean that Monet's and Pissarro's paintings were situated where van Gogh was likely to find them. In the mid-1800s, the foremost evaluator in this domain was the government-sponsored Académie des Beaux-Arts.¹¹⁸ Its official exhibition—the Salon—displayed works chosen by the Académie's members. But those members consistently rejected Impressionist paintings, leading the Impressionists to launch the Société Anonyme des Artistes Peintres, Sculpteurs, Graveurs, etc.¹¹⁹ Critics lined up on both sides of the Académie/Société divide, with Edmond Duranty's 1876 essay "La Nouvelle Peinture" providing important support to the pro-Société position.¹²⁰ And it was the acceptance of the Société by evaluators like Duranty that elevated the salience of Impressionist painting in the Parisian domain of the visual arts.

I am skipping a lot of nuance in order to focus on this: The crucial turning point in van Gogh's career—his exposure

¹¹⁷ See *Vincent van Gogh Biography*, THE VAN GOGH GALLERY, www.vangogh-gallery.com/misc/biography.html [https://perma.cc/JU6W-D72T] (last visited Aug. 21, 2023) (noting that after van Gogh "met the new Impressionist painters, he tried to imitate their techniques; he began to lighten his very dark palette and to paint in the short brush strokes of the Impressionists' style"). Of course, the Impressionists were not the only important influence on van Gogh; Japanese art, newly arrived in France in the latter half of the 1800s, had a particularly profound impact. See generally LOUIS VAN TILBORGH, NIENKE BAKKER, CORNELIA HOMBURG, TSUKASA KÖDERA & CHRIS UHLENBECK, *VAN GOGH & JAPAN* (Yale Univ. Press 2018) (2017); Colta Ives, *Japonisme*, THE METRO. MUSEUM OF ART (Oct. 2004), https://www.metmuseum.org/toah/hd/jpon/hd_jpon.htm [https://perma.cc/7ZCA-GXAU] (describing the impact on French artists of Japanese arts and crafts that arrived in France "[a]fter Japanese ports reopened to trade with the West in 1853" and following France's "first formal exhibition of Japanese arts and crafts" at Japan's "pavilion at the World's Fair of 1867").

¹¹⁸ Jason Rosenfeld, *The Salon and the Royal Academy in the Nineteenth Century*, THE METRO. MUSEUM OF ART (Oct. 2004), https://www.metmuseum.org/toah/hd/sara/hd_sara.htm [https://perma.cc/4FL2-Z3J9] (describing that institution's "virtual monopoly on public taste and official patronage").

¹¹⁹ *Id.* (explaining that the "first of the eight Impressionist exhibitions" were "a dissenting and independent gambit").

¹²⁰ See ROBERT L. HERBERT, *IMPRESSIONISM: ART, LEISURE, AND PARISIAN SOCIETY* 19 (1988) (characterizing Duranty's essay as "a polemical defense of the [I]mpressionists' exhibition of 1876").

to Impressionist art—happened in significant part because of domain-maker-evaluator interactions. Evaluators (like the Salon, the Société, and Duranty) assessed the work of makers (like Monet and Pissarro) to produce a domain in which individuals living in Paris and interested in the visual arts (like van Gogh) would be likely to find the particular artifacts (Impressionist paintings) that were necessary preconditions to van Gogh's own contributions.

Moreover, just as the creation of van Gogh's paintings can be traced to domain-maker-evaluator interactions, so too can their impact. Van Gogh had a limited audience during his lifetime. And for the first decade following his death, he was a minor figure in the Impressionist movement.

That changed with the Berlin Secession. Much as the Société rebelled against the Académie's insistence on traditional artistic expression, so the Berlin Secession rebelled against the German equivalent of the Académie—the Association of Berlin Artists.¹²¹ Paul Cassirer, a German art dealer and member of the Berlin Secession's board, then pushed for the inclusion of five van Gogh paintings in a 1901 exhibition.¹²² Along with Johanna van Gogh-Bonger (Theo van Gogh's widow), Cassirer spent the next decade promoting van Gogh's paintings among German artists, critics, and collectors. At first, these paintings produced “only ironic laughter and the shrugging of shoulders.”¹²³ But “each year, the Secession exhibited new works” by van Gogh; a decade later, a van Gogh was “considered among the best and most expensive works in any collection.”¹²⁴ By continuing to display van Gogh's works in the face of a hostile audience, the Berlin Secession increased the odds that subsequent artists would use van Gogh's work as the foundation for new ideas and artifacts.

¹²¹ The definitive work on the Berlin Secession is PETER PARET, *THE BERLIN SECESSION: MODERNISM AND ITS ENEMIES IN IMPERIAL GERMANY* (1980). See *id.* at 59–91 (situating the origins of the Berlin Secession in turn-of-the-century German social movements).

¹²² JOHN REWALD, *STUDIES IN POST-IMPRESSIONISM* 248 (Irene Gordon & Frances Weitzenhoffer eds., 1986) (identifying Cassirer's exhibition as the first meaningful display of van Gogh's work in Germany).

¹²³ GERMAN HIST. IN DOCUMENTS AND IMAGES, LOVIS CORINTH, “THE PAINTINGS FROM THE BRANDENBURG MARCH AND THE FOUNDING OF THE BERLIN SECESSION” (1903) 2 (Richard Pettit, trans.), https://ghdi.ghi-dc.org/sub_document.cfm?document_id=722 [<https://perma.cc/W8XT-EJXB>] (last visited Nov. 15, 2024) (translating LOVIS CORINTH, *DAS LEBEN WALTER LEISTIKOWS. EIN STÜCK BERLINER KULTURGESCHICHTE* [THE LIFE OF WALTER LEISTIKOW: A PIECE OF BERLIN'S CULTURAL HISTORY] 51–56 (1910)).

¹²⁴ *Id.*

The impact of van Gogh's work can thus be traced in part to the early twentieth-century evaluators who promoted his work to other makers and evaluators. Of course, the maker matters too. Van Gogh conceptualized the images and physically layered the paint on canvas, plus there were any number of other people who saw Monet and Pissarro but didn't paint *Starry Night*. Still, the key point is that it was only this particular combination of domain, maker, and evaluators that made van Gogh's works so influential for subsequent artists. All of these factors interacting with each other were necessary and none, not even van Gogh, would come close to being sufficient on its own.¹²⁵

B. Refining the Ecosystem Model

In this section, I will more precisely define the three core components of the ecosystem model: the domain, the makers, and the evaluators. As I do so, I will also say a bit about how they relate to existing concepts in IP theory.

1. *The Domain*

The term "domain" refers to a *reasonably coherent set of existing ideas and artifacts accessible to individuals*.¹²⁶ The essential characteristic of a domain is that some group of individuals knows about its ideas and artifacts. Examples of domains include biology, sculpture, magical realist novels, and solid-state ionics.¹²⁷ As these examples illustrate, domains can be sliced into larger or smaller portions.

In concrete terms, the domain comprises written materials like books, academic journals, lab memos, sheet music, circuit diagrams, and amino acid sequences. It also includes physical objects: telescopes, statues, cell cultures, microchips,

¹²⁵ See CSIKSZENTMIHALYI, *supra* note 19, at 31 (arguing that a "more objective description of van Gogh's contribution is that his creativity came into being when a sufficient number of art experts felt that his paintings had something important to contribute to the domain of art").

¹²⁶ *Id.* at 27–28 (identifying the first component of the creative system as "the domain, which consists of a set of symbolic rules and procedures"). I use the formulation "ideas and artifacts" rather than the IP-specific "inventions" and "expressive works" for two reasons. First, the use of "ideas and artifacts" here avoids conflating the form in which creativity is realized from the implications of creative efforts for obtaining IP rights. Second, "ideas and artifacts" is more consistent with the way this concept is described in the creativity literature from which the model is derived.

¹²⁷ *Id.* (explaining that "[m]athematics is a domain" and "at a finer resolution algebra and number theory can be seen as domains").

paint pigments, and wind tunnels. The domain even and importantly further includes things only embodied in actual living individuals: mental models, techniques of applying paint to canvas, intuitions about the mechanisms underlying powered flight, methods of projecting a voice, and the fine motor control required to manipulate sensitive scientific instruments.

The domain is characterized by its *accessibility*: the ease with which existing ideas and artifacts can be found.¹²⁸ Various features of the domain—including the degree to which information is tacit versus codified, the geographic distribution of the physical and human embodiments of the domain, and the social relationships among a domain’s participants—determine its accessibility.¹²⁹ Because existing ideas and artifacts must be found before they can serve as the basis for new ones, the accessibility of a domain is a key factor influencing technological and cultural progress.

IP scholars have, of course, long recognized that old ideas and artifacts form the basis for new ones. Here’s Jessica Litman, forty years ago: To “say that every new work is . . . based on the works that preceded it . . . has long been a cliché.”¹³⁰ And here’s the Supreme Court, one hundred and fifty years ago: “When a man supposes he has made an invention or discovery useful in the arts, . . . it is, nine times out of ten, an improvement on some existing article, process, or machine”¹³¹ IP scholars often point to this dynamic to defend the public domain: We need to keep an area of knowledge and culture free of

¹²⁸ Csikszentmihalyi’s systems model identifies three “particularly relevant” characteristics of domains that can influence creativity: (1) “the clarity of [the domain’s] structure,” (2) the domain’s “centrality within the culture,” and (3) the domain’s “accessibility.” *Id.* at 38. In the ecosystem model, these are all captured by the notion of accessibility.

¹²⁹ See Cohen, *supra* note 15, at 1180 (describing a “cultural landscape” that is “defined . . . by the ways in which artistic and intellectual goods are accessible to individuals in the spaces where they live”). On tacit knowledge and codified knowledge, see Dan L. Burk, *The Role of Patent Law in Knowledge Codification*, 23 BERKELEY TECH. L.J. 1009 (2008) (describing how the patent system makes it easier for organizations to reduce the costs of employee departures by encouraging the transformation of information from tacit to codified form); Peter Lee, *Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer*, 100 CALIF. L. REV. 1503 (2012) (explaining how some kinds of knowledge resist codification, leading firms to seek integration with universities’ human capital). On social relationships, see Pedraza-Fariña, *Social Origins*, *supra* note 11, at 399–403 (explaining how “discontinuities in social relationships . . . prevent[] the free flow of information among groups”).

¹³⁰ Jessica D. Litman, *The Public Domain*, 39 EMORY L.J. 965, 966 (1990).

¹³¹ *Merrill v. Yeomans*, 94 U.S. 568, 570 (1877).

legal restrictions so that authors and inventors can create new meaning by drawing from what has come before.¹³²

The domain is not, however, coextensive with the public domain.¹³³ Indeed, existing IP theory does not adequately account for the significant effort that makers devote to finding old ideas and artifacts, the considerable extent to which domains vary in the ease with which their ideas and artifacts can be found, and the broad array of non-legal restrictions that can make it difficult to find old ideas and artifacts.

To the contrary, we typically take for granted that anyone can readily access anything in the public domain. Litman, for example, argued that the “*contents of the public domain may be mined by any member of the public.*”¹³⁴ Similarly, as Justice Brandeis put it in one particularly influential articulation: “The general rule of law is, that the noblest of human productions—knowledge, truths ascertained, conceptions, and ideas—become, after voluntary communication to others, *free as the air to common use.*”¹³⁵ These canonical statements exemplify the standard view—just as information in its “natural” state is a nonrival, nonexcludable good, the public domain should be understood as an undifferentiated mass of existing ideas and artifacts, all of which are equally accessible to all individuals.¹³⁶

¹³² See Litman, *supra* note 130, at 968 (arguing that the public domain “should be understood . . . as a device that permits the rest of the system to work by leaving the raw material of authorship available for authors to use”).

¹³³ Of course, ideas and artifacts that are the subject of IP rights cannot be readily used by others. Another way to put the point is that existing IP theory tends to view legal restrictions as the only relevant constraints on the accessibility of old ideas and artifacts.

¹³⁴ Litman, *supra* note 130, at 975 (emphasis added) (describing the public domain as “a true commons comprising elements of intellectual property that are ineligible for private ownership”) (footnote omitted); see also Yochai Benkler, *Free as the Air to Common Use: First Amendment Constraints on Enclosure of the Public Domain*, 74 N.Y.U. L. REV. 354, 360 (1999) (arguing that “information is in the public domain if all users are equally privileged to use it”). This view of the public domain persists in more recent scholarship. See, e.g., Dave Fagundes & Jorge L. Contreras, *Private Ownership of Public Facts: Docudramas, Deals, and Life Story Rights*, 57 U.C. DAVIS L. REV. 743, 780 (2023) (“Anyone can use content that comprises the public domain without restriction.”).

¹³⁵ *Int’l News Serv. v. Associated Press*, 248 U.S. 215, 250 (1918) (Brandeis, J., dissenting) (emphasis added).

¹³⁶ While there are “multiple conceptions of the public domain . . . in the legal literature[,] . . . most of them are rooted in analogies to open roads and parks, or in metaphors such as ‘free as the air to common use,’” which “suggest a homogeneous space where information resides, free for the taking.” Pedraza-Fariña, *Social Origins*, *supra* note 11, at 392. Relatedly, many economic models assume that “[i]nstead of being scarce, ideas are common knowledge, and all progress

But ideas and artifacts in fact vary in their accessibility and people need to do some work in order to find them.¹³⁷ Some ideas can be found in textbooks all over the world (e.g., the colors of a rainbow); others reside only in the minds of a handful of individuals (e.g., a potential pathway to building an economically feasible fusion reactor).¹³⁸ Similarly, some artifacts are widely distributed and relatively cheap (e.g., you can get a breadboard for \$5 at Amazon, Adafruit, or Walmart) while others exist only in a single, remote location and cannot be adequately captured in a photograph (e.g., the Spiral Jetty). Thus, rather than characterize existing ideas and artifacts as uniformly distributed and freely accessible to all, the ecosystem model characterizes the domain as lumpy, unevenly distributed, and accessible only at some cost to interested individuals.

The ecosystem model's emphasis on accessibility accordingly resonates with Anupam Chander and Madhavi Sunder's critique of Brandeisian "free as the air" conceptions of the public domain.¹³⁹ As Chander and Sunder explain, putting informational resources in the public domain does not make such resources readily exploitable by anyone.¹⁴⁰ Instead, individuals are heterogenous in their ability to exploit informational resources that the law places in the public domain.¹⁴¹

could occur instantly if enough resources were devoted to it." SUZANNE SCOTCHMER, *INNOVATION AND INCENTIVES* 112 n.7 (2004).

¹³⁷ The analysis that follows builds on Cohen's argument that the public domain as understood from the vantage point of liberal political philosophy ignores "the concrete forms of cultural artifacts and practices" as well as "the spaces within which cultural practices occur." Cohen, *supra* note 15, at 1175 (calling for IP scholars to focus on "more concrete questions about how people use culture and produce knowledge" and "about the conditions that lead to creative experimentation"). In addition to providing examples of some of those concrete forms, I extend Cohen's argument to technological domains.

¹³⁸ Cf. Zuckerman & Lederberg, *supra* note 10, at 630 (noting the impact that the translation into English of Aleksandr Oparin's *The Origin of Life on Earth* and Erwin Schrödinger's *What is Life?* had on the discovery of sexual reproduction in bacteria).

¹³⁹ See generally Anupam Chander & Madhavi Sunder, *The Romance of the Public Domain*, 92 CALIF. L. REV. 1331, 1331-32 (2004) (arguing that romantic rhetoric regarding the public domain bolsters efforts to "propertiz[e] the information resources of the West" while "leaving in the commons the information resources of the rest of the world" and elaborating on the "distributional consequences of the commons").

¹⁴⁰ *Id.* at 1341-43 (explaining how "differing circumstances—including knowledge, wealth, power, and ability—render some better able than others to exploit a commons").

¹⁴¹ *Id.* at 1351-54 (describing how private corporations in the West were better able to exploit traditional knowledge that TRIPS made part of the public domain because such firms had cheaper access to capital, greater familiarity with

Even Chander and Sunder, however, define the scope of the public domain according to the legal status of ideas and artifacts.¹⁴² But IP restrictions do not alone determine the degree to which a domain's ideas and artifacts are accessible. Instead, a broad array of social and physical factors influence accessibility. Ideas and artifacts can be more or less accessible independent of whether everyone has the nominal legal right to use them.

This matters because, in order to understand the impact of IP on creativity, we need to understand how creativity works without IP. If core elements of the creative process are defined primarily by reference to the legal rules that might influence them, we risk missing the complex ways in which law and creativity interact. In this context, the standard approach is to define the existing set of ideas and artifacts in terms of whether IP law limits their use. If it does, then those ideas and artifacts are out of the public domain; if it does not, then those ideas and artifacts are in it. This leads naturally if not inevitably to the proposition that IP law reduces access because, by definition, only ideas and artifacts free of legal restrictions are in the public domain (that is, are in the shared repository of knowledge and culture that anyone can use).

But it's at least possible that IP ownership can make ideas and artifacts more accessible than equivalent ideas and artifacts in the public domain.¹⁴³ For example, music publishers host retreats at which they encourage songwriters to use the publishers' old songs to make new ones. They do so because copyright law gives publishers "a vested interest in getting tracks interpolated: They get revenue on the new songs . . . and interpolations . . . often drive streams to the original material to boot."¹⁴⁴ In these scenarios, the ideas and artifacts associated

IP regimes, wealthier local markets for selling the output of IP investments, and more significant government support for research); *see also* Cohen, *supra* note 15, at 1175 (arguing that people need "affirmative rights of access to unowned expression within the spaces where people actually live").

¹⁴² Chander & Sunder, *supra* note 139, at 1338 (defining the public domain as "[r]esources for which legal rights to access and use for free (or for nominal sums) are held broadly").

¹⁴³ The standard view is that IP protection reduces the accessibility of inventions and expressive works, but that this can be justified if it sufficiently increases the incentive to create such works in the first instance. *See* Lemley, *supra* note 7, at 996–97 (summarizing the incentive-access tradeoff).

¹⁴⁴ Ethan Millman, 'No Shelf Life Now': The Big Business of Interpolating Old Songs for New Hits, *ROLLING STONE* (Sept. 7, 2021), <https://www.rollingstone.com/pro/features/olivia-rodriigo-doja-cat-interpolation-music-1220580/> [https://perma.

with copyrighted songs might be more accessible than otherwise comparable music in the public domain.¹⁴⁵ A model that characterizes the accessibility of ideas and artifacts independent of their status under IP rules thereby encourages us to consider a broader range of possible effects of IP.¹⁴⁶

For now, though, the point is simply this. The characterization of the domain in the ecosystem model captures an important feature of our world: Even absent legal constraints, we wouldn't all equally enjoy free access to ideas and artifacts. If the metaphor for the public domain is the air, then, the metaphor for the domain is the ground—nutrient-rich loamy soil in some places, comparatively lifeless sand and rocks in others. People situated in relatively fertile areas of the domain will have ready access to the ideas and artifacts necessary to make new ones, whereas people situated in relatively barren areas will find it difficult to secure the ideas and artifacts they need.¹⁴⁷

cc/B98G-2JY5]. An interpolation is a re-recording of a portion of an existing song, to be reused in a new one.

