

MAKING SENSE OF LEGAL DISRUPTION

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INTRODUCTION

What does it mean for technology to disrupt law? Several possibilities come to mind. The first is that disruption refers to reshuffling some feature of the prevailing social order, destabilizing the balance of power and rights under prior law.¹ Social impacts like these are instrumental to legal disruption—they often precipitate legal action to reverse or entrench the new status quo—but focusing on social impacts tells us little about the role or response of law itself.

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¹ See Part I.A *infra*.

The second possibility is disruption in the sense of challenging and changing substantive legal doctrine.² This is perhaps the most popular and intuitive usage, and certainly a core concern for legal scholars. To define disruption this way, however, sweeps in too much. Change is an expected feature of a functional legal system rather than an indicator of anything remarkable. One might try to reserve the disruption label for particularly sudden changes or difficult doctrinal problems, but this solution invites further line-drawing questions. This framing of legal disruption is also incomplete: it begs for an account of why some doctrinal challenges prove more difficult than others.

This essay introduces a third possibility grounded in institutional analysis.³ By this account, legal disruption arises when technological change presents problems that are difficult to resolve through standard processes of making, enforcing, and updating the law.⁴ It arises fundamentally from the mismatch between the questions presented and the capabilities of existing legal institutions along the dimensions of authority, competence, and legitimacy.⁵ This account of disruption provides a schema for understanding how the difficulty of resolving techlaw problems extends beyond questions at the level of doctrine.

The legal system can often muddle through difficult questions for a time. The accumulation of intractable problems and unsatisfactory answers may, however, prompt structural changes to the legal system. These changes sometimes lead to disruption in a fourth sense: institutional disruption.⁶ Institutional disruption follows when the reconfiguration or replacement of legal institutions raises further systemic problems—for example, where privatization of government functions undermines the system’s legitimacy. These transformations are typically adopted in the guise of addressing

² See Part I.B *infra*.

³ See Part II.A *infra*. The institutions under study here include conventional institutions like courts, legislatures, and agencies as well as the processes for creating, enforcing, or updating rights and obligations, including traditional processes like legislation and contracting as well as newer ones like algorithmic decision-making. See Julie E. Cohen, *From Lex Informatica to the Control Revolution*, 36 BERKELEY TECH. L.J. 1017, 1022 (2021).

⁴ BJ Ard, *Law of Disruption* 8–11 (Apr. 17, 2015) (unpublished manuscript) (surveying characteristics of technology that may disrupt the lawmaking process).

⁵ Rebecca Crotoft & BJ Ard, *Structuring Techlaw*, 34 HARV. J.L. & TECH. 347, 376–77 (2021) (delineating these factors as drivers of institutional uncertainty).

⁶ Ard, *supra* note 4, at 2. See also Margot Kaminski, *Legal Disruption: How Technology Disrupts the Law* 20–23 (Mar. 14, 2017) (unpublished manuscript) (identifying institutional disruption in the line-drawing battles where technologies expose gaps or overlaps in the jurisdiction of regulatory institutions).

apparent deficiencies in prior institutional arrangements, but they are also propelled by currents in the wider political economy.⁷ I argue that disruption in the third and fourth sense characterizes the problems of greatest concern in technology law and regulation.

The discussion proceeds in three parts. Part I situates the discussion against prior scholarship exploring substantive disruption at the social and doctrinal levels. Part II develops the institutional account of legal disruption using examples from privacy and copyright, two bodies of law commonly associated with disruption. The institutional account explains that legal disruption results when technological change presents questions beyond the capabilities of existing institutions. The institutional account also allows us to recognize institutional disruption, where institutional transformations pose new challenges to the legal system's capabilities. Part III surveys the emerging techlaw literature to show that, although overt references to these types of disruption are rare, institutional capabilities and reconfigurations are core concerns in the ongoing discussion.

I. SUBSTANTIVE LEGAL DISRUPTION

Prior techlaw scholarship has laid the foundations for studying technology's implications for legal change through its substantive impact. Technology may demand a legal response when it removes constraints, restructures power relations, or otherwise destabilizes the balance of interests the law was previously calibrated to achieve. At the level of doctrine, technological change may undermine assumptions integral to the law's coherence, blurring familiar categories or even inviting reexamination of the goals motivating the law. Importantly, these prior accounts demonstrate that substantive legal disruption does not follow from any feature inherent to technology per se. Instead, it emerges from the interaction of technology as actually used with features of the existing legal system.