¹⁴⁵ To be sure, some domains may be better suited to this kind of reuse than others—it's hard to imagine book publishers running writing camps at which they encourage authors to incorporate references and allusions to copyrighted books. See generally Olufunmilayo B. Arewa, *From J.C. Bach to Hip Hop: Musical Borrowing, Copyright and Cultural Context*, 84 N.C. L. REV. 547 (2006) (describing the pervasive practice of borrowing from existing works in music).

¹⁴⁶ Of course, the net effect is what ultimately matters and I don't take the position that IP ownership increases accessibility overall. See Christopher Buccafusco & Paul J. Heald, *Do Bad Things Happen When Works Enter the Public Domain?: Empirical Tests of Copyright Term Extension*, 28 BERKELEY TECH. L.J. 1 (2013) (showing that audio books made from bestsellers that were in the public domain were more available than audio books made from bestsellers that were not in the public domain).

¹⁴⁷ Cohen, *supra* note 15, at 1177 (“Understanding the ways in which pre-existing content . . . shapes creative practice requires careful consideration of the spatial distribution of cultural resources and actors.”). For an example, consider that the legendary Brazilian signer Caetano Veloso began collaborating with the equally legendary Brazilian guitarist Gilberto Gil because they bumped into each other walking down the street in Salvador, Brazil. Jonathan Blitzer, *How Caetano Veloso Revolutionized Brazil's Sound and Spirit*, NEW YORKER (Feb. 7, 2022), <https://www.newyorker.com/magazine/2022/02/14/how-caetano-veloso-revolutionized-brazils-sound-and-spirit> [<https://perma.cc/W76Q-4ZM7>]. Taking nothing away from these supremely talented individuals, one factor leading to their shared success was simply that they had access to the requisite ideas and artifacts because they both lived in Salvador at the same time. The mundane fact of geographic proximity—orthogonal to their musical knowledge and skills, creative motivations, and financial resources—made the ideas that Gil embodied accessible to Veloso (and vice versa). *Id.* (describing Gil as “a prodigy of limitless interests” who “played the guitar unlike anyone Veloso had ever seen,” and quoting Veloso as saying “I learned how to play the guitar by imitating the positions of Gil's hands”). At the same time, those ideas were comparatively inaccessible to countless other similarly talented, motivated, and resource-rich individuals around the world.

2. *The Makers*

The term “maker” refers to *the individual who improves on or combines existing ideas or artifacts to make new ones*.¹⁴⁸ A maker begins by exploring a domain; after interacting with some number of existing ideas and artifacts, she can make new ones.¹⁴⁹ Moreover, this process is recursive: A maker becomes aware of a domain, searches it for ideas and artifacts of interest, makes some ideas and artifacts during that search, and discloses them while continuing to search the domain and refine her ideas and artifacts.

Makers are characterized by their (1) *knowledge and skills*; (2) *motivations*; and (3) *resources*.¹⁵⁰ These characteristics determine a maker’s ability to generate an idea or artifact in any given domain. Because traditional IP models extensively explore the role that resources (e.g., equipment, tools, and capital) play in the creation of ideas and artifacts, I won’t say anything more about them here.

The knowledge and skills dimension refers to the mental and physical capacities relevant to realizing ideas and artifacts. Examples include diligence, statistical reasoning skills, knowledge of musical notation, and visual perceptual abilities.¹⁵¹ Some of these apply across domains while others are domain-specific. Thus, some individuals are more diligent than others, and that makes them more likely to produce new ideas and artifacts across a wide variety of domains; similarly, some individuals have better visual perception than others, and that

¹⁴⁸ CSIKSZENTMIHALYI, *supra* note 19, at 28 (identifying as a “component of the creative system” the “individual *person*” who, “using the symbols of a given domain . . . has a new idea or sees a new pattern”). For expository convenience, the text refers to an individual, even though many ideas and artifacts result from groups of makers working together.

¹⁴⁹ See Litman, *supra* note 130, at 1010 (explaining that an author’s “views of the world are shaped by her experiences, by the other works of authorship she has absorbed (which are also her experiences), and by the interaction between the two”). While individuals might unintentionally stumble upon new ideas and artifacts in a domain about which they know little, *cf.* Alfred Bell & Co. v. Catalda Fine Arts, Inc., 191 F.2d 99, 104–05 (2d Cir. 1951) (reasoning that a work would be copyrightable even if its “substantial departures” from prior work “were inadvertent”), the more common scenario is that individuals first learn about the domain before they search it in a (more or less) directed way.

¹⁵⁰ One or another of these factors may dominate in any instance, but as a general matter, each is likely to play some role.

¹⁵¹ The relevant capacities are domain-specific. For example, in order to produce an idea or artifact in the domain of battery design, a maker needs to know some chemistry; in order to produce an idea or artifact in the domain of literature, a maker needs to have some skill at using words.

makes them more likely to produce new ideas and artifacts in domains that rely on visual perception.¹⁵²

Makers accordingly fall along a spectrum from domain outsiders to domain insiders. Domain outsiders know relatively few of the domain's ideas and artifacts and lack the skills required to make new ones; in contrast, domain insiders possess both the knowledge and the skills required to make meaningful contributions. While domain outsiders can become domain insiders as they increase their knowledge and improve their skills, at any given moment a maker might have already acquired most of the relevant knowledge and skills—thus placing her closer to the domain-insider end of the spectrum—or she may have relatively little of the relevant knowledge and skills—thus placing her closer to the domain-outsider end.

The “motivations” dimension refers to the reasons that an individual has for engaging in an activity. IP scholars have recognized that motivation influences creativity, focusing especially on the difference between intrinsic and extrinsic motivation.¹⁵³ Intrinsic motivation arises from features related to the task itself.¹⁵⁴ Extrinsic motivation, meanwhile, arises from considerations independent of the task itself.¹⁵⁵ In the IP

¹⁵² To be sure, an individual's capacity can change over time as they undergo projects of self-improvement or as their knowledge and skills atrophy. Moreover, economic and social factors will influence an individual's ability to acquire and exercise the relevant knowledge and skills. See Bair, *supra* note 13 (explaining how the psychology of poverty impacts an individual's creative decision-making); Alex Bell, Raj Chetty, Xavier Jaravel, Neviana Petkova & John Van Reenen, *Who Becomes an Inventor in America? The Importance of Exposure to Innovation*, 134 Q.J. ECON. 647 (2019) (providing results of quantitative analysis showing that early exposure to inventors has a meaningful impact on the likelihood that an individual will later obtain a patent, particularly for women, minorities, and children in low-income families).

¹⁵³ See, e.g., Christopher Buccafusco, Zachary C. Burns, Jeanne C. Fromer & Christopher Jon Sprigman, *Experimental Tests of Intellectual Property Laws' Creativity Thresholds*, 92 TEX. L. REV. 1921, 1935–36 (2014) (describing IP law as adding “an additional extrinsic motivator: the opportunity to receive formal rights that potentially increase economic returns on creativity”); Kwall, *supra* note 15, at 1964 (emphasizing the “importance” of “the intrinsic dimension of creativity,” while acknowledging that extrinsic motivation can sometimes enhance creativity); Lydia Pallas Loren, *The Pope's Copyright? Aligning Incentives with Reality by Using Creative Motivation to Shape Copyright Protection*, 69 LA. L. REV. 1, 11 (2008) (“Many artists, authors, musicians, poets, and other highly creative individuals create as a means of expressing themselves, rather than for an extrinsic reward.”); Mandel, *supra* note 13, at 2008–13 (describing how perceptions of extrinsic motivators, including IP rights, can influence whether such motivators enhance or detract from creativity).

¹⁵⁴ TERESA M. AMABILE, CREATIVITY IN CONTEXT 108–09 (1996).

¹⁵⁵ *Id.*

literature, extrinsic motivation refers to the money and control offered by IP rights, as well as the reputational and other non-monetary rewards associated with the production of ideas and artifacts.¹⁵⁶ The standard view is that intrinsic motivation is more conducive to creativity than extrinsic.

To sum up, the maker is a variation on those ubiquitous figures in IP theory: the authors and inventors to whom we grant exclusive rights. As we'll see, the ecosystem's more robust characterization of makers as compared to (typical) descriptions of authors and inventors enhances our understanding of social and psychological impacts on creativity.

Before proceeding, however, a point about IP rhetoric. The word "author" in the IP literature has two distinct denotations: an author is (1) the default owner of a copyright; and (2) the person who writes words on paper, composes music on a piano, and so on. Similarly with "inventor": an inventor is (1) the default owner of a patent; and (2) the person who makes compounds in labs, devices in workshops, and so on.

These dual usages run afoul of the old Hohfeldian admonition against conflating "purely legal relations" with the "physical and mental facts that call such relations into being."¹⁵⁷ When the same word refers both to a legal conclusion and to some of the predicate facts required in order to reach that conclusion, usage of the word might lead us to think—wrongly—that a particular legal conclusion must follow from a given set of facts.¹⁵⁸ And the IP literature regularly uses the terms "author" and "inventor" in precisely this way.

To see the problem a bit more concretely, suppose someone poses the following question: Should the author of a memoir be able to prevent others from copying portions of that memoir? The word "author" here is doing the double duty that Hohfeld warned about: it is denoting both (1) the legal status that confers the right to prevent reproduction of a copyrighted work; and (2) the human being who wrote the memoir. This places a

¹⁵⁶ See Jessica Silbey, *Harvesting Intellectual Property: Inspired Beginnings and "Work-Makes-Work," Two Stages in the Creative Process of Artists and Innovators*, 86 NOTRE DAME L. REV. 2091, 2101 (2011) (defining "the positive role of attribution and contributing social value as extrinsic motivations"); Tushnet, *supra* note 15, at 516 (identifying reputation as "the most common nonmonetary extrinsic motivation dissected in the literature on copyright and creativity").

¹⁵⁷ Wesley Newcomb Hohfeld, *Some Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 23 YALE L.J. 16, 20 (1913).

¹⁵⁸ A classic example is the word "property," which refers sometimes to the *res* itself and at other times to the legal relationship between an individual and the *res*. See *id.* at 21–22.

rhetorical thumb on the scale in favor of granting authors control over the facts they relate in their memoirs. After all, the person who put pen to paper is undoubtedly the author of the memoir, and it is exactly an author who has the copyright in—and the corresponding ability to prevent copying of—the resulting literary work.¹⁵⁹ We need not be strong Whorfians to think that this gives a rhetorical edge to those who want to expand the scope of the rights that copyright owners can exercise.¹⁶⁰

The term “maker” accordingly responds to a lacuna in IP literature—it’s a word that we can use to refer to factual predicates without inadvertently taking a position on the legal conclusions. In the patent context, the term fits naturally. Makers produce things: hammers, elixirs, robots, lightbulbs, keyboards, barbed wire. Makers thus engage in activities that render them potential inventors, as that term is used to refer to a legal status in the patent system, without necessarily clearing the hurdles that must be cleared before a person achieves that status.

Meanwhile, although the term “maker” appears at first glance ill-suited to the copyright context—the person who writes a novel isn’t usually referred to as that novel’s maker—the Supreme Court has used the term “maker” to expound the meaning of the word “author”: in *Burrow-Giles*, the Court explains that “[a]n author in [the constitutional] . . . sense is ‘he to whom anything owes its origin; originator; *maker*.’”¹⁶¹ Moreover, in several fields of cultural production, it is perfectly common to refer to the pertinent people as “makers” or the pertinent actions as “making”: *filmmakers* create motion pictures; a band *makes* beautiful music together; and the *mapmakers*

¹⁵⁹ To be clear, as a matter of black-letter copyright law, the answer is that the memoirist does not have this right: “facts are not copyrightable.” *Feist Publ’ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 344 (1991).

¹⁶⁰ See Barbara C. Scholz, Francis Jeffrey Pelletier, Geoffrey K. Pullum & Ryan Nefdt, *Whorfianism*, STANFORD ENCYCLOPEDIA OF PHILOSOPHY, <https://plato.stanford.edu/entries/linguistics/whorfianism.html> [<https://perma.cc/Q9WY-YRP9>] (last visited Nov. 15, 2024) (describing strong Whorfianism as the view “that language *determines* thought[] or fixes it in some way”). As James Boyle put it: “What should we think about this desire to cast around in every situation until we find the people who most resemble authors, whereupon we confer property rights on them?” BOYLE, *supra* note 112, at 107; see also Stewart E. Sterk, *Rhetoric and Reality in Copyright Law*, 94 MICH. L. REV. 1197, 1198 (1996) (noting that “copyright rhetoric has focused both on economics and on ‘deserving’ authors,” at least since the Statute of Anne).

¹⁶¹ *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 57–58 (1884) (emphasis added).

art has been part of the American IP system since the very first Copyright Act.¹⁶²

In sum, “maker” can be a useful umbrella term for referring to people who engage in the kinds of activities that might give rise to patents or copyrights without performing the kind of double duty Hohfeld warned about or doing too much violence to the English language in the process. Even if imperfect, it has value as another linguistic tool for avoiding confusion in some contexts.¹⁶³

3. *The Evaluators*

The term “evaluator” refers to *an individual or institution that arranges the ideas and artifacts of a domain*.¹⁶⁴ Evaluators first assess the merit of ideas and artifacts and then increase the salience of the ideas and artifacts they deem most valuable. In order to fulfill this function, evaluators must exert considerable influence in a domain’s social context.¹⁶⁵ They

¹⁶² Copyright Act of 1790, ch. 15, § 1, 1 Stat. 124 (1790) (granting the “authors of any map, chart, book or books” the “sole right and liberty of printing, reprinting, publishing and vending such map, chart, book or books.”). Plus, it’s not as though the term “author” is particularly apt for all copyright contexts: artists, musicians, and sculptors do not author their paintings, songs, or sculptures. Cf. Rebecca Tushnet, *Worth a Thousand Words: The Images of Copyright*, 125 HARV. L. REV. 683, 710–11 (2012) (arguing that “[l]aw’s word-centrism is inconsistent with the real impetus for most copyright fights: audiovisual works now generate most copyright controversies, and anticopying technology is mostly directed at protecting video and music rather than printed works”).

¹⁶³ Also, the notion that you can’t make something from nothing is sufficiently embedded in our culture that perhaps the term “maker” will reinforce the proposition that new ideas and artifacts have their origins in old ones.

¹⁶⁴ CSIKSZENTMIHALYI, *supra* note 19, at 28 (defining the “job” of the evaluator as “decid[ing] whether a new idea or product should be included in the domain” and “select[ing] what new works . . . deserve to be recognized, preserved, and remembered”); see also *id.* at 42 (explaining that evaluators are “experts in a given domain whose job involves passing judgment on performance in that domain” and that these experts “choose from among the novelties those that deserve to be included in the canon”). Csikszentmihalyi uses the term “field” to refer to this concept. *Id.* I use the term “evaluator” rather than “field” to emphasize the role that these individuals and institutions play in assessing the ideas and artifacts they render accessible to other makers. I also wish to avoid confusion with the unrelated concept of the “field” of an invention. See generally Saurabh Vishnubhakat, *The Field of Invention*, 45 HOFSTRA L. REV. 899 (2017) (developing a theory of the Patent Office’s power to engage in technology classification).

¹⁶⁵ See Pierre Bourdieu, *The Specificity of the Scientific Field and the Social Conditions of the Progress of Reason*, 14 SOC. SCI. INFO. 19, 20–21 (1975) (describing how social hierarchies affect judgments of scientific and technical capacity). Bourdieu describes science as requiring scientists to make “a strategic choice between ‘succession’ and ‘subversion.’” Jacob G. Foster, Andrey Rzhetsky & James A. Evans, *Tradition and Innovation in Scientists’ Research Strategies*, 80 AM. SOCIO.

can attain that influence in several ways, including by (1) controlling access to essential resources (instruments or money or distribution channels); (2) having previously made successful contributions to the domain; or (3) having personal relationships with other individuals who work with the ideas and artifacts of the domain.¹⁶⁶

Evaluators are characterized by the *quantity and quality of assessments they make*.¹⁶⁷ It takes some time to assess any given idea or artifact—the faster evaluators can work or the more evaluators there are in any given domain, the greater the *quantity* of assessments they can collectively perform on the domain's ideas and artifacts. *Quality*, meanwhile, is a measure of how closely evaluators' assessments correspond to some notion of the social good. The intuition here is that some ideas and artifacts are more likely to lead to desirable ideas and artifacts; others are less likely to do so. Evaluators' assessments are high quality when they make most accessible the ideas and artifacts most likely to lead to desirable new ones.¹⁶⁸

Evaluators have not ordinarily been incorporated into IP models. That should change. Creativity is a social phenomenon crucially dependent on competent judges recognizing and assimilating novel ideas and artifacts into a domain. Of course, evaluators do not exercise complete control over technological and cultural progress. Robert Christgau's assessment of ABBA—"We have met the enemy and they are them"—didn't stop that band's contributions from serving as the foundation for subsequent work by the Sex Pistols, Erasure, and Britney Spears.¹⁶⁹ Still, as Mihaly Csikszentmihalyi puts it, the "level

REV. 875, 878 (2015). Although Bourdieu's focus is on the physical sciences, his framework has been applied to the kinds of contexts that form the subject of IP law. See, e.g., Lu Liu, Nima Dehmamy, Jillian Chown, C. Lee Giles & Dashun Wang, *Understanding the Onset of Hot Streaks Across Artistic, Cultural, and Scientific Careers*, 12 NATURE COMM'NS, art. 5392, at 1 (2021) (applying Bourdieu's framework, among others, to study the careers of artists, film directors, and the chemist John Fenn, whose work was the subject of extensive patent litigation with his university).

¹⁶⁶ See Bourdieu, *supra* note 165, at 21–28 (describing the process by which scientists engage in a "struggle for scientific authority").

¹⁶⁷ See CSIKSZENTMIHALYI, *supra* note 19, at 41–45 (describing how evaluators help solve the problem of "scarcity of attention" in a domain).

¹⁶⁸ And, conversely, make least accessible the ideas and artifacts least likely to do so. To be sure, we should not imagine that there is some unidimensional and universally agreed-upon metric of assessment quality. Quality in one era or for one society will not necessarily correspond to quality in another.

¹⁶⁹ Robert Christgau, ABBA, ROBERT CHRISTGAU, http://www.robertchristgau.com/get_artist.php?name=ABBA [<https://perma.cc/G25U-RQSJ>] (last visited

of creativity in a given place at a given time does not depend only on the amount of individual creativity,” but instead “just as much on how well suited the respective domains” and evaluators “are to the recognition and diffusion of novel ideas.”¹⁷⁰ In order to understand how IP influences creativity, then, we need a model of creativity that treats evaluators as distinct objects of inquiry.

In addition, the role of evaluators in the ecosystem model must be distinguished from the role of gatekeepers in some existing IP models. Gatekeepers are individuals and institutions that determine whether any given idea or artifact is realized and made available to the public in the first instance. Certain ideas and artifacts can only be made with significant amounts of capital—classic examples include blockbuster films and pharmaceuticals—and some scholars have argued that IP should encourage gatekeepers, rather than makers themselves, to invest the resources required for these capital-intensive ideas and artifacts.¹⁷¹

Evaluators, on the other hand, do not allocate resources to the creation of ideas or artifacts; nor do they otherwise determine whether an idea or artifact is realized in the first instance.

Aug. 17, 2023). They fared no better with other critics. *See generally* Per F. Broman, “When All Is Said and Done”: Swedish ABBA Reception During the 1970s and the Ideology of Pop, 17 J. POPULAR MUSIC STUD. 45 (2005) (describing critiques of ABBA arising from the 1970s Music Movement in Sweden). For ABBA’s influence on music in the 1980s and 1990s, see Jackie Mansky, *What’s Behind ABBA’s Staying Power*, SMITHSONIAN MAG. (July 20, 2018), <https://www.smithsonianmag.com/arts-culture/whats-behind-abbas-staying-power-180969709/> [<https://perma.cc/68UC-8DFK>] (noting that Glen Matlock, the bassist for the Sex Pistols, drew from ABBA’s song “SOS” for his band’s “Pretty Vacant”).

¹⁷⁰ CSIKSZENTMIHALYI, *supra* note 19, at 31.

¹⁷¹ On this view, IP law should be designed to influence the decisions of the film distributors, venture capitalists, record labels, and other investors that determine which projects get funding. *See* Jonathan M. Barnett, *Copyright Without Creators*, 9 REV. L. & ECON. 389, 404–14 (2013) (arguing that copyright law should focus on encouraging efficient distribution and marketing of creative works); Julie E. Cohen, *Copyright as Property in the Post-Industrial Economy: A Research Agenda*, 2011 WIS. L. REV. 141, 154–55 (explaining how copyright facilitates the economic functions of intermediaries); Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 345 (2010) (suggesting reforms designed to focus patent law on the commercialization of technology, rather than on the initial invention). *But see* Mark A. Lemley, *IP in a World Without Scarcity*, 90 N.Y.U. L. REV. 460, 495–96 (2015) (“[E]mpirical evidence suggests that IP rights actually impede rather than encourage commercialization.”). The more common approach is to treat makers and gatekeepers in a unified manner. *See, e.g.,* W. Nicholson Price II, *The Cost of Novelty*, 120 COLUM. L. REV. 769, 771 n.1 (2020) (“[A]ssuming a unified innovator whose inventive and commercialization efforts are driven by a desire to profit from the innovation.”).

Instead, evaluators assess the ideas and artifacts that have already been realized.

The evaluator's function matters because it is the domain—that is, the body of existing ideas and artifacts accessible to individuals—that influences technological and cultural progress. When gatekeepers help realize an idea or artifact, it may directly impact society upon disclosure. But if subsequent makers cannot easily find that idea or artifact, then it is unlikely to impact the path of progress.¹⁷² And it is the role of an evaluator, not a gatekeeper, to determine whether subsequent makers can easily find the ideas and artifacts that have been realized.

Different kinds of individuals and institutions can play each of those roles. To be sure, the boundaries between them are porous—a single individual or institution can be an evaluator and a gatekeeper, either simultaneously or sequentially.¹⁷³ Still, take some prototypical cases of each: a film distributor is a gatekeeper, while a film critic is an evaluator; the manager of a pharmaceutical firm's research-and-development budget is a gatekeeper, while the American Psychiatric Association is an evaluator. As these examples suggest, gatekeepers and evaluators have distinct influences on technological and cultural progress.

¹⁷² Note the distinction between the immediate impact that ideas and artifacts have on individuals and the subsequent impact that ideas and artifacts have on makers. Ideas and artifacts, whether newly made or preexisting, can be consumed, used, or otherwise interacted with by individuals in a society. Separately, certain ideas and artifacts can be the basis for producing new ideas and artifacts. Not every idea or artifact consumed or used by society at large will influence makers producing new ideas and artifacts; instead, evaluators will make some ideas or artifacts more accessible, and thereby increase the likelihood that makers will use them to produce new ideas and artifacts. In some other models, the ordinary interactions that ordinary people have with ideas and artifacts are precisely the source of new ideas and artifacts. See Cohen, *supra* note 15, at 1190–92 (explaining how “creative play . . . is an important determinant of creative success”); Tushnet, *supra* note 15, at 515–16 (characterizing “individual reports of how creativity is experienced as unpredictable, tyrannical, obsessive, and joyful” as “consistent with the thesis that creativity arises from unplanned and stochastic encounters with the world around us”). Such models downplay the distinction that I am emphasizing here.

¹⁷³ For example, a tenured professor might be part of a grant-making organization and also serve on a committee that decides who should receive an endowed chair. When assessing grant proposals, the professor is a gatekeeper because her funding decisions (partially) determine whether particular ideas and artifacts are realized. When assessing candidate files for the endowed chair, the professor is performing both roles: she is an evaluator insofar as the awarding of the chair will raise the salience of the ideas and artifacts that its recipient created and she is a gatekeeper insofar as the awarding of the chair comes with additional funds that facilitate the creation of subsequent ideas and artifacts. As this example illustrates, the lines can get quite blurry in practice.

Now that the core features of the ecosystem model are in place, the next Part will use the model to generate novel predictions regarding the fundamental descriptive question of IP theory.

III

THE PATH OF PROGRESS IN SCIENCE AND USEFUL ARTS

According to the Constitution, the point of IP is “[t]o promote the Progress of Science and useful Arts.”¹⁷⁴ But what exactly is progress?

IP theory offers a simple answer: more.

Per Barton Beebe, call this an accumulationist vision.¹⁷⁵ Here’s a sketch of how it works. Our ultimate goal is to increase social welfare; for simplicity, this is treated as equivalent to the sum of individual welfare.¹⁷⁶ Individual welfare, in turn, is a function of the ideas and artifacts that a person experiences—reading a book or surviving an illness thanks to a pharmaceutical intervention makes a person better off. The more ideas and artifacts available, the more opportunities each person has to experience those that would contribute to her own welfare. In the end, then, progress just means accumulating as many ideas and artifacts as possible so that each person has the greatest possible number of welfare-enhancing opportunities.¹⁷⁷

¹⁷⁴ U.S. CONST. art. I, § 8, cl. 8.

¹⁷⁵ See Beebe, *supra* note 69, at 345–46 (describing the “standard accumulationist account” in technological domains as comprising “the development over time of ever more efficient technical means to given ends,” such that progress is “unidirectional or ratchet-like in nature,” and in aesthetic domains as comprising “the accumulation over time of ever more artistic achievements or great works, though . . . their relative merit cannot be objectively assessed”).

¹⁷⁶ See Christopher Buccafusco & Jonathan S. Masur, *Intellectual Property Law and the Promotion of Welfare*, in 1 RESEARCH HANDBOOK ON THE ECONOMICS OF INTELLECTUAL PROPERTY LAW 98, 102–03 (Ben Depoorter & Peter S. Menell eds., 2019) (characterizing “the dominant view within intellectual property law” as comprising the ultimate goal of “promoting some view of social welfare,” where “welfare consists of the satisfaction of individual preferences”). This common approach elides many interesting and important questions regarding the nature of welfare. *Id.* To focus on the contrast between existing approaches and the ecosystem model, however, I do the same here.

¹⁷⁷ As Beebe puts it, “while a strong accumulationist model of progress is typically applied to scientific-technological progress, in which the goal is to accumulate ever-better scientific and technological achievements, a weak accumulationist model is typically applied to aesthetic progress. In the latter, the focus is not on better works but simply on more works.” Beebe, *supra* note 69, at 346. To be sure, there is an extensive literature critiquing the accumulationist vision of progress. See, e.g., JESSICA SILBEEY, *AGAINST PROGRESS* (2022) (arguing that IP should be reoriented away from accumulationism and towards the fundamental values of equality, privacy, distributive justice, and institutional accountability);

This raises the fundamental descriptive question of IP theory: What determines the path of progress in science and useful arts? Or, to pose the question in explicitly accumulationist terms: What determines the rate at which society accumulates ideas and artifacts?

In this Part, I'll first explain how traditional IP models answer this question. I will then show how the ecosystem model's description of creativity generates novel predictions about the rate of progress—where, again, progress is understood as nothing more or less than the accumulation of ideas and artifacts.

A. The Conventional Wisdom on Progress

In traditional IP models, the rate of accumulationist progress is principally a function of the level of investment in ideas and artifacts.¹⁷⁸ These models start by treating ideas and artifacts as public goods—that is, they are nonrival and nonexcludable.¹⁷⁹ Private actors decide whether to invest in new ideas and artifacts on the basis of their expected returns.¹⁸⁰ Because the nonexcludable character of ideas and artifacts means that new ones can be freely copied without authorization, private actors cannot readily recover their fixed costs of creating ideas

Amy Kapczynski & Talha Syed, *The Continuum of Excludability and the Limits of Patents*, 122 YALE L.J. 1900, 1904 (2013) (describing challenges to “welfarism as a value” and questions about “the relationship between market value and social value”). But because there is no consensus on what should replace it, I'll accept accumulationism here to illustrate how the ecosystem model can shed light on problems in IP theory.

¹⁷⁸ See sources cited *supra* note 7. Public-goods-oriented models have long recognized that “authors and inventors must necessarily build on what came before them.” Lemley, *supra* note 7, at 997. But it does not constitute the binding constraint on progress. Instead, consistent with the microeconomic theory from which these models are drawn, potential makers are rational utility-maximizers. The expected profit from an activity is treated as a good-enough proxy for the expected utility of an activity. Traditional IP models emphasize the subset of ideas and artifacts for which social and private value diverge; the ideas and artifacts required to produce them are often simply taken for granted. See, e.g., SCOTCHMER, *supra* note 136, at 39 (describing “a model of the creative environment in which the incentive system operates” that makes “a clean separation between an exogenous process that generates ideas for innovation, and the decisions whether to invest in them”).

¹⁷⁹ Michael J. Burstein, *Exchanging Information Without Intellectual Property*, 91 TEX. L. REV. 227, 236 (2012). The defining characteristics of a public good are that it is nonrival and nonexcludable. “Nonrivalry means that one person’s use of a good does not preclude use by any other person. Nonexcludability means that no person can be excluded from using the good.” *Id.* at 236 n.24.

¹⁸⁰ Lemley, *supra* note 7, at 994.

and artifacts by using or selling them.¹⁸¹ Absent government intervention, then, “the result . . . is an underproduction of books and other works of invention and creation with similar public goods characteristics.”¹⁸²

The notion of “underproduction” implies that private actors will create some, but not enough, ideas and artifacts. First-mover advantages, tacit knowledge, and other considerations enable makers to appropriate some fraction of an idea or artifact’s social value; this fraction of social value that a maker can appropriate is the private value of the idea or artifact.¹⁸³ Private actors decide whether to create ideas and artifacts depending on whether this private value exceeds the private costs of creation.¹⁸⁴ So long as the answer is yes, private actors will make the requisite investments—these ideas and artifacts are the accumulationist progress society will enjoy even without IP.

But when the private value of an idea or artifact is lower than its private cost, private actors will not make the requisite investment, even if its social value exceeds its social cost. Crucially, then, there will be some desirable ideas and artifacts that society will not obtain—that is, those that have a social value higher than their social cost, but private value lower than private cost. We should expect this to happen with some frequency because, again, the public-good character of ideas and artifacts ensures that their private value is typically only a fraction of their social value. And it results in the “underproduction” of “invention and creation” referenced above—these ideas and artifacts are the accumulationist progress that we fail to achieve.

¹⁸¹ Burstein, *supra* note 179, at 236; Lemley, *supra* note 7, at 994–95 (explaining why, in the traditional public-goods framework, neither using nor selling an idea would be a feasible means of “recoup[ing] the fixed cost of . . . invention and creation”).

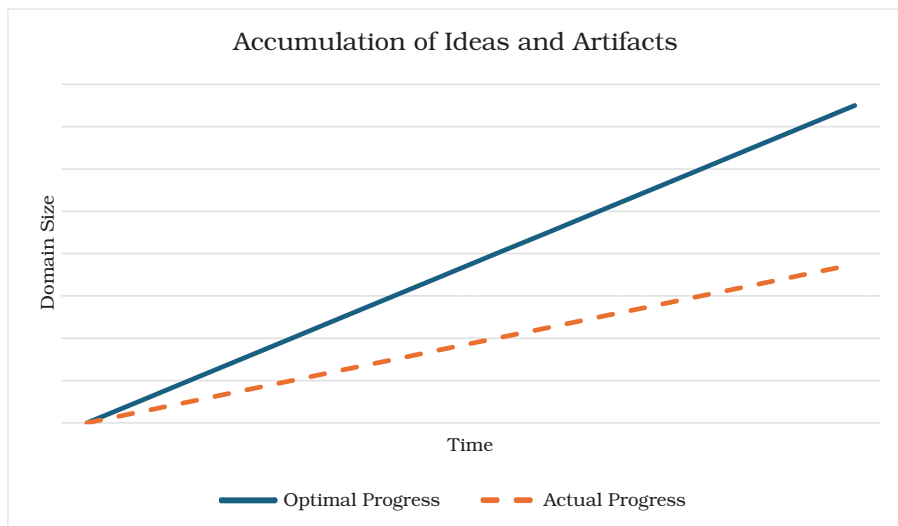
¹⁸² Lemley, *supra* note 7, at 995; see also Benjamin N. Roin, *Intellectual Property Versus Prizes: Reframing the Debate*, 81 U. CHI. L. REV. 999, 1019 (2014) (concluding that in “a perfectly competitive market, . . . private actors will be unwilling to invest as much as is socially desirable in the production of new ideas and expressions that others can freely copy”).

¹⁸³ See Burstein, *supra* note 179, at 250–51 (explaining why information is at least partially excludable).

¹⁸⁴ I am setting aside here complications that do not change the primary story told in the text. For example, negative externalities might create a scenario in which private value is higher than private cost, but social value is less than private cost, such that we would prefer not to create these works, but private actors will do so anyway. The primary story is simply one of aligning private incentives with social welfare.

Accumulationist progress is therefore slower than would be desirable because private actors have a hard time profiting from investments in creating new ideas and artifacts. In the figure below, these “missing” ideas and artifacts produce a gap between optimal and actual progress. Progress is slower than we’d like, as the actual accumulation of ideas and artifacts steadily falls behind the optimal accumulation.¹⁸⁵

Fig. 1: Traditional IP models’ depiction of change in domain size over time under optimal and actual conditions



B. A New Perspective on Progress

The ecosystem model paints a radically different picture of the relationship between optimal and actual progress. The actual rate of accumulationist progress will not be stable; instead, we should expect progress to accelerate in some periods

¹⁸⁵ As time passes, the gap between the optimal number of ideas and artifacts and the actual number of ideas and artifacts widens because, in any given period, there is a lower level of investment in creating ideas and artifacts than would be optimal. Thus, suppose that suboptimal investment in period 1 creates a shortfall of x ideas and artifacts in that period; the gap between the optimal number of ideas and artifacts and the actual number of ideas and artifacts after period 1 is accordingly x . Then, suboptimal investment in period 2 creates a shortfall of y ideas and artifacts in that period; the gap between the optimal and actual number of ideas and artifacts is now $x + y$. The important point is that the actual rate of accumulationist progress is always slower than would be optimal; as a result, the gap between the optimal and actual number of ideas and artifacts grows over time. None of this requires the combinatorial dynamics I describe in the period of rapid and accelerating progress.

and decelerate in others. Nor will progress necessarily be slower than optimal; instead, progress might proceed faster than would be optimal.

In this section, I will first explain how domain-maker-evaluator interactions drive progress. I'll then describe the overall path of progress and the dynamics that characterize each of three distinct phases in the development of domains.

1. *Domain-Maker-Evaluator Interactions*

In the ecosystem model, the rate of accumulationist progress is ultimately a function of the likelihood that makers will find *enough* of the *right* ideas and artifacts (where “right” means something like the ones that a maker can most readily use as the basis for new ones). This likelihood, in turn, is determined by domain-maker-evaluator interactions.

The mechanisms responsible for this are easiest to see at the level of a single maker. At the outset, a potential maker is a domain outsider. Before interacting with any of the domain's ideas and artifacts, she is very unlikely to generate her own. After interacting with a few, however, it becomes plausible for her to generate some. As she builds her knowledge of the domain's ideas and artifacts, she develops into a domain insider. And as the number of her interactions with the domain increase, so too does the likelihood that she will make more new ideas and artifacts.¹⁸⁶ Although there is a point of diminishing returns, the basic dynamic is straightforward: The more ideas and artifacts that a maker knows, the better her odds of generating new ones. Thus, progress depends in part on the sheer number of ideas and artifacts that makers find.

Still, a maker is a better match for some old ideas and artifacts than others. Recall that makers are characterized by their knowledge and skills, motivations, and resources. In order to generate any given potential idea or artifact, a maker must (1) have some particular combination of knowledge and skills, motivations, and resources; and (2) interact with some particular old ideas and artifacts. A maker finds matches when she interacts with old ideas or artifacts that fit well with her characteristics, such that she is reasonably likely to improve

¹⁸⁶ This is, perhaps, intuitively obvious. Take any domain with which you are unfamiliar—it could be particle physics, dubstep, or constitutional law—and consider the likelihood that you would be able to generate a new idea or artifact in that domain. Now compare that to a domain that you know well—it could be particle physics, dubstep, or constitutional law—and consider the likelihood that you would be able to generate a new idea or artifact in that domain.

on or combine those old ideas or artifacts. The better and more frequent a maker's matches, the more new ideas and artifacts she can generate.

Now consider the more general process. Not all ideas and artifacts in any given domain are equally accessible; instead, ideas and artifacts are heterogenous with respect to the effort required to find them.¹⁸⁷ At any given moment, the "good" matches might be easy for a maker to find, and the "bad" matches might be obscure. The converse, however, is also possible, as makers might find "bad" matches much more readily than good ones.

Progress occurs more rapidly when evaluators organize a domain such that makers are likely to encounter good matches. When makers are unlikely to find good matches because a domain is small or evaluators have organized it poorly, new ideas and artifacts accumulate slowly. Conversely, when makers are likely to find good matches because evaluators have done a good job of organizing a domain that contains a sufficient amount fruitful ideas and artifacts, new ideas and artifacts accumulate rapidly. These differences, moreover, exist not only across ideas and artifacts at any given moment, but also for any given idea or artifact over time. Domains can accordingly become more or less conducive to progress as time passes.

Consider, for example, the most extreme possibility: ideas and artifacts that are at one moment in the domain may later fall entirely out of it.¹⁸⁸ It's easy to imagine this happening in domains principally governed by copyright law. Many works of literature, visual art, and music have been lost to history, and while some have been recovered, undoubtedly many remain beyond our reach. To take just one example, we have less than

¹⁸⁷ The point of Chander and Sunder's critique is that *people and organizations are heterogenous* with respect to their ability to exploit ideas and artifacts in the public domain. See Chander & Sunder, *supra* note 139, at 1341 (arguing that "some [are] better able than others to exploit a commons" because of differences in "knowledge, wealth, power, and ability"); cf. Andrew Gilden, *Raw Materials and the Creative Process*, 104 *Geo. L.J.* 355, 375–82 (2016) (documenting class, racial, and gender disparities in how courts treat claims by artists that their use of existing works ought to be permitted (or not) under the fair use doctrine).

¹⁸⁸ IP scholars have evaluated more modest versions of this possibility. See Alan L. Durham, *Lost Art and the Public Domain*, 49 *ARIZ. ST. L.J.* 1257, 1292–94 (2017) (analyzing when a prior art reference can become unavailable under patent law's novelty statute); Mark A. Lemley, *Disappearing Content*, 101 *B.U. L. REV.* 1255 (2021) (describing the increasing frequency with which content owners refuse to provide any legal access to the works in which they hold copyright).

four percent of the original Yongle Encyclopedia, “[t]he largest literary project ever undertaken in China.”¹⁸⁹

Although less commonly appreciated, this phenomenon also occurs in domains principally governed by patent law. Perhaps the most consequential example is the Antikythera mechanism, which was lost for centuries until it was discovered in a shipwreck in the early 1900s.¹⁹⁰ This ancient Greek device relied on precisely crafted gear ratios to calculate the positions of planets and stars.¹⁹¹ The Antikythera mechanism thus embodied a technology—the use of mechanical gear ratios to perform complex calculations—that was accessible to the ancient Greeks but that was apparently inaccessible throughout Europe for well over a thousand years. This technology, furthermore, was the predecessor of the earliest mechanical computers: Pascal’s Calculator (invented in 1642) and Babbage’s Difference Engine (1822).¹⁹² It’s tempting to wonder, then, what might have happened had the technology embodied by the Antikythera mechanism remained in the domain.¹⁹³ A complete understanding of domain exits is beyond the scope of this Article, but the main point for now is simple: Ideas and artifacts can become more or less accessible over time, independent of the effects of IP.

2. *The Path of Progress*

We can now draw a picture of the path of progress. When domains are very small, matching is unlikely because the few

¹⁸⁹ Charles Hartman, *Chinese Historiography in the Age of Maturity, 960-1368*, in 2 THE OXFORD HISTORY OF HISTORICAL WRITING, 37, 42 (Sarah Foot & Chase F. Robinson eds., 2012).

¹⁹⁰ Another prominent example is the loss of bone tools in Tasmania. See Joseph Henrich, *Demography and Cultural Evolution: How Adaptive Cultural Processes Can Produce Maladaptive Losses—The Tasmanian Case*, 69 AM. ANTIQUITY 197 (2004) (describing how the use of bone tools on Tasmania gradually declined and ultimately disappeared after rising sea levels cut the island off from mainland Australia).

¹⁹¹ T. Freeth et al., *Decoding the Ancient Greek Astronomical Calculator Known as the Antikythera Mechanism*, 444 NATURE 587 (2006); Jo Marchant, *Mechanical Inspiration*, 468 NATURE 496 (2010).

¹⁹² See S. Chapman, *Blaise Pascal (1623-1662): Tercentenary of the Calculating Machine*, 150 NATURE 508, 509 (1942) (noting that Pascal was just nineteen years old when he invented “the calculating machine” in 1642); SUBRATA DASGUPTA, *IT BEGAN WITH BABBAGE: THE GENESIS OF COMPUTER SCIENCE* 25 (2014) (dating the first prototype of the Babbage Difference Engine to 1822).

¹⁹³ Cf. Chapman, *supra* note 192, at 508 (asserting that the Pascaline “started the progress towards the many intricate and powerful computing machines” available in the first half of the twentieth century).

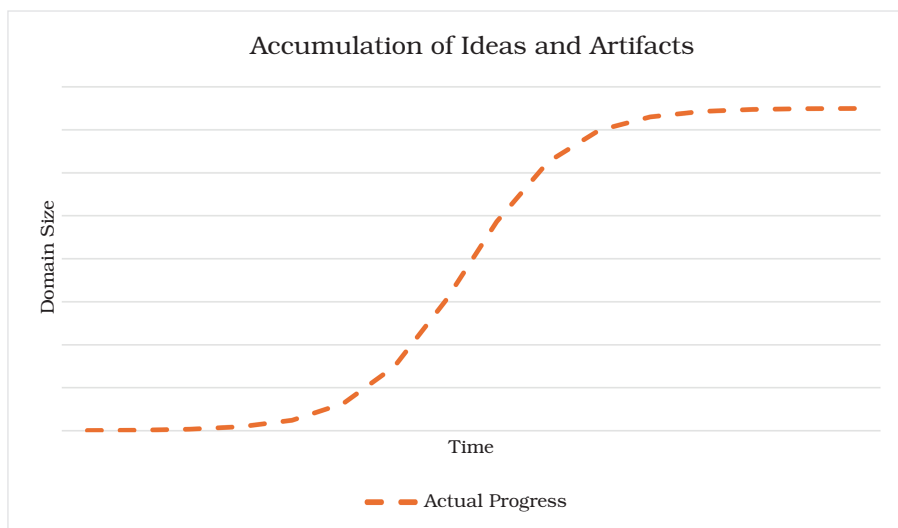
existing ideas and artifacts are sparsely distributed throughout the world. Simply put, makers are unlikely to encounter *any* ideas and artifacts, let alone the ones that match their characteristics. This dynamic leads to the first phase of progress: slow takeoff.

Still, some matches nevertheless eventually occur and the domain grows until it reaches a threshold. Past this threshold and conditional on evaluators organizing the domain well enough, matching becomes increasingly likely because creativity thrives on combinations—each addition to the domain generates many more possible further additions. Because there is a rapidly increasing number of opportunities that have not yet been exploited, makers find matches much more readily; there are many old ideas and artifacts that could be the basis of new ones given a wide range of maker characteristics. This leads to the second phase of progress: rapid and accelerating growth.

Eventually, however, progress slows again. Matching becomes difficult once more because the most feasible opportunities have been exploited; a maker must therefore explore a very large number of old ideas and artifacts before she encounters ones that match her characteristics and that have not yet been exploited. This produces the third phase of progress: ossification.

The three phases—slow takeoff, rapid and accelerating growth, and ossification—are depicted below, in Figure 2.

Fig. 2: Ecosystem model's depiction of change in domain size over time under actual conditions



Note here the first key difference between traditional IP models and the ecosystem model: the accumulation of ideas and artifacts follows an S-shaped curve. In traditional IP models, there's no reason to think that the rate of progress changes over time; by contrast, in the ecosystem model the rate of progress fluctuates with the size of the domain.

As important as what Figure 2 shows is what it does not show: an optimal rate of progress. There is an implicit normative position embedded in traditional IP models—namely, that actual progress is slower than we'd like. While this is a plausible normative position, it is not an inevitable one. The ecosystem model does not carry with it an implicit normative position. It's possible that the actual rate of progress is always faster than would be desirable, that it is always slower than would be desirable, or that it is sometimes faster and sometimes slower than would be desirable.

Fig. 3: Ecosystem model's depiction of progress that is persistently faster than optimal

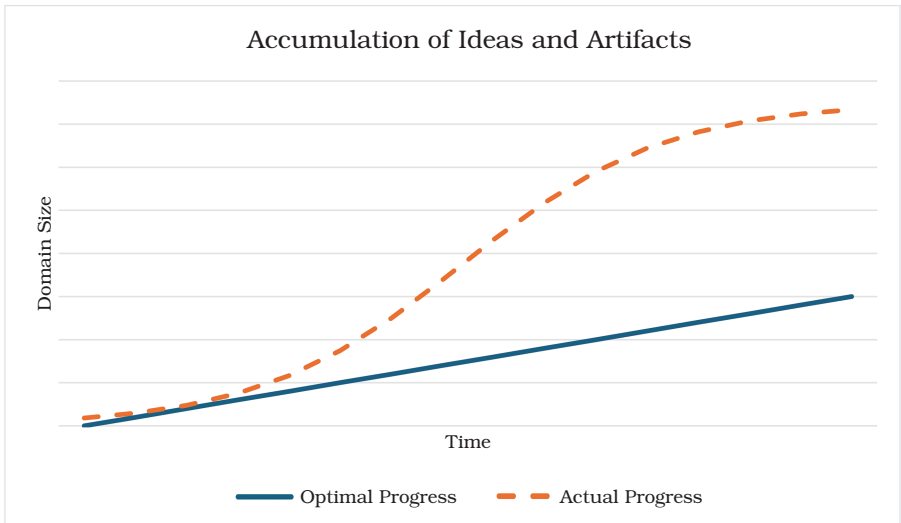


Fig. 4: Ecosystem model's depiction of progress that is persistently slower than optimal

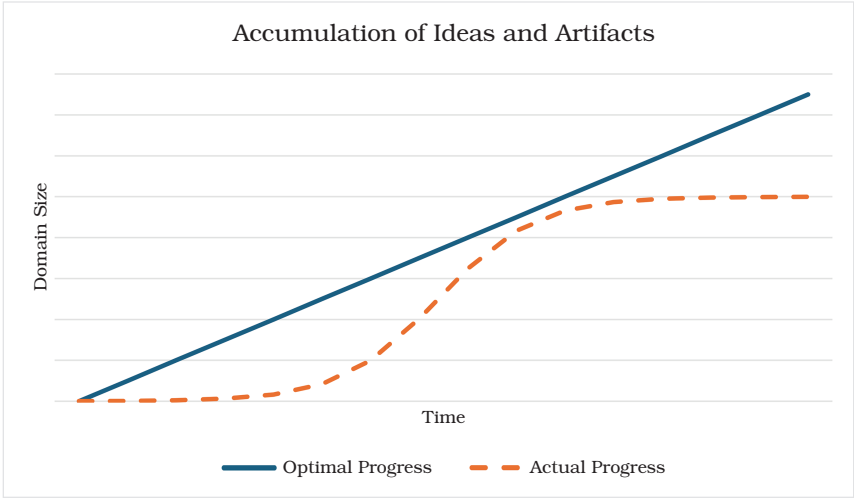
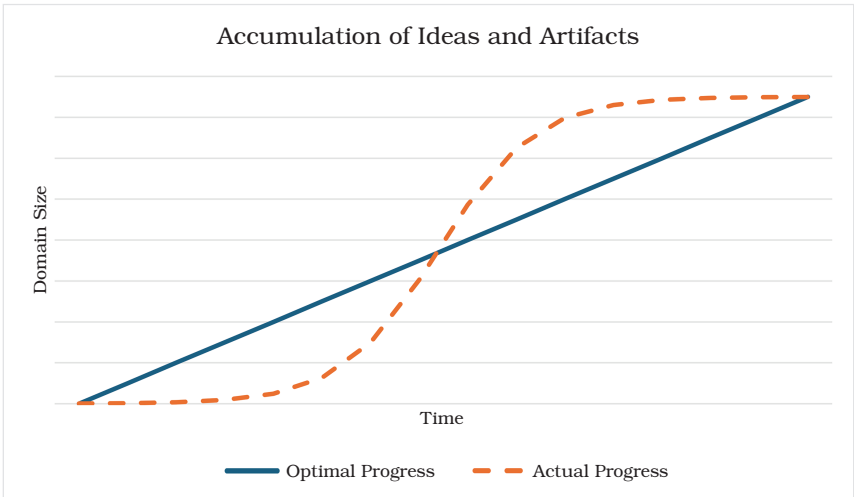


Fig. 5: Ecosystem model's depiction of progress that is sometimes slower and sometimes faster than optimal



The essential point is that the ecosystem model provides only a descriptive account of domain-maker-evaluator interactions over time. As applied to the standard accumulationist definition of progress, the ecosystem model tells us that the rate of accumulation changes over time; it says nothing about whether that rate is desirable or not.

These two differences make the ecosystem model a better tool for understanding the progress of science and useful arts. For

example, progress in nuclear physics may have been too fast in the first half of the twentieth century; progress in targeted advertising may have been too fast in the first decades of the twenty-first; and progress in artificial intelligence may be too fast today. To be clear, the argument is not that this is necessarily true—perhaps the rate of progress was optimal or even suboptimal during those periods. Instead, the argument is simply that it might be true—it is possible that progress was too fast during those periods. The ecosystem model makes clear that the normative question is not answered merely by increasing the rate at which we accumulate ideas and artifacts. Because it invites contestation over the normative implications of accumulating ideas and artifacts, the ecosystem model is a better tool for evaluating what IP law and policy should do in any given scenario.

Furthermore, whatever we conclude as a normative matter, at least as a descriptive matter, progress in nuclear physics, targeted advertising, and artificial intelligence proceeded much more quickly in some periods than in others. Because IP is the primary mechanism the Constitution provides for promoting progress, IP scholars would be well-served by conceptual tools that allow for that possibility. The ecosystem model is just such a tool.

With this overview in place, I'll elaborate now on the dynamics that characterize each phase of progress: slow takeoff, rapid and accelerating growth, and ossification.

3. *Slow Takeoff*

In a very small domain, makers will struggle to find enough ideas and artifacts. Not only are there very few of them by definition, but the ideas and artifacts of a small domain are often sparsely distributed throughout the world—a doctoral thesis in a German library,¹⁹⁴ a Brazilian guitarist in a Sheraton hotel lobby,¹⁹⁵ a theory of statistical inference in a dead man's desk drawer.¹⁹⁶ As a general matter, then, accumulationist progress

¹⁹⁴ Cf. *In re Hall*, 781 F.2d 897, 897 (Fed. Cir. 1986) (holding that a single copy of a doctoral thesis catalogued in a German library constituted a “printed publication”).

¹⁹⁵ Cf. Beatriz Miranda, “I Was Transformed”: The Power of Brazilian Jazz Legend Bola Sete, *THE GUARDIAN* (Aug. 14, 2023), <https://www.theguardian.com/music/2023/aug/14/i-was-transformed-the-power-of-brazilian-jazz-legend-bola-sete> [perma.cc/D5UU-NSLW] (describing Dizzy Gillespie as “astonished” when he saw the then-“little-known” Brazilian guitarist Bola Sete playing the Tudor Room’s cocktail hour at the Sheraton Palace).

¹⁹⁶ Cf. SHARON BERTSCH MCGRAYNE, *THE THEORY THAT WOULD NOT DIE: HOW BAYES’ RULE CRACKED THE ENIGMA CODE, HUNTED DOWN RUSSIAN SUBMARINES, & EMERGED TRIUMPHANT FROM TWO CENTURIES OF CONTROVERSY* 9–10 (2011) (reporting that Thomas Bayes “buried” the essay containing his eponymous theorem among his papers, where it

will be slow in small, nascent domains because it will be hard for makers to find any of the requisite building blocks.¹⁹⁷

At this stage, there are perhaps two principal mechanisms by which makers find the ideas and artifacts they need. The first is serendipity—sometimes, a maker encounters the relevant ideas and artifacts by pure chance.¹⁹⁸ The second is by domain-crossing—sometimes, a maker can find ideas and artifacts in a large, accessible domain, and use them to generate new ideas and artifacts in a nascent one.¹⁹⁹ But these are both challenging things to accomplish. So until a domain reaches some threshold size, new ideas and artifacts will accumulate slowly. The binding constraint on progress is that makers do not know where to look for the old ideas and artifacts they need, even if those old ideas and artifacts have previously existed somewhere in the world.

Consider, for example, two possible explanations for why a mechanical computer like Pascal's Calculator was not developed hundreds of years earlier than it was. The first is the story told by traditional IP models: Potential investors in mechanical computers were deterred because rivals might freely appropriate the value of their inventions. That seems implausible.

The second is the story told by the ecosystem model: No one would have found the prerequisite ideas and artifacts because the domain was not yet coherent. Although medieval turret clocks and ancient Greek astronomical calculators existed for centuries before Pascal made his calculator, evaluators had not organized those and other existing ideas and artifacts such that makers would have used them as building blocks on the way to mechanical computers. That is, because there was no domain that could properly be understood as "mechanical computation," a potential

"was still gathering dust when he died[,] at which point one of his mathematician friends found it).

¹⁹⁷ A classic example is Gregor Mendel's work on the principles underlying genetic inheritance, which was ignored for thirty years. See Zuckerman & Lederberg, *supra* note 10, at 629 (characterizing "Mendel's discovery of particulate inheritance" as "the best-known historical case" of a contribution that the domain failed to incorporate).

¹⁹⁸ See Cohen, *supra* note 15, at 1190–91 (describing Einstein's theory of relativity as having "been stimulated by fortuitous encounters" and citing examples of "representational shifts" in art that "emerged following serendipitous encounters").

¹⁹⁹ Important aesthetic and technological contributions have often been characterized as combinations of ideas and artifacts from multiple domains. See CSIKSZENTMIHALYI, *supra* note 19, at 9 ("[C]reativity generally involves crossing the boundaries of domains . . ."); Pedraza-Fariña, *Sociology of Innovation*, *supra* note 10, at 840 ("Many historically significant discoveries can be conceptualized as coming about through intellectual migration . . .").

Pascal would have had to engage in the difficult task of domain-crossing to find the requisite ideas and artifacts.²⁰⁰ Thus, in order to catalyze a period of rapid and accelerating progress, we need to facilitate the serendipity and domain-crossing that allows domains to emerge from the slow takeoff phase.

4. *Rapid and Accelerating Progress*

Of course, some makers overcome this challenge and produce a handful of ideas and artifacts. Evaluators then organize them into a domain—that is, evaluators draw together a few existing ideas and artifacts in a way that brings attention to a previously unrecognized coherence among them.²⁰¹ Eventually, the domain grows to contain a substantial number of ideas and artifacts that can, in turn, serve as a foundation for more. This is the point at which we should expect rapid and accelerating accumulationist progress.

The key mechanism here is that just one new idea or artifact can be the basis for many more additional ideas and artifacts. To see why, start with the assumption that makers can never generate ideas and artifacts *ex nihilo*.²⁰² Instead, every new idea or artifact is either (1) an improvement of an existing idea or artifact; or (2) a combination of existing ideas or artifacts. This implies that linear growth in the current size of the domain can produce factorial growth in the number of potential additions to the domain.²⁰³

Whether factorial growth actually results depends on three parameters: (1) the number of new ideas or artifacts that can be made by improving any single existing idea or artifact; (2) the

²⁰⁰ See YOSHIHIDE IGARASHI, TOM ALTMAN, MARIKO FUNADA & BARBARA KAMIYAMA, *COMPUTING: A HISTORICAL AND TECHNICAL PERSPECTIVE* 87–88 (2014) (describing Pascal's use of the cogwheel, which was used in windmills and clocks in his era, to invent his mechanical calculator).

²⁰¹ See Runco & Albert, *supra* note 34, at 4 (arguing that “institutions and identifiable groups are critical in selecting and giving coherence to the important strands of possibilities from those already in the work and minds of interested persons”).

²⁰² Of course, it's possible that this sometimes happens. But it seems so uncommon that we can safely ignore it. Cf. Robin Schimmelpennig, Layla Razek, Eric Schnell & Michael Muthukrishna, *Paradox of Diversity in the Collective Brain*, 377 *PHIL. TRANSACTIONS B* 1, 2 (2021) (“Recombination has far more potential to drive innovation than incremental improvement . . .”). As a result, combinatorial dynamics are likely to be the most relevant to understanding this phase of progress.

²⁰³ Cf. Foster, Rzhetsky & Evans, *supra* note 165, at 900 (“Nevertheless, science benefits when individuals overcome the dispositions that orient them toward established islands of knowledge in the *expanding ocean of possible topics*.”) (emphasis added) (citation omitted).

number of new ideas and artifacts that can be made from any given combination of existing ones; and (3) the number of existing ideas and artifacts that can be combined to form the foundation for a new idea or artifact.

To get a sense for the possibilities, make the following assumptions about those parameters. First, each idea or artifact can be the basis of one and only one improvement. Second, any combination of ideas and artifacts leads to one and only one new idea or artifact. And third, any two ideas and artifacts can be combined with each other, but larger combinations are not possible. On these assumptions, the potential new ideas and artifacts associated with a domain of size n is given by $n + n!/2!(n - 2)!$, where n is the number of existing ideas and artifacts already in the domain and 2 represents the size of the combinations permitted. Past an initial threshold, then, the number of potential additions to the domain grows much faster than the number of ideas and artifacts currently in it.²⁰⁴

Periods of rapid and accelerating growth abound in the historical record—time and again, a group of makers with privileged access to an emerging domain rapidly generate a large number of new ideas and artifacts. Examples include Impressionist art in Paris in the 1870s and 1880s, nuclear physics at MIT Building 20 in the 1940s and 1950s, and soul music in Detroit in the 1960s. As these examples suggest, geographic proximity looms large—access to an emerging domain might reduce to access to the makers who are generating the ideas and artifacts of that domain. One possible mechanism is that tacit knowledge is an essential component of emerging domains. Another possible mechanism is that first-mover effects are so important at this stage that physical proximity to the maker responsible for a new idea or artifacts is a dominant factor—the implications of new ideas and artifacts might be so apparent to makers in the domain that hearing about them mere days

²⁰⁴ If this domain has ten ideas and artifacts, it has forty-five opportunities for new ones; adding one idea or artifact to this domain would give it fifty-five opportunities for new ones. The domain has grown by one, while the opportunity space has grown by ten. Other parameter values are possible too. For example, in some cases, a single idea or artifact might be improved in multiple ways even without combining it with any others. Some pairs of ideas and artifacts won't be the basis of any viable new ones, while other pairs might be the basis of many new ones. And in at least some instances, combinations of more than two ideas and artifacts will be possible. I leave for another day a more complete formalization of these possibilities. For now, the point is simply that there can be some threshold beyond which each idea or artifact added to the domain opens up the possibility of many more subsequent ideas and artifacts. If that threshold is crossed, then the conditions are in place for a period of rapid and accelerating accumulationist progress.

before others is enough to confer a meaningful advantage in the race to be the first to build on them.²⁰⁵

In any event, the upshot for IP is that the difficulty of finding ideas and artifacts is not likely to constitute a binding constraint for progress during these periods of rapid growth. There will, however, be important distributional considerations when a domain is going through rapid and accelerating progress. Again and among other things, a potential maker's geographic proximity to others in the relevant domain seems to be a prerequisite to contributing new ideas and artifacts. IP itself might mitigate (or exacerbate) this tendency; more broadly, we might consider other policy levers that could more equitably distribute these opportunities.²⁰⁶

5. *Ossification*

Additional growth in the size of the domain will not, however, indefinitely fuel rapid and accelerating progress. Instead, as a domain gets larger, it will ossify and the rate of progress will slow. There are two basic drivers of this phenomenon.

First, makers have a finite capacity for searching a domain. A maker is a better match for some potential ideas or artifacts than for others. Continued accumulationist progress depends on makers finding the old ideas and artifacts that match well with their characteristics. When a domain first enters a period of rapid and accelerating progress, this is relatively easy. A maker can interact with all of its ideas and artifacts—sooner or later, she will necessarily find the best matches simply because she can explore all possible options. However, there is some maximum number of ideas and artifacts she can find on her own.²⁰⁷

As a result, growing domains will eventually implicate the second driver of ossification: Evaluators have a finite capacity for organizing ideas and artifacts. Once a domain exceeds a

²⁰⁵ Paul Dirac was probably referring to something like this when he famously described the early twentieth century as a period when it was “very easy . . . for any second-rate physicist to do first-rate work.” S. CHANDRASEKHAR, TRUTH AND BEAUTY: AESTHETICS AND MOTIVATIONS IN SCIENCE 25 (1990) (quoting P.A.M. DIRAC, DIRECTIONS IN PHYSICS 7 (1978)).

²⁰⁶ See Colleen Chien, *Redefining Progress: The Case for Diversity in Innovation and Inventing*, 71 UCLA L. REV. 540 (2024) (proposing several reforms that would increase the diversity of inventors and innovators).

²⁰⁷ See Benjamin F. Jones, *The Burden of Knowledge and the “Death of the Renaissance Man”: Is Innovation Getting Harder?*, 76 REV. ECON. STUD. 283, 284 (2009) (providing evidence that as “innovation [has] increase[d] the stock of knowledge, . . . the educational burden on successive cohorts of innovators [has] . . . increase[d]” too).

maker's capacity for searching, she will rely (at least in part) on evaluators' assessments of which ideas and artifacts are worth her while.²⁰⁸ Continued accumulationist progress then depends on the quality and quantity of evaluators' assessments. Evaluators, however, face the same problem as makers: because it takes time to assess the merit of any given idea or artifact, the more ideas and artifacts in a domain, the harder it is to assess all of them accurately. At some point, evaluators will be overwhelmed by a large domain—that is, the number of ideas and artifacts in the domain will eventually grow larger than the maximum quantity of assessments evaluators can perform for a given level of quality.

Evaluators might respond to this situation by keeping the quality of assessments constant and reducing the proportion of the domain's ideas and artifacts that they assess. For example, evaluators might altogether ignore new ideas and artifacts. If so, their assessments would cover an ever-smaller fraction of the domain's possible total number of ideas and artifacts.

Alternatively, overwhelmed evaluators might apply simple heuristics to reduce the amount of time spent on each idea or artifact, at the cost of reducing the quality of their assessments. One possible heuristic is to use past performance as a proxy for current achievements. Evaluators applying this heuristic would increase the salience of new ideas and artifacts associated with makers who have previously been the source of valuable ideas and artifacts, regardless of whether their new ideas and artifacts actually merit such attention. Suggestive evidence for this can be found in the Matthew Effect, by which scientists who receive early renown attract a disproportionate share of subsequent attention; more recent research finds evidence for Matthew Effects in the film industry, semiconductors, and wine production.²⁰⁹

²⁰⁸ Consistent with this possibility, recent research has shown that as the annual number of papers published in a domain increases, the already well-cited papers garner a disproportionate number of additional citations. Johan S. G. Chu & James A. Evans, *Slowed Canonical Progress in Large Fields of Science*, 118 PROC. NAT'L ACAD. SCIS. U.S. AM., art. e2021636118, at 1 (2021). For related work supporting the possibility that large domains ossify, see Nicholas Bloom, Charles I. Jones, John Van Reenen & Michael Webb, *Are Ideas Getting Harder to Find?*, 110 AM. ECON. REV. 1104 (2020) (providing evidence of declining research productivity across a wide range of sectors); Michael Park, Erin Leahey & Russell J. Funk, *Papers and Patents Are Becoming Less Disruptive Over Time*, 613 NATURE 138 (2023) (showing that papers and patents have become less likely to change networks of citations in a variety of fields).

²⁰⁹ Robert K. Merton, *The Matthew Effect in Science: The Reward and Communication Systems of Science Are Considered*, 159 SCI. 56 (1968); see Pierre

Worse still, evaluators might be biased against certain groups of makers. That bias could manifest in the form of flawed assessments of the ideas and artifacts produced by those makers. And larger domains are more vulnerable to the pernicious effects of such bias because makers themselves cannot easily find the ideas and artifacts wrongly ignored by evaluators. When there are few ideas and artifacts, evaluators who ignore valuable work cannot cause too much harm; ideas and artifacts that they wrongly overlook would be found by makers soon enough. But when there are many ideas and artifacts, the harm can be significant because makers must rely on evaluators' organization of the domain to find the ideas and artifacts they need.

As an example, consider the art historians Ernst Gombrich and H.W. Janson, authors of the ostensibly comprehensive texts, *The Story of Art* and *History of Art*, respectively. Those books defined the Western canon of visual art in the postwar era, serving as textbooks in countless art history courses and reference works on countless desks. Spanning thousands of years of history, they also included a combined total of none female artists. When asked why, Gombrich replied that he selected only artistic geniuses and “[n]ot everyone can do what a genius can.”²¹⁰ Janson was similarly dismissive, asserting that no women were “important enough to go into a one-volume history of art.”²¹¹ Gombrich's and Janson's bias thus systematically undermined both the quality and quantity of their assessments, thereby distorting the domain of Western visual art.²¹²

To be sure, Gombrich and Janson were not solely responsible for the situation that Linda Nochlin described in her landmark essay, “Why Have There Been No Great Women Artists?”²¹³

Azoulay, Toby Stuart & Yanbo Wang, *Matthew: Effect or Fable?*, 60 MGMT. SCI. 92, 92 (2014) (summarizing evidence of Matthew Effects in various contexts).

²¹⁰ Cody Delistraty, *The Myth of the Artistic Genius*, THE PARIS REVIEW: THE BIG PICTURE (Jan. 8, 2020), <https://www.theparisreview.org/blog/2020/01/08/the-myth-of-the-artistic-genius/> [<https://perma.cc/KUT8-8AA5>].

²¹¹ Nanette Salomon, *The Art Historical Canon: Sins of Omission*, in (EN)GENDERING KNOWLEDGE: FEMINISTS IN ACADEME (Joan E. Hartman & Ellen Messer-Davidow eds., 1991), reprinted in THE ART OF ART HISTORY: A CRITICAL ANTHOLOGY 344, 347 (1998) (quoting Eleanor Dickinson, *Sexist Texts Boycotted*, 5 WOMEN ARTISTS NEWS, Sept.-Oct. 1979, at 12).

²¹² To say nothing of the harms that Gombrich and Janson directly inflicted on the artists they ignored.

²¹³ Linda Nochlin, *Why Have There Been No Great Women Artists?*, ARTNEWS, Jan. 1971, at 22. It's not for nothing that art critics today describe “the history of art” as “the history of many women not receiving their dues.” Norma

Still, had Nochlin exerted the influence that Gombrich and Janson exerted, it also seems fair to say that the domain of visual arts in postwar America would have looked quite different than it did. And that would have had profound implications for the subsequent path of progress. Crucially for our purposes, Gombrich and Janson were influential in part because makers needed some way to navigate the vast domain of Western visual art; were the domain smaller, makers could have more readily circumvented their assessments and found many more valuable ideas and artifacts produced by female artists.²¹⁴

The implications for IP are as follows. First, policymakers might use IP to make it easier for makers and evaluators to navigate large domains. Second, policymakers might consider how IP influences who becomes an evaluator and how IP itself structures domains, with the goal of producing domains that are conducive to achieving some normative vision of progress.²¹⁵

IV

IMPLICATIONS FOR IP LAW AND POLICY

The preceding section identified novel mechanisms that influence the rate at which society accumulates ideas and artifacts, thereby producing a new picture of progress in science and useful arts. Here, I elucidate the implications of that analysis for IP law and policy. I do not aim to provide a fully worked-out set of ready-to-implement prescriptions. Instead, my aim is to lay the foundation for such prescriptions, identify key questions for further inquiry, and illustrate by way of

Clarke, *The Female Gaze*, LITERARY REV., Mar. 2021 (reviewing JENNIFER HIGGIE, *THE MIRROR AND THE PALETTE: REBELLION, REVOLUTION AND RESILIENCE: 500 YEARS OF WOMEN'S SELF-PORTRAITS* (2021)); see also KATY HESSEL, *THE STORY OF ART WITHOUT MEN* (2023); HIGGIE, *supra*.

²¹⁴ Of course, many artists in this period did rely on work by female predecessors—my claim is not that Gombrich and Janson alone determined which existing ideas and artifacts could serve as the basis for new ones. My claim is only that they had a significant impact and, notwithstanding the fact that some makers were able to mitigate the harms they inflicted, many others were not.

²¹⁵ Nicholson Price and Jake Linford have separately argued that more ideas and works might be normatively undesirable per se. See Price, *supra* note 171 (describing how patent law can pull innovators in the direction of innovations that undermine progress); Jake Linford, *Copyright and Attention Scarcity*, 42 CARDOZO L. REV. 143 (2020) (arguing that additional expressive works impose burdens on consumer attention that might outweigh the benefits of consuming them). My point is more modest: assuming *arguendo* that more ideas and artifacts have a positive social impact and that this impact outweighs the greater burden that more ideas and artifacts impose on evaluators, it would still make sense to consider ways to reduce the burden so as to improve the quality of the domain.

example how scholars can use the ecosystem model to solve pressing problems in IP.

A. Innovation and Cultural Policy Pluralism

Although the Constitution assigns to IP the task of promoting progress, there are alternatives.²¹⁶ Innovation and cultural policy pluralists accordingly try to specify when to prefer IP over prizes, grants, subsidies, procurement, taxes, and other policy levers.²¹⁷ IP will often be better at calibrating investments to the social value of potential ideas and artifacts because it can “aggregate widely dispersed information regarding consumers’ willingness to pay for new knowledge goods.”²¹⁸ In contrast, policy levers that require the government to determine the size of pecuniary rewards impose “an informational burden that bureaucrats may be ill equipped to handle.”²¹⁹ These government-set rewards also run the risk that “political pathologies [may] skew policy outcomes toward the interests of the powerful few.”²²⁰ Despite these general advantages for IP over other mechanisms, the balance may tip away from IP when consumers’ willingness-to-pay is a poor proxy for social value or when the deadweight loss of monopoly pricing is too high to tolerate.²²¹

²¹⁶ Although the Constitution empowers Congress to use IP to promote progress, Congress has also deployed other policy levers to the same end. Whether it can do so is a matter of some debate. See Thomas B. Nachbar, *Intellectual Property and Constitutional Norms*, 104 COLUM. L. REV. 272 (2004) (arguing that the Progress Clause does not prevent Congress from using its Commerce Clause power to promote progress); Jeanne C. Fromer, *The Intellectual Property Clause’s External Limitations*, 61 DUKE L.J. 1329, 1333–35 (2012) (summarizing literature arguing that the Progress Clause prevents Congress from using other powers to promote progress and offering an intermediate position).

²¹⁷ See Hemel & Ouellette, *supra* note 27, at 544. These debates are long-standing. See B. ZORINA KHAN, *INVENTING IDEAS: PATENTS, PRIZES, AND THE KNOWLEDGE ECONOMY* 65 (2020) (“Policymakers in the past have already explored the full range of options for promoting ingenuity, including patents, privileges, prizes, subsidies for science, bounties, trade secrecy protection, appointments to desirable jobs, pensions and other types of personal support, cartelization and the protection of monopolies, and government procurement.”). For some other contributions to this large literature, see Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is It the Best Incentive System?*, in NBER, 2 INNOVATION POLICY AND THE ECONOMY 51 (Adam B. Jaffe, Josh Lerner & Scott Stern eds., 2002); Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 UCLA L. REV. 970 (2012); Roin, *supra* note 182; Steven Shavell & Tanguy van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525 (2001).

²¹⁸ Hemel & Ouellette, *supra* note 27, at 555.

²¹⁹ *Id.*

²²⁰ *Id.* at 556.

²²¹ *Id.* at 555–56.

The ecosystem model sheds new light on these longstanding debates. Specifically, it reveals that the institutions that administer innovation and cultural policy levers can themselves be evaluators—that is, these institutions can assess ideas and artifacts, and they can increase the salience of those they deem most valuable. To show how this works and why it matters, I will first revisit a hotly contested historical example of innovation policy: the prizes for food-preservation technology awarded by Napoleonic France. I will then draw some more general lessons from that analysis.

1. *Innovation Policy in Revolutionary and Napoleonic France*

Louis Pasteur now receives most of the credit for his eponymous pasteurization technique. Pasteur was not, however, the first to sterilize food using heat and vacuum-sealed containers; instead, he relied on the ideas and artifacts of the makers that preceded him. Especially influential: the work of Nicolas Appert.²²² Indeed, Appert's contributions seem to have sparked a period of rapid and accelerating growth in the domain of food preservation throughout the 1800s, culminating in Pasteur's work.

Scholars have, however, disagreed about the role that French innovation policy plays in this story. For some, it is a model to be emulated; for others, it is an example of what can go awry when the government directly rewards invention. As we'll see, both sides have missed an alternative reading of this narrative.

The canonical version of the story highlights the appeal of prizes over patents. The plot follows a specified sequence of events: first, a prize is announced; then, motivated by the prospect of winning that prize, an inventor dedicates her time and money to developing an invention. And this is the sequence that Suzanne Scotchmer recounts in her influential book, *Innovation and Incentives*. According to Scotchmer, a prize was offered in 1795 for the successful development of a “means to preserve food to feed Napoleon's vast armies and navy.”²²³

²²² See Joel Mokyr, *Long-Term Economic Growth and the History of Technology*, in 1B HANDBOOK OF ECONOMIC GROWTH 1113, 1150 (Phillippe Aghion & Steven N. Durlauf eds., 2005) (Pasteur knew of Appert's work, and “eventually admitted that his own work on the preservation of wine was only a new application of Appert's method.”).

²²³ SCOTCHMER, *supra* note 136, at 43.

Nicolas Appert then won that prize in 1810 for his method of sterilizing food packed in glass bottles.²²⁴

Scotchmer accordingly concludes that this was a successful use of an *ex ante* prize—that is, one established to motivate inventors to pursue new solutions to problems identified by prize sponsors.²²⁵ On this telling, the Appert story shows that prizes, just like IP, can increase private incentives to invest in public goods because it was the government’s offer of a pecuniary reward that encouraged Appert to invest creating in his method. Moreover, because Appert had to “publish the technique and put it in the public domain” in order to receive his reward, the prize did not entail the static inefficiency normally associated with IP.²²⁶ The ultimate lesson is that, under certain conditions, a “prize gives the same incentives to invest in the idea as the intellectual property system, but with less deadweight loss.”²²⁷

A closer inspection, however, reveals that this canonical version is implausible. It seems that Appert began marketing food preserved using some version of his method no later than the mid-1790s.²²⁸ In order to motivate him to invent that method, the prize must therefore have existed well before 1800. But there are good reasons to doubt that it did.

First, in 1795, Napoleon was an artillery general fighting royalists in Vendée; he had not yet conducted the 1797 Italian campaign that led to his fame and ultimate appointment as ruler of France in 1799. It therefore seems unlikely that, in 1795, he would have offered a prize to feed “vast armies

²²⁴ *Id.* at 43–44.

²²⁵ *Id.* at 41–44; see also Peter Lee, *Social Innovation*, 92 WASH. U. L.R. 1, 53, 53 n.336 (2014) (describing the Appert story as an example of a prize that “stimulated the development” of a method of “sealing food in glass jars”).

²²⁶ SCOTCHMER, *supra* note 136, at 44.

²²⁷ *Id.* at 38. To be sure, Scotchmer is careful to explain that the efficiency advantages of prizes over IP can only be realized under limited conditions in which (1) the prize giver can accurately observe the social value of the innovation and (2) this value can be verified by a court. *Id.* at 40. The point of the Appert story, however, is to illustrate a situation in which those conditions may have been satisfied.

²²⁸ See Moky, *supra* note 222, at 1127 n.15 (“The idea of preserving food by cooking followed by vacuum sealing was hit upon by the Frenchman Nicolas Appert in 1795.”); Rebeca Garcia & Jean Adrian, *Nicolas Appert: Inventor and Manufacturer*, 25 FOOD REVS. INT’L 115, 117–18 (2009) (recounting Appert’s “research at the beginning of the French revolution, around 1790”); Anton Howes, *Myth-Busting Innovation Prizes*, AGE OF INVENTION (Apr. 22, 2022), <https://www.ageofinvention.xyz/p/age-of-invention-myth-busting-innovation> [https://perma.cc/7Z4G-STF5] (identifying 1795 as the date “when he first scaled-up and began marketing a technique that he had already been working on for some time”).

and [a] navy” he did not yet command.²²⁹ Moreover, the institution that ultimately awarded Appert his prize, the Société d’Encouragement pour l’Industrie Nationale (“SEIN”), was only established in 1801.²³⁰ So it again seems unlikely that it would have offered a prize in 1795.

As a result, economic historians have recently provided a revisionist account of the Appert story. As B. Zorina Khan tells it, French innovation policy in the 1700s and 1800s was a system of “special favors . . . directed to special interests.”²³¹ Khan’s investigation reveals that Appert had been working on his method well before the award was announced; the SEIN award therefore could not have motivated investments that Appert had already made.²³² Moreover, although his “array of delicacies won enthusiastic testimonials from . . . elite panelists,” it was not fit for the stated purpose of the award—“provisioning an army on the march”—because the glass bottles it required were expensive and fragile.²³³

Thus, although the Appert story “is commonly cited as evidence of the success of inducement prizes, with grandiose claims that this prize created the canning industry,” Khan argues that it is better understood as an example of rent-seeking by an unsuccessful inventor.²³⁴ Appert did not respond to the announcement of a prize by dedicating his time and money to inventing a new method of preserving food; instead, he finagled compensation from bureaucrats for an existing method “that largely failed in the market.”²³⁵

His scheme worked because, as critics of prize systems argue, the relevant government actors lacked adequate technological and economic expertise.²³⁶ The Appert story thus

²²⁹ SCOTCHMER, *supra* note 136, at 43.

²³⁰ KHAN, *supra* note 217, at 152.

²³¹ *Id.*

²³² *Id.* at 77 (noting that Appert had “been experimenting on the job to discover ways to improve on the flavor of preserved foods” well before the prize was announced). This account sets aside the possibility that the prize motivated Appert to increase the magnitude of his investment in improving an invention that he had already made some progress towards perfecting. Because my goal is to show how the SEIN prize could have had a causal role without altering the level of investment, I also set this possibility aside here. A comprehensive analysis of this episode should, however, consider it.

²³³ *Id.*

²³⁴ *Id.*

²³⁵ *Id.*

²³⁶ *Id.* at 70, 77 (using Appert’s as an example of an individual who was able to successfully lobby multiple institutions for prizes because the relevant “administrators [could not] . . . distinguish value at the margin”).

exemplifies how government prize systems have provided “disproportionate benefits for elites . . . , disadvantaged creativity that was radically new . . . , and all too often promoted rent-seeking rather than productivity and innovation.”²³⁷

The ecosystem model, meanwhile, reveals a third version of Appert’s story that both the canonical and revisionist versions overlook. If Khan’s chronology is accurate, the SEIN prize could not have induced Appert’s investment for the simple reason that the investment was already made by the time the prize was established. That would seem to rule out a causal role for the SEIN prize in the development of food preservation technology.

But this is too narrow a view of technological and cultural progress. Progress is determined by more than just the level of private investment in public goods. And policy levers can accordingly influence progress through channels other than motivating such private investments. As explained *supra*, progress is a function of domain-maker-evaluator interactions. And the SEIN prize may have played a decisive role through its effect on those interactions because it increased the salience of Appert’s sterilization method.

In this version of the Appert story, the pivotal moment occurred in 1809, when SEIN demanded that Appert publish a book describing his invention before receiving their prize.²³⁸ The combination of the SEIN prize and Appert’s book then attracted considerable attention—even though Appert had been using his method for over a decade, a flurry of newspaper articles about it appeared immediately following the prize and the book’s publication in May and June of 1810.²³⁹ Moreover, vital improvements in food preservation technology occurred shortly after that surge of media attention. As noted, Appert’s implementation of the method was impractical because glass bottles were expensive and fragile.²⁴⁰ But at some point between 1810 and 1812, Phillippe de Girard and Peter Durand improved on Appert’s method by substituting tin cans for glass

²³⁷ *Id.* at 145.

²³⁸ SCOTCHMER, *supra* note 136, at 44; Garcia & Adrian, *supra* note 228, at 121. It is unclear how much of the publicity was due to the book as compared to the SEIN prize. SEIN awarded Appert 10,000 francs in 1810, but only awarded him a silver medal in 1816. See KHAN, *supra* note 217, at 77 (noting 1810 payout, 1816 silver medal, and 1820 gold medal). Archival research is required to fill in these gaps.

²³⁹ Garcia & Adrian, *supra* note 228, at 122.

²⁴⁰ See KHAN, *supra* note 217, at 77.

bottles.²⁴¹ And it was this improvement that gave birth to a global, commercial-scale canning industry in the nineteenth century.²⁴²

The ecosystem model thus offers a fresh reading of an old story. Innovation and cultural policy levers can do more than merely induce private investment in public goods. Indeed, the mere existence of Appert's method from (apparently) 1795 to 1810 was insufficient to catalyze subsequent progress. Instead, an evaluating institution—SEIN—had to assess the merit and increase the salience of Appert's ideas and artifacts; only then would other makers build on them.²⁴³

This episode is accordingly an example of how prize-awarding institutions can successfully restructure the domain so as to increase the salience of the most fruitful ideas and artifacts. And it offers more general lessons for innovation and cultural policy.

2. *A New Dimension for Innovation and Cultural Policy Pluralism*

Existing literature recognizes that innovation and cultural policy levers perform two distinct functions: (1) they are “*innovation incentives*, which establish the payoff structure for producers of knowledge goods”; and (2) they are “*allocation*

²⁴¹ Some of the facts are hard to pin down precisely, with dates for the improvement spanning from late 1810 until 1812. Still, all accounts converge on a timeline in which the use of tin cans postdates the newspapers describing Appert's invention in late spring and early summer of 1810 and they consistently suggest that the use of tin was a deliberate improvement to his method. See KHAN, *supra* note 217, at 77 (describing problems with widespread adoption of Appert's method and concluding that the subsequent “patented English method of canning . . . proved to be more efficient and scalable for the mass market”); MOKYR, *supra* note 222, at 1127 n.15 (explaining that “Appert originally used glassware . . . , but in 1812 an Englishman named Peter Durand suggested using tin-plated cans, which were soon found to be superior”); GORDON L. ROBERTSON, *FOOD PACKAGING: PRINCIPLES AND PRACTICE* 123 (2d ed. 2006) (acknowledging “controversy as to who introduced the tin can” to Appert's method, but concluding “based on extensive research of early nineteenth century archives” that “the French inventor Phillippe de Girard . . . got Durand (a broker in London) to patent the process in 1810, the patent referring to the substitution of glass jars and bottles with tin cans”); Garcia & Adrian, *supra* note 228, at 118 (concluding that de Girard used Durand as a straw man to take out a patent “in October 1810”). Further historical research is required to resolve these ambiguities and to determine the extent to which SEIN's award to Appert was the catalyst for drawing attention to his ideas and artifacts.

²⁴² See ROBERTSON, *supra* note 241, at 123 (describing the growth of the canning industry throughout the 1800s).

²⁴³ Whether it did so by virtue of the prize itself or its accompanying demand that Appert publish a book remains for future research. See *supra* note 238.

mechanisms, which establish the conditions under which consumers can use knowledge goods.”²⁴⁴

But the institutions that administer innovation and cultural policy levers also perform a third function: they are evaluators. They assess the merit of existing ideas and artifacts, and they can raise the salience of the ones they deem most valuable.

The Appert story illustrates how prize-awarding institutions perform this evaluation function. SEIN assessed the merit of his ideas and artifacts when three of its scientists reviewed his documents and tasted food preserved using his method.²⁴⁵ It then took an affirmative step to increase the salience of his invention in the domain: SEIN demanded, as a condition of its prize, that Appert write a book describing his process.²⁴⁶

The story also demonstrates that the evaluation function is independent of the incentive and allocation functions. SEIN performed an evaluation function—it assessed the merit of Appert’s invention and, based on that assessment, increased the invention’s salience in the domain. SEIN also performed an allocation function—the organization put Appert to the choice of either (1) patenting his method or (2) permitting open-access and receiving pecuniary compensation from SEIN.²⁴⁷ But SEIN did not perform an incentive function—Appert had already made the requisite investments by the time the prize was established. In the Appert story, then, the evaluation function was combined with an open-access allocation mechanism and no incentive.

²⁴⁴ See Hemel & Ouellette, *supra* note 27, at 548–49. Although Hemel and Ouellette focus on technology and patent law, the same framework can be applied to culture and copyright law. See *id.* at 551 n.8 (explaining that their use of the term “knowledge good” refers to “anything that can be digitized,” but that their “argument does not depend on the exact contours of this category”).

²⁴⁵ Garcia & Adrian, *supra* note 228, at 120.

²⁴⁶ *Id.* at 121. We might be tempted to think of the SEIN prize as a subsidy that covered Appert’s upfront costs of writing his book. And there is something to the idea that this episode describes a mixed strategy, although the details remain somewhat murky. I want to emphasize the conceptual point here: SEIN could have demanded that Appert write the book as a condition of receiving the prize itself apart from any monetary compensation. That is, SEIN could have awarded Appert only a medal or other symbolic recognition, in much the same way that the Academy Awards gives its winners only a small statue. It is accordingly easy to imagine a prize-awarding institution implementing a high-salience evaluation strategy while performing no incentive function at all (or, by extension, combining a high-salience evaluation strategy with a range of incentive strategies).

²⁴⁷ *Id.*

But SEIN could have done differently. Indeed, the allocation and evaluation functions could have been combined in a variety of ways. The table below illustrates the possibilities.

Table 1: Evaluation and Allocation Strategies in Innovation and Cultural Policy

		Evaluation Strategy	
		High salience	Low salience
Allocation Strategy	Monopoly pricing	<ul style="list-style-type: none"> – Allow patent – Require book 	<ul style="list-style-type: none"> – Allow patent – No book req
	Open-access	<ul style="list-style-type: none"> – Prohibit patent – Require book 	<ul style="list-style-type: none"> – Prohibit patent – No book req

Thus, SEIN could have combined a monopoly-pricing allocation strategy (i.e., permit Appert to patent his method) with a high-salience evaluation strategy (i.e., demand that he write a book describing the method as a condition of receiving the prize).²⁴⁸ Or it could have combined an open-access allocation strategy (i.e., prohibit Appert from patenting as a condition of receiving the prize) with a low-salience evaluation strategy (i.e., do not demand that he write a book). As it happened, SEIN combined an open-access allocation strategy (i.e., prohibit Appert from patenting) with a high-salience evaluation strategy (i.e., demand that he write a book as a condition of receiving the prize).

The upshot is that innovation and cultural policy levers can promote progress by improving the accessibility of a domain without doing anything to induce investments in ideas and artifacts or taking any particular approach to allocating them. The conventional wisdom has it that prizes must compensate their winners, either through direct pecuniary rewards or through reputational enhancement that then leads to increased earnings, in order to be effective. But this proposition holds only to the extent that the primary role of a prize is to induce investments in the creation of public goods.

²⁴⁸ As Hemel and Ouellette explain, monopoly pricing may be an attractive allocation strategy when, for example, there are significant negative externalities associated with consumption of the knowledge good and political-economy considerations militate against Pigouvian taxes. Hemel & Ouellette, *supra* note 27, at 571–73.

As the analysis here reveals, prizes (and other innovation and cultural policy levers) can also promote progress by improving the structure of a domain. A prestigious prize that draws attention to existing ideas and artifacts need not pay a large financial reward—Oscar winners, for example, do not get any money to go with their golden statues. And the reputational effects need not translate to any increased earnings potential in order to promote progress—posthumous awards can effectively increase the salience of particular ideas and artifacts even though their makers cannot enjoy the fruits of any corresponding reputational enhancement. To be sure, there are limits to this strategy because attention is scarce.²⁴⁹ Still, the basic point remains: innovation and cultural policy levers can organize domains so as to reduce barriers to progress without making any direct or indirect transfers to makers.

Finally, as a general matter, we can array innovation and cultural policy levers along a continuum indicating the magnitude of the impact they typically have on domain structure. At one end of the continuum lie prizes, which will typically have significant effects on the structure of a domain by making prize-winning ideas and artifacts more salient.²⁵⁰ At the other end lie tax credits, which will typically have no effect on the structure of a domain—subsequent makers will not be any more likely to find ideas and artifacts for which tax credits were claimed than ideas and artifacts for which tax credits were not claimed.

²⁴⁹ See Marc Malkin, *Francis Ford Coppola Says There Are Too Many Award Shows: "I Liked It When It Was Just The Oscars"*, VARIETY (Feb. 24, 2022), <https://variety.com/2022/film/columns/francis-ford-coppola-godfather-oscars-megalopolis-1235188919/> [<https://perma.cc/6R8Y-VLNE>]; Linford, *supra* note 215, at 161–63 (summarizing psychological literature on attention scarcity).

²⁵⁰ This is deliberate. For example, the “mission of the Recording Academy is to recognize excellence in the recording arts and sciences, . . . and ensure that music remains an indelible part of our culture.” *About the Recording Academy*, RECORDING ACAD., <https://www.recordingacademy.com/about> [<https://perma.cc/YUU5-9S82>] (last visited Feb. 9, 2024) (emphasis omitted). Similarly, the mission of the Booker Prize Foundation is “to inspire people to read the world’s best fiction.” *Notes to Editors*, THE BOOKER PRIZES, <https://thebookerprizes.com/notes-to-editors> [<https://perma.cc/65J7-Z9JV>] (last visited Feb. 9, 2024). And the Google Lunar XPRIZE was created with two goals in mind.

(1) To spur affordable access to the moon and give space entrepreneurs a legitimate platform to develop long-term business models around lunar transportation and (2) to inspire the next generation of scientists, engineers, space explorers and adventurers to enter the STEM fields.

The New Space Race, XPRIZE, <https://www.xprize.org/prizes/google-lunar> [<https://perma.cc/4N3M-WTY4>] (last visited Feb. 12, 2024).

In between lies IP. The effects of IP on domain structure depend on the particulars of the IP system. In the next section, I will explain how IP doctrine might be reformed to improve its effect on domain structure; here, I emphasize simply that there are many ways in which IP operates as an evaluator. For example, copyright owners must deposit copies of their work upon publication in order to amass a collection for the Library of Congress.²⁵¹ This creates an opportunity for the Register of Copyright to increase the salience of ideas and artifacts that are underappreciated by market-based mechanisms. Eliminating the deposit requirement, meanwhile, would undermine this function of the copyright system. Or compare what the Patent and Trademark Office does to help makers find patents with what Google does.²⁵²

To be sure, the government institutions that implement innovation and cultural policy levers are not the only institutions that can influence the salience of ideas and artifacts. As exemplified by the earlier discussion of Gombrich and Janson, many evaluators will be private actors. The point here is simply that government institutions perform this function too, often alongside private ones. Future work should explore how to design these government institutions so that they complement or fill in gaps left by private ones, while avoiding undesirable distortions or crowding out effects.

B. Reforming IP Doctrines

In this section, I offer novel doctrinal prescriptions grounded in the ecosystem model's characterization of progress. Starting with patent law, I argue that the written description requirement should be reformed to serve domain outsiders because the related enablement requirement already serves domain insiders. Doing so could reduce barriers to domain-crossing, an important method for overcoming the problem of slow takeoff in small domains. I then turn to the problem of ossification in music. While copyright law lacks a formal attribution right, industry-specific practices in the shadow of copyright law might exacerbate the difficulty of navigating large domains. But because makers have greater reason to care about the source of

²⁵¹ 17 U.S.C. § 407.

²⁵² Compare *Patent Public Search*, USPTO, <https://ppubs.uspto.gov/pubwebapp/static/pages/landing.html> [<https://perma.cc/D3FJ-P5AD>] (last visited Sept. 24, 2024), with *GOOGLE PATENTS*, <https://patents.google.com/> [<https://perma.cc/7VPW-YH5A>] (last visited Sept. 24, 2024).

ideas and artifacts, formal attribution rights could be more effective than scholars have appreciated thus far.

1. *The Written Description Requirement*

Begin with the written description requirement. By statute, a patent must include a specification describing the invention in words and images.²⁵³ The statutory language has been interpreted to impose two distinct requirements—written description and enablement.²⁵⁴ Both are measured by reference to the central figure in the patent system: the person having ordinary skill in the art (“PHOSITA”).²⁵⁵ Defined as “a person who would be expected to solve the type of problem in question,”²⁵⁶ the PHOSITA is a paradigmatic domain insider.

As others have argued, the written description and enablement requirements appear redundant—indeed, enablement appears to do all the work.²⁵⁷ Written description demands that the specification “reasonably convey[]” to a PHOSITA “that the inventor had possession of the claimed subject matter as of the filing date.”²⁵⁸ Enablement, meanwhile, demands that the specification teach a PHOSITA how to make and use the invention.²⁵⁹ If a specification explains how to make and use an invention (thereby satisfying the enablement requirement), it seems that it must also convey that the inventor possessed the invention (thereby satisfying the written description requirement). Put differently, it’s hard to imagine that an inventor could describe how to make and use an invention that she doesn’t possess.

²⁵³ 35 U.S.C. § 112(a).

²⁵⁴ *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1340 (Fed. Cir. 2010) (en banc) (holding that § 112(a) “contains a written description requirement separate from enablement”).

²⁵⁵ See Laura Pedraza-Fariña & Ryan Whalen, *The Ghost in the Patent System: An Empirical Study of Patent Law’s Elusive “Skilled Artisan,”* 108 IOWA L. REV. 247, 249–50 (2022) (“The modern-day PHOSITA scaffolds every major patent law doctrine . . .”).

²⁵⁶ DONALD S. CHISUM, CHISUM ON PATENTS glossary (2024), LexisNexis.

²⁵⁷ Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 161–63 (2006) (criticizing the written description requirement as redundant); Mark D. Janis, *On Courts Herding Cats: Contending with the “Written Description” Requirement (and Other Unruly Patent Disclosure Doctrines)*, 2 WASH. U. J.L. & POL’Y 55, 107 (2000) (“As a first step, the Federal Circuit might simply admit that the written description requirement is redundant of enablement.”).

²⁵⁸ *Bos. Sci. Corp. v. Johnson & Johnson*, 647 F.3d 1353, 1362 (Fed. Cir. 2011) (quoting *Ariad Pharms., Inc.*, 598 F.3d at 1351).

²⁵⁹ *Amgen Inc. v. Sanofi*, 143 S. Ct. 1243, 1254 (2023).

Making matters worse, the written description requirement lacks a sound, independent theoretical justification. Enablement performs several functions that are not well performed by other doctrines—for example, it ensures that patent scope is commensurate with the inventor’s contribution to the art.²⁶⁰ Written description, on the other hand, is usually justified as a timing doctrine—the idea is that it avoids granting exclusivity too soon, before the applicant has actually achieved the invention.²⁶¹ But there are many other timing doctrines in patent law, including utility, patentable subject matter, and enablement itself.²⁶² It therefore remains unclear what independent work written description can or should do.

The doctrinal and theoretical redundancy follow, in part, from the fact that both doctrines take the knowledge and skills of a domain insider as the benchmark against which to measure compliance.²⁶³ The PHOSITA is the benchmark here as it is for virtually all patent law doctrines because, on the conventional view, the patent system provides incentives for this domain insider to invest in invention.²⁶⁴ But as the foregoing analysis suggests, the domain insider’s incentives to invest aren’t always the binding constraints on technological progress.

²⁶⁰ See Dmitry Karshedt, Mark A. Lemley & Sean B. Seymore, *The Death of the Genus Claim*, 35 HARV. J.L. & TECH. 1, 10–13 (2021) (explaining how enablement polices claim scope through its “commensurability” requirement).

²⁶¹ See Dmitry Karshedt, *The Completeness Requirement in Patent Law*, 56 B.C. L. REV. 949, 976 (2015) (explaining that the “familiar policy concern behind” *Ariad* “is that patents on research plans stifle later inventive activity”).

²⁶² See *id.* (concluding that courts use both written description and utility “to police completeness of the claimed invention, requiring applicants to make their inventions more downstream before they can qualify for a patent”); *id.* at 977 (concluding that patentable subject matter doctrine is also designed “to bar patents on inventions that are thought by courts to be too upstream”); *Grant v. Raymond*, 31 U.S. 218, 247 (1832) (explaining that enablement “is necessary in order to give the public, after the privilege shall expire, the advantage for which the privilege is allowed, and is the foundation of the power to issue the patent”).

²⁶³ See Allen K. Yu, *The En Banc Federal Circuit’s Written Description Requirement: Time for the Supreme Court to Reverse Again?*, 33 CARDOZO L. REV. 895, 916 (2012) (arguing that the written description and enablement requirements are “identical and commensurate” insofar as they are both evaluated from the perspective of a PHOSITA). Enablement asks whether a domain insider could make and use the invention by relying on the information in the patent document combined with her own background knowledge and skills. *Koito Mfg. Co. v. Turn-Key-Tech, LLC*, 381 F.3d 1142, 1156 (Fed. Cir. 2004). Written description similarly determines whether the specification, combined with the domain insider’s knowledge and skills, “reasonably conveys” that the inventor had possession of the invention. *Bos. Sci. Corp. v. Johnson & Johnson*, 647 F.3d 1353, 1362 (Fed. Cir. 2011).

²⁶⁴ See Buccafusco & Masur, *supra* note 176, at 3 (explaining the standard incentive theory for patent law).

One way out of the written-description morass, then, is to reorient the doctrine away from the PHOSITA and towards domain outsiders: The written description requirement could demand that the specification communicate, in language comprehensible to domain outsiders, what the inventor thinks she has added to the domain.²⁶⁵ This would require the inventor to explain both what is already known in her domain and what she has contributed to it.²⁶⁶ Moreover, the specification could not rely on the PHOSITA's knowledge and skills to supplement its explicit disclosures—the required information would have to appear in the specification itself. Of course, the degree of technical sophistication demanded by written description would be lower than that demanded by enablement, in recognition of the distinct audiences to which they would be speaking and the distinct goals they would be meant to achieve.²⁶⁷

Such an approach would draw cleaner doctrinal lines between these two requirements. A specification that satisfied the enablement requirement would not necessarily satisfy the written description requirement—it might (1) explain to domain insiders how to make and use the invention but still

²⁶⁵ For an argument that we should abandon the PHOSITA perspective for claim construction, novelty, and infringement, but preserve it for the disclosure requirements, see Greg Reilly, *Rethinking the PHOSITA in Patent Litigation*, 48 *LOX. U. CHI. L.J.* 501, 531–33 (2016).

²⁶⁶ This kind of disclosure requirement would not be entirely alien to our patent system. Consider the following passage from the canonical case of *Merrill v. Yeomans*: A patent application must “describe that upon which [the applicant] . . . engrafts his invention, as well as the invention itself; . . . in every application for a patent, the descriptive part is necessarily largely occupied with what is not new, in order to an understanding of what is new.” *Merrill v. Yeomans*, 94 U.S. 568, 570 (1876). There is also an intriguing historical precedent for the intuition underlying this proposal. Among the reasons for the flowering of technological development in England in the 1700s was the Royal Society for Arts & Science’s “institutionalized recognition” of the work done by “otherwise scattered (and often rancorous) scientists and mathematicians.” Runco & Albert, *supra* note 34, at 7. The Royal Society required that members (1) present their work to all of the Society’s members; (2) publish only in the Society’s journal, *Philosophical Transactions*; (3) avoid idiosyncratic language; and (4) use notation that was comprehensible to all members. *Id.* In other words, the Royal Society’s disclosure requirements facilitated domain-crossing by ensuring that descriptions of new ideas and artifacts were comprehensible to domain outsiders.

²⁶⁷ Cf. Jeanne C. Fromer & Mark A. Lemley, *The Audience in Intellectual Property Infringement*, 112 *MICH. L. REV.* 1251, 1251 (2014) (arguing that IP infringement should be sensitive to differences between consumer and expert audiences); Mark D. Janis & Timothy R. Holbrook, *Patent Law’s Audience*, 97 *MINN. L. REV.* 72, 75 (2012) (arguing that the patent system ought to be reformed so that it communicates more effectively with the complex set of stakeholders that comprise its audience, including not only inventors, but also the patent bar, venture capitalists, managers, courts, the Patent Office, and others).

(2) not help domain outsiders distinguish the invention from what was already known. Similarly, a specification might plausibly describe to domain outsiders the state of the art and the inventor's contribution to it without adequately disclosing to domain insiders how they could make and use the invention themselves. As a doctrinal matter, the reformed written description and enablement requirements would not necessarily rise and fall together.

Moreover, this version of the written description requirement would serve the distinct normative aim of making domains more accessible to outsiders. A disclosure that met it would help domain outsiders understand what the invention is, which would help them decide whether it's worth learning how to make and use it. And because insiders in one domain are outsiders for most other domains, a reform along these lines would accordingly facilitate domain-crossing: A maker that has achieved the status of domain insider could rely on patent specifications to access the ideas and artifacts of the many other domains for which they remain an outsider.²⁶⁸

2. Copyright Law and Attribution Practices

Turn now to copyright law and the right of attribution. In many countries, formal legal rules grant makers the right to demand credit.²⁶⁹ In the United States, however, attribution

²⁶⁸ A proposal like this would add to the cost of obtaining patents, and it is unclear whether that additional cost would be justified. Compare Mark A. Lemley, Essay, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1496 (2001) (arguing that we should not devote more resources to evaluating patent applications because most patents turn out to be worthless, rendering it more efficient to rely on litigation to scrutinize the validity of the few patents that turn out to be valuable), with Michael D. Frakes & Melissa F. Wasserman, *Irrational Ignorance at the Patent Office*, 72 VAND. L. REV. 975, 975–76 (2019) (revisiting the rational ignorance thesis with newly-available data and concluding that society should invest more in patent examination). A variation on this proposal could demand that the written description requirement be met with a separate filing done concurrently with payment of required maintenance fees, at which point we can rely on the patentee's decision to pay the fee as a signal that the invention is sufficiently valuable as to justify incurring some additional cost. See Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521, 1525–26 (2005) (reporting results of empirical study showing that 53.71% of patentees “allow their patents to expire for failure to pay one of their maintenance fees”).

²⁶⁹ See Roberta Rosenthal Kwall, *Copyright and the Moral Right: Is an American Marriage Possible?*, 38 VAND. L. REV. 1, 7 (1985) [hereinafter Kwall, *American Marriage*] (explaining that the attribution right “safeguards a creator's right to compel recognition for his work and prevents others from naming anyone else as the creator”). Kwall here uses the formulation “right of paternity.” Consistent with contemporary usage, I refer instead to attribution or credit. Along with integrity and disclosure rights, attribution rights “form the backbone of moral rights

rights attach only to a small number of works under the Visual Artists Rights Act; outside of that context, credit is primarily a matter of industry-specific norms.²⁷⁰

Scholarly treatments of attribution focus on the makers who are responsible for the idea or artifact at issue. From a deontological perspective, attribution can vindicate a maker's "dignity and personality interests," which arise from the special relationship she has with the idea or artifact she makes;²⁷¹ from a utilitarian perspective, attribution can provide incentives to make ideas and artifacts because successful makers reap "economic and psychic" rewards from receiving credit for an idea or artifact.²⁷² Existing analyses, however, devote scant attention to how attribution affects makers other than the one associated with the idea or artifact at issue.²⁷³

doctrine." Roberta Rosenthal Kwall, *The Attribution Right in the United States: Caught in the Crossfire Between Copyright and Section 43(A)*, 77 WASH. L. REV. 985, 986 (2002) [hereinafter Kwall, *Attribution Right*].

²⁷⁰ 17 U.S.C. § 106A; Catherine L. Fisk, *Credit Where It's Due: The Law and Norms of Attribution*, 95 GEO. L.J. 49, 51 (2006) ("In the absence of law, economic sectors that value attribution have devised non-property regimes founded on social norms to acknowledge and reward employee effort and to attribute responsibility for the success or failure of products and projects."); see also Jane C. Ginsburg, *The Right to Claim Authorship in U.S. Copyright and Trademarks Law*, 41 HOUS. L. REV. 263, 279–86 (2004) (describing the limited attribution rights afforded by American copyright law); Rebecca Tushnet, *Naming Rights: Attribution and Law*, 2007 UTAH L. REV. 789, 789 (explaining that the Digital Millennium Copyright Act creates "some attribution-like rights").

²⁷¹ Kwall, *Attribution Right*, *supra* note 269, at 996.

²⁷² Fisk, *supra* note 270, at 57; see also Greg Lastowka, *Digital Attribution: Copyright and the Right to Credit*, 87 B.U. L. REV. 41, 42 (2007) (grounding attribution rights in "complex reputation-based interests of authors"). Relatedly, attribution can contribute to labor market efficiency by giving employers and other gatekeepers information about an author's human capital. John Tehranian, *Toward a New Fair Use Standard: Attribution Use and the Closing of Copyright's Crediting Gap*, 96 S. CALIF. L. REV. 1, 20 (2022) (explaining that attribution "provides actionable data about labor involved in the production of intellectual property"). Likely for some combination of these reasons, makers themselves care deeply about attribution. Christopher Sprigman, *Reform(aliz)ing Copyright*, 57 STAN. L. REV. 485, 565–66 (2004) (reporting that "Creative Commons data shows that almost all licensors (97%) require attribution in exchange for permission to use their works"). Attribution can also serve broader social functions, like making it easier for authorities to punish expression (think obscenity now or heresy in the past) or increasing the public legitimacy of intellectual property law (by aligning the system with public intuitions about fairness or by putting a human face on corporate political campaigns). Stephanie Plamondon Bair, *Rational Faith: The Utility of Fairness in Copyright*, 97 B.U. L. REV. 1487, 1519 (2017); Fisk, *supra* note 270, at 61–62.

²⁷³ To be clear, others have argued that ordinary readers rely on attribution to find ideas and artifacts of interest. The most notable example is Laura A. Heymann, *The Birth of the Authornym: Authorship, Pseudonymity, and Trademark Law*, 80 NOTRE DAME L. REV. 1377 (2005); see also Fisk, *supra* note 270, at 62–65

We have, accordingly, failed to appreciate the role of attribution in domain structure: Credit can guide a maker's search of the domain by tying together related ideas and artifacts. For any given idea or artifact, there are often several individuals who could plausibly be identified as a maker. Most obviously, films require contributions by directors, cinematographers, screenwriters, actors, editors, and others; similarly, songs reflect the work of vocalists, instrumentalists, composers, lyricists, engineers, mixers, producers, and others. The matter is made more complex by the fact that an idea or artifact might depend on an older one to such an extent that the individuals associated with the old idea or artifact should also be associated with the new one; consider a film based on a book or a song that samples an older one. Attribution practices operating against the backdrop of copyright law govern which of these many individuals actually have their names associated with the idea or artifact. And this can influence the direction of progress because a person interested in an idea or artifact by one maker may try to find other ideas and artifacts associated with that same maker.

As an illustration, consider a maker exploring popular music. She starts with *Hound Dog*, one of the earliest and biggest rock 'n' roll hits.²⁷⁴ Of the several individuals who could

(describing the "branding aspects of attribution"); Tushnet, *supra* note 270, at 791–92 (describing a "consumer-oriented rationale for attribution rights, treating authorship as a type of trademark and thus a consumer-protection device"). I depart from Heymann's analysis in two ways. First, I draw a sharper distinction between the large majority of consumers who will not generate works that are even plausibly subject to IP rights and the small minority who will become makers in the sense that I have been using that term. See Heymann, *supra*, at 1389 (describing the postmodern view of authorship "in which all writers are readers, all readers are writers, and the 'author' is simply the medium by which collective creation is presented"). As we'll see, this has important prescriptive implications. Second, and as a result of the first, I locate attribution squarely within the copyright regime; Heymann's analysis, meanwhile, locates it in trademark and related doctrines. See *id.* at 1412–32 (developing a theory of the authornym as a trademark). That said, I see my analysis as complementary to hers.

²⁷⁴ Presley's "Hound Dog" single, with "Don't Be Cruel" as the B-side, spent a then-record eleven weeks at number one. Gary Trust, *Here's Why Elvis Presley's Hot 100 History Doesn't Tell the Full Story*, BILLBOARD (June 23, 2022), <https://www.billboard.com/pro/elvis-presley-history-hot-100-before/> [<https://perma.cc/2EH4-RHFP>]. "Hound Dog" is also a prominent example of attribution problems. See Arewa, *supra* note 145, at 616–17 (identifying Presley's "break out hit 'Hound Dog'" as part of his "general pattern" of taking songwriting credits on songs written by Black songwriters and performed "by [B]lack artists for struggling independent labels") (quoting Bruce Tucker, "Tell Tchaikovsky the News": Postmodernism, Popular Culture and the Emergence of Rock 'N' Roll, 9 BLACK MUSIC RSCH. J. 271, 282 (1989)). The story was told so many times that the original performer—Willie Mae Thornton—became a symbol of "the ripped-off African

plausibly claim to be the song's maker, the one who has received the most credit is Elvis Presley.²⁷⁵ Our hypothetical maker might accordingly search the domain for other ideas and artifacts attributed to Presley—songs like *Heartbreak Hotel*, *It's Now or Never*, and *Can't Help Falling in Love*.

Presley, however, didn't make *Hound Dog* alone—his recording identified Jerry Leiber and Mike Stoller as the songwriters.²⁷⁶ So our hypothetical maker might also look for other songs credited to Leiber and Stoller. This would include other hits they wrote for Presley—*Jailhouse Rock* a notable standout—as well as Ben E. King's *Stand by Me*, The Coasters' *Yakety Yak*, and the Broadway standard *On Broadway*. Importantly, the ideas and artifacts our hypothetical maker might produce after following a path through the domain marked by Leiber and Stoller compositions would differ from the ones she would produce after following a path marked by Presley performances. Still, so long as both paths are reasonably available to her, so good.

Here's the thing, though: Leiber and Stoller didn't write *Hound Dog* for Presley—they wrote it for Willie Mae Thornton. Recording under the name “Big Mama,” Thornton had recently signed to Peacock Records when the producer Johnny Otis invited Leiber and Stoller to write songs for her.²⁷⁷ After watching Thornton rehearse, Leiber and Stoller drafted lyrics to suit what they perceived as her personality, using the term “hound dog” as a placeholder reference to a “no-account

American musician,” Maureen Mahon, *Listening for Willie Mae “Big Mama” Thornton's Voice: The Sound of Race and Gender Transgressions in Rock and Roll*, 15 *WOMEN & MUSIC: J. GENDER & CULTURE* 1, 4 (2011), while Presley's name became shorthand for “an overall pattern of cultural appropriation,” Kimberlé Crenshaw, *Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color*, 43 *STAN. L. REV.* 1241, 1288 n.161 (1991).

²⁷⁵ See Tyina Steptoe, *Big Mama Thornton, Little Richard, and the Queer Roots of Rock 'n' Roll*, 70 *AM. Q.* 55, 55 (2018) (“Thornton's name” was no longer the “one primarily associated with ‘Hound Dog’” after “Presley recorded a cover version that became a smash hit.”). It's still common enough to see people give Presley the lion's share of the credit for the song. See, e.g., David Williams, *The Daily Elvis: Big Mama, Bono, Superfoot and, Of Course, the King*, *MEMPHIS COM. APPEAL* (Aug. 14, 2017), <https://www.commercialappeal.com/story/entertainment/people/elvis-presley/2017/08/14/daily-elvis-big-mama-bono-superfoot-and-course-king/540053001/> [<https://perma.cc/F8PV-U3B4>] (asserting that even though the song “was first recorded” by Willie Mae Thornton, “the song is synonymous with Elvis” and dismissing as a “myth” the notion that “her original was superior to Elvis[s]”).

²⁷⁶ ELVIS PRESLEY, *HOUND DOG* (RCA Victor 1956).

²⁷⁷ *Valjo Music Publ'g Corp. v. Elvis Presley Music, Inc.*, 156 F. Supp. 568, 569 (S.D.N.Y. 1957).

man.”²⁷⁸ Thanks to an innovative instrumental arrangement and Thornton’s “commanding” vocal performance, the recording of that session made “an immediate splash”—Thornton’s *Hound Dog* reached number one on Billboard’s Rhythm & Blues chart, where it stayed for seven weeks.²⁷⁹

But unlike Leiber and Stoller, Thornton’s name appears nowhere on Presley’s recording. Indeed, between roughly 1960 and 2010, a maker who started with *Hound Dog* would have been unlikely to find Thornton; during that period, she was scarcely associated with the song at all.²⁸⁰ There is, then, a third potential path through the domain—a path we might define as works associated with Thornton’s *Hound Dog*—that our hypothetical maker would have been unlikely to find for decades.²⁸¹

The responsibility for closing it off, moreover, rests with copyright law, industry practices, and domain-maker-evaluator interactions. Despite the absence of a formal attribution right in American copyright law, the owner of the copyright in a musical work has leverage to demand some form of credit in exchange for authorizing others to reproduce the song.²⁸² The

²⁷⁸ See David Fricke, *Leiber and Stoller*, ROLLING STONE, April 19, 1990, at 97, 99; Mahon, *supra* note 274, at 10. From there, the development of the song gets a bit ambiguous; Thornton may have composed some of the music and lyrics too. In Otis’s lawsuit to establish his ownership of the song, the court noted that in a “song of this nature—described as a ‘rhythm and blues’ song—there is no written music”; instead, “the band in such a situation would provide a rhythmic background while the vocalist provided such melody as she chose.” *Valjo*, 156 F. Supp. at 569. For her part, “Thornton routinely asserted that she added improvised material” to the composition; however, she was “never able to establish [her] claims legally.” Mahon, *supra* note 274, at 8. To simplify the discussion, I am assuming here that she did not contribute to the melody or lyrics.

²⁷⁹ Mahon, *supra* note 274, at 8. Rhythm and blues “was a product of the Black experience in a segregated world and included influences from a number of sources, including Black gospel music, boogie-woogie, jump blues and electric instruments.” Arewa, *supra* note 145, at 615–16.

²⁸⁰ See Steptoe, *supra* note 275, at 55 (noting that Thornton’s association with the song ended after Presley’s recording).

²⁸¹ The path would likely include *Ball & Chain* (written and performed by Thornton before Janis Joplin recorded an adaptation with Thornton’s permission), Thornton’s Arhoolie Records albums with Buddy Guy and Muddy Waters, and perhaps Rufus Thomas’s *Bear Cat* (the most popular of the many *Hound Dog* answer songs recorded in the wake of Thornton’s chart-topper).

²⁸² Songs typically give rise to two copyrights—one in the musical work and the other in the sound recording. See *Recording Indus. Ass’n of Am. v. Libr. of Cong.*, 608 F.3d 861, 863 (D.C. Cir. 2010) (noting that most songs “embody two distinct copyrights”). Sound recording copyrights are limited to preventing others from using the same recording; they do not include the right to prevent others from making their own recording of the same sounds. *Id.* (explaining that a section 115 compulsory license permits an individual “to record and sell a cover

doctrinal question, then, is whether Thornton was as an author (hence, default owner) of the musical work *Hound Dog*. She was undoubtedly responsible for much of what is valuable in the original recording—enthusiastic reviews singled out features of her vocal performance for praise.²⁸³ But those elements of a song have long been excluded from the scope of copyright in a musical work.²⁸⁴ As a result, Thornton would not have been an author of *Hound Dog*, and she accordingly would have had no legal leverage to demand credit on Presley's recording.²⁸⁵

Turn now to the music industry's attribution practices. Although an artist like Presley recording a previously recorded song might be under no legal obligation to credit the original performer, it's easy enough to imagine a world in which he chose to do so. Songwriting credits are increasingly given to individuals for contributions that would not qualify them as authors of the musical work.²⁸⁶ Nevertheless, consistent with

version of Bruce Springsteen's 1975 hit *Born to Run*, but that licensee could not make copies of Springsteen's recording of that song and sell them"). The leverage, then, comes from the fact that the owner of the copyright in a musical work has the right to prevent others from making recordings without authorization; credit is often a condition of authorization. See Olufunmilayo B. Arewa, *A Musical Work Is a Set of Instructions*, 52 Hous. L. Rev. 467, 498 (2014) (explaining that infringement of a musical work focuses on "three principal notated musical features: melody, which is typically given primary consideration, and to a lesser extent harmony and rhythm"). Although, as in this instance, the actual negotiation for covers is typically handled by publishing companies, authorship status on the original is typically sufficient (if not necessary) to obtain the leverage required to demand songwriting credits in the artist's initial agreement with the publishing company; indeed, this is how Presley's recording ended up identifying Leiber and Stoller as the songwriters. See *Valjo*, 156 F. Supp. at 570 (describing publishing rights agreements that led Leiber and Stoller to receive songwriting credit on Presley's recording of *Hound Dog*).

²⁸³ *Billboard's* review gave the song an "excellent" rating, noting that the "vocal is outstanding"; *Cash Box* said that Thornton was "[e]asy when she should be easy, and driving when she has to bang it home." Mahon, *supra* note 274, at 8 (alteration in original).

²⁸⁴ Joseph P. Fishman, *Music as a Matter of Law*, 131 Harv. L. Rev. 1861, 1884–87 (2018) (describing traditional approach that excluded timbre from the scope of the musical work).

²⁸⁵ Even if she had it, it's not clear that she would have been able to effectively exercise it. See K.J. Greene, *Copyright, Culture & Black Music: A Legacy of Unequal Protection*, 21 Hastings Commc'ns & Ent. L.J. 339, 361 (1999) (documenting the history of racial exploitation in the music industry).

²⁸⁶ Indeed, Presley apparently demanded such credit at times. See *Dolly Parton Reflects on Her Greatest Moments*, COUNTRY MUSIC TODAY (July 7, 2006), <https://www.cmt.com/news/sgqdan/dolly-parton-reflects-on-her-greatest-moments> [<https://perma.cc/H3SM-D6W2>] (reporting that Dolly Parton refused to grant Presley a songwriting credit as a condition of Presley performing the song *I Will Always Love You*, which Parton had written). The more recent trend appears to be

industry practice at the time, Presley simply omitted Thornton's name from his recording. Compounding the problem: Presley refused to perform alongside Thornton or otherwise acknowledge her contribution to the song.²⁸⁷ Presley's choices thus weakened the association between Thornton and the song she first made famous.

Still, Presley did not act alone—consider the role of evaluators in constructing this domain. Faced with related ideas and artifacts made by Thornton and Presley (among others), evaluators could well have emphasized the debt that Presley's version of *Hound Dog* owed to Thornton. For decades, however, they chose to do the opposite, ignoring or downplaying Thornton's contributions while elevating Presley's.²⁸⁸

We can understand the resulting situation as an instance of domain ossification. Some evaluators, overwhelmed by the quantity of popular music recorded in the subsequent decades, simply credited the more famous maker with the song.²⁸⁹ Although Thornton's *Hound Dog* was a hit, Presley's was a much bigger one, in no small part because, as a white performer in

driven by some combination of norm entrepreneurs on social media and risk aversion in light of recent copyright infringement decisions. Charlie Harding & Nilay Patel, *Déjà Vu: Why Olivia Rodrigo Keeps Giving Up Songwriting Credits*, SWITCHED ON POP, at 53:37 (Sept. 21, 2021), <https://switchedonpop.com/episodes/deja-vu-olivia-rodrigo-copyright-decoder-good-4-u-paramore> [<https://perma.cc/2HWA-HWP8>]; James Gibson, *Risk Aversion and Rights Accretion in Intellectual Property Law*, 116 YALE L.J. 882 (2007) (describing how uncertainty and the potential of large litigation losses lead risk-averse individuals to obtain licenses even when IP law would not require them to do so). Of course, songwriting credits aren't free—they entitle the credited individual to publishing royalties, which can be substantial. See Charlie Harding & Emily Warren, *Pop's Worst Kept Secret ft. Emily Warren*, SWITCHED ON POP (June 22, 2021), <https://switchedonpop.com/episodes/pops-worst-kept-secret-emily-warren> [<https://perma.cc/382J-MXS6>] (describing efforts by songwriters to stop performers from demanding songwriting credits in order to obtain publishing royalties that traditionally went to those responsible for writing the music); cf. Jennifer E. Rothman, *The Questionable Use of Custom in Intellectual Property*, 93 VA. L. REV. 1899, 1971–72 (2007) (arguing that customs like those associated with attribution in French cuisine are “more worthy of consideration” when they are aspirational than when they are “motivated by litigation avoidance, relationship preservation, and other nonnormative considerations”).

²⁸⁷ See Mahon, *supra* note 274, at 10–11 (noting that “Presley's risk taking did not extend to acknowledging” Thornton and reporting Thornton's recollection that Presley refused an offer to perform together).

²⁸⁸ See Arnold Shaw, *Researching Rhythm & Blues*, 1 BLACK MUSIC RSCH. J. 71, 75 (1980) (citing influential sources from the 1960s and 1970s that “neglect[ed] . . . rock's black roots”). Shaw singles out “Greil Marcus's evaluation of Elvis Presley's debt to Arthur ‘Big Boy’ Crudup and Willie Mae ‘Big Mama’ Thornton” as “an instructive instance of depreciation.” *Id.* at 71.

²⁸⁹ Cf. Chu & Evans, *supra* note 208 (documenting this phenomenon in scientific domains).

the 1950s, he had access to a much larger audience than did Thornton.²⁹⁰ Other evaluators, driven more by racial or gender animus, chose to ignore Thornton's contribution on those grounds.²⁹¹ As a result, in 2004, Presley's *Hound Dog* landed at number 19 on *Rolling Stone's* list of the 500 greatest songs of all time; despite the crucial role she played in launching the rock 'n' roll genre, Thornton was not on the list at all.²⁹²

None of this means that copyright law must mandate effective attribution as a way to disrupt ossification. There are other relevant considerations too, like worsening the problem of overcomplexity that already plagues our copyright system.²⁹³ But it contributes to our understanding of the problem of attribution in three ways.

First, it answers an important objection to strengthening attribution rights: that doing so would be ineffective. As Rebecca Tushnet explains, consumers typically ignore disclosures of the sort proposed by audience-oriented proponents of attribution rights.²⁹⁴ But makers might care far more than consumers do about the sources of ideas and artifacts; makers therefore might plausibly pay attention to these attribution disclosures as they use an artifact to find other, related ideas

²⁹⁰ See, e.g., Shaw, *supra* note 288, at 77 (describing some of the obstacles black artists faced in reaching large audiences, including "the ban of R&B disks by major white stations, which contributed to the cover syndrome of 1955–56 and the white ripoff of black records").

²⁹¹ Cf. Mahon, *supra* note 274, at 1–2 (describing her "motivation for exploring Thornton's rock-and-roll legacy" as stemming "in part from a frustration with the marginal position [B]lack women occupy in mainstream histories of the genre" in "the 1990s," and the way that those "narratives position white male artists at the center of the story as the real rock and rollers and overlook [B]lack women's impact").

²⁹² *500 Greatest Songs of All Time (2004)*, ROLLING STONE (Dec. 11, 2003), <https://www.rollingstone.com/music/music-lists/500-greatest-songs-of-all-time-151127/smokey-robinson-and-the-miracles-shop-around-71184/> [<https://perma.cc/9H5Z-EVJ3>] (last visited Aug. 18, 2023). Leiber and Stoller themselves assert that Presley's recording

is *not* the record that should be celebrated. It should be Big Mama Thornton's record. *That's* the way it was conceived, and that's the way it was written It's an angry song for a woman who is really pissed off at her man, who played around on her. *He* was the dog. Elvis is singing it to a *real* dog. Which is not right at all.

Paul Zollo, *Behind the Song: "Hound Dog," by Leiber & Stoller*, AM. SONGWRITER, <https://americansongwriter.com/behind-the-song-hound-dog/> [<https://perma.cc/4S99-2244>] (last updated Oct. 18, 2021).

²⁹³ See Tushnet, *supra* note 270, at 816 (concluding that "a new, generalized attribution right [in] . . . American copyright law would be a mistake" because of the "additional complexity and uncertainty that would be generated").

²⁹⁴ *Id.* at 798–803.

and artifacts in the domain (even if ordinary consumers would ignore precisely the same disclosures).

Second, the analysis reveals that there is an important social interest at stake in attribution that existing analyses overlook: the social interest in the direction of subsequent progress in the relevant domain. The path of progress in music was influenced in some way by Presley's prominence and Thornton's erasure. We cannot, of course, chalk this up entirely to attribution. Still, we can at least more modestly conclude that private ordering through voluntary exchanges between makers and gatekeepers will not necessarily lead to desirable attribution practices because those exchanges will not account for the interests of third parties who would benefit from the domain following one or another potential path in the future. That should move us in favor of attribution-enhancing proposals that rely on involuntary mechanisms, like fair use, and away from those relying on voluntary mechanisms, like waivable contractual defaults.²⁹⁵

Finally, the analysis also reveals that there is an underappreciated channel by which we might respond to attribution problems: evaluators. IP might influence who becomes an evaluator—recall that one pathway to the social influence required to be an evaluator is the success of a person's own prior contributions. As some scholars have argued, IP might make it easier for diverse makers to achieve such success.²⁹⁶ And the identity of evaluators can matter—over the past two decades, diverse evaluators have restructured the domain of popular music to accord greater prominence to the black and female artists whose contributions were long overlooked.²⁹⁷

That restructuring has included a reassessment of Thornton's contributions—she now regularly receives credit for “Hound Dog.” Indeed, in 2021, seventeen years after the

²⁹⁵ Compare Fisk, *supra* note 270, at 112 (proposing a “right of attribution vis-à-vis the public [that] would be waivable”), with Tehranian, *supra* note 272, at 56–65 (proposing that attribution be incorporated into the fair use analysis).

²⁹⁶ See Justin Hughes & Robert P. Merges, *Copyright and Distributive Justice*, 92 NOTRE DAME L. REV. 513, 555 (2016) (making this argument in the context of copyright law); Peter Lee, *Toward a Distributive Agenda for U.S. Patent Law*, 55 HOUS. L. REV. 321, 331–32 (2017) (making this argument in the context of patent law); *but see* Bair, *supra* note 13 (arguing that the psychological impact of poverty impedes creativity).

²⁹⁷ See Mahon, *supra* note 274, at 2–3 (summarizing work that “put[] [B]lack women back into the rock-and-roll narrative,” and noting that Thornton is “typically placed at the beginning and grouped among women identified as influential forerunners”).

original, *Rolling Stone* published a new list of the 500 greatest songs of all time. On this list, Presley's *Hound Dog* doesn't make the cut at all; in its place is Thornton's version.²⁹⁸ Well, almost in its place—since it was associated with Thornton rather than Presley, *Hound Dog* fell a mere 299 spots to number 318 overall.

CONCLUSION

Right, so then: the bicycle. I haven't yet offered a solution to the puzzle posed at the outset. But law professors often don't ask questions because we want the answers; instead, we ask them because they can shed light on the analytical tools we use to answer a class of questions. In that spirit, the bicycle question emphasized the inadequacy of the traditional tool IP scholars use to answer questions regarding technological and cultural progress. And the remainder of this Article showed that the ecosystem model offers a compelling alternative framework for answering at least some of those questions.

That said, I owe readers an explanation for another puzzle, the one raised by the punctuation in the Article's title: *The Law of Creativity*? Although there are good reasons to use creativity as an organizing framework for studying IP—including but not limited to the influence of the concept of creativity on IP jurisprudence—there are also reasons for skepticism. In particular, we might doubt that IP could have a meaningful effect on the psychological and social determinants of creativity.²⁹⁹

The question, then, is whether IP ought to be framed as the law of creativity. The ecosystem model can inform our answer to that question. Like all models, it's wrong in many relevant ways. But it can still be useful.³⁰⁰ Although philosophers of science have yet to pin down precisely why models work, it's hard

²⁹⁸ *The 500 Greatest Songs of All Time*, ROLLING STONE (Sep. 15, 2021), <https://www.rollingstone.com/music/music-lists/best-songs-of-all-time-1224767/> [<https://perma.cc/Y987-S3UK>].

²⁹⁹ See Cohen, *supra* note 15, at 1193 (concluding that her model “suggest[s] a much more modest conception of the role that copyright plays in stimulating creative processes and practices”).

³⁰⁰ For the quantitatively-minded, see G. E. P. Box, *Robustness in the Strategy of Scientific Model Building*, in ROBUSTNESS IN STATISTICS 201, 202 (Robert L. Launer & Graham N. Wilkinson eds., 1979) (“ALL MODELS ARE WRONG BUT SOME ARE USEFUL.”). For those of a more literary bent, see JORGE LUIS BORGES, *On Exactitude in Science*, in COLLECTED FICTIONS 325, 325 (Andrew Hurly trans., Penguin Books 1998).

to dispute that they do.³⁰¹ And among other possible functions, models help organize our observations of phenomena—they tell us which features of the world to look at and which ones to ignore. The test, then, of the framework I’ve offered here will come as we use it to study the influence of intellectual property on technological and cultural progress. Insofar as that work is yet to be done, the question implied by the title remains: What is IP good for?

³⁰¹ For an introduction to the literature, see Roman Frigg & Stephan Hartmann, *Models in Science*, STAN. ENCYCLOPEDIA PHIL., <https://plato.stanford.edu/entries/models-science/> [<https://perma.cc/SE3X-H8PB>] (last updated Feb. 4, 2020).