A. *Social Impact*

A substantial body of scholarship explores how technology impacts law and society by changing constraints on behavior. Larry Lessig's model of regulation as the culmination of four modalities—

⁷ See Cohen, *supra* note 3, at 1023–24. These transformations may sometimes be propelled by the affordances of technology apart from any legal questions they pose. Information technologies, for example, have reshaped the operations and ideology of governance in ways that present deep questions for institutional capabilities. See *id.* at 1022–23.

law, norms, the market, and architecture—is a prominent example.⁸ Technological change can bolster or diminish any of these constraints, and substantive law may be rendered ineffective to the extent its framers designed it to operate alongside a particular equilibrium among these constraints.⁹ Transportation technologies like the automobile, for example, diminished the power of social norms by allowing individuals to escape the proximity of family, neighbors, and related social institutions that might otherwise enforce traditional mores.¹⁰ Over a century later, GPS tracking of cars diminished the cost, and thereby the economic constraints, of police surveillance because it was an order of magnitude cheaper than tailing a suspect in person.¹¹ The resulting changes in the frequency or degree of the resulting conduct gives rise to complaints by those affected, especially in scenarios where the law implicated no longer achieves its ostensible purposes.¹² When disruption is framed this way, discussion of law’s role typically hews to the question of whether law should intervene to restore the prior status quo.¹³ Disruptive technologies more generally—those that disrupt industries rather than law, per se—implicate the same question:

⁸ LAWRENCE LESSIG, CODE: VERSION 2.0 122–25 (2006). See also Joel R. Reidenberg, *Lex Informatica: The Formulation of Information Policy Rules Through Technology*, 76 TEX. L. REV. 553 (1997); Harry Surden, *Structural Rights in Privacy*, 60 SMU L. REV. 1605 (2007); Justin (Gus) Hurwitz, The Technological Problem of Social Cost (Aug. 16, 2016), available at <https://ssrn.com/abstract=2757358>. For criticism of Lessig’s account for failure to grapple with deeper challenges that technological change may pose for society and its values, see Frank Pasquale & Arthur J. Cockfield, *Beyond Instrumentalism: A Substantivist Perspective on Law, Technology, and the Digital Persona*, 2018 MICH. ST. L. REV. 821, 841–44.

⁹ Ard, *supra* note 4, at 5.

¹⁰ See BJ Ard & William J. Novak, *Foreword: Willard Hurst’s Unpublished Manuscript on Law, Technology, and Regulation*, 2022 WIS. L. REV. 444, 454–55.

¹¹ See Kevin S. Bankston & Ashkan Soltani, *Tiny Constables and the Cost of Surveillance: Making Cents Out of United States v. Jones*, 123 YALE L. J. ONLINE 335, 350 (2014).

¹² Hin-Yan Liu, Matthijs Maas, John Danaher, Luisa Scarcella, Michaela Lexer & Leonard Van Rompaey, *Artificial Intelligence and Legal Disruption: A New Model for Analysis*, 12 L. INNOV. & TECH. 205, 224 (2020) (identifying “disruptive moments” where technologies unlock new affordances, those affordances are actualized, and the legal system identifies the behavior as a problem).

¹³ See LESSIG, *supra* note 8, at 157–68 (describing this as a process of “translation”); Orin Kerr, *An Equilibrium-Adjustment Theory of the Fourth Amendment*, 125 HARV. L. REV. 476 (2011) (developing this perspective in detail).

parties threatened by changes to the status quo often spur new legal developments by petitioning for protectionist interventions.¹⁴

Jack Balkin offers a different angle for considering technology's impact. Rather than modeling the abstract modalities a technology may unsettle, he directs us to identify which features of the social order a technology makes newly salient.¹⁵ This may well be removal of a constraint: the internet's capacity to reduce the costs of coordinating software development facilitated open-source software development and attendant questions for law and policy.¹⁶ Or it might be a recurring pattern, like the substitutionary effects that AI and robotics promise to have across contexts, and the ensuing legal questions that arise in, say, employment and copyright law as robots displace workers in creative roles.¹⁷ This approach to assessing social impact may call to mind a wider array of legal and policy responses than the return to a prior status quo.

These frameworks were articulated largely without recourse to the terminology of disruption, but they speak to an important precondition to legal disruption. As Balkin observes in another context, when a force of change “disrupts the social order, it also disturbs the law’s connection to that order, and, in time, brings about legal change.”¹⁸ Interested parties take advantage of that moment of uncertainty in how the law applies—and how it *should* apply—to argue for changes in legal doctrine.¹⁹

B. Doctrinal Impact

Countless law review articles have invoked disruption to describe the process whereby new technologies unsettle existing law

¹⁴ See Mark A. Lemley & Mark P. McKenna, *Unfair Disruption*, 100 B.U.L. REV. 71, 75 (2020) (“[M]any IP, unfair competition, and related cases are really about whether competition from new players can force incumbents to change their business models.”); Sepehr Shahshahani, *The Role of Courts in Technology Policy*, 61 J.L. & ECON. 37, 56–58 (2018) (arguing courts should side with the more resource-constrained party—usually the newcomer—to counteract this tendency).

¹⁵ Jack M. Balkin, *The Path of Robotics Law*, 6 CALIF. L. REV. CIR. 45, 46 (2015).

¹⁶ *Id.* at 48.

¹⁷ *Id.* at 58.

¹⁸ Jack M. Balkin & Reva B. Siegel, *Principles, Practices, and Social Movements*, 154 U. PENN. L. REV. 927, 946 (2006) (assessing the impact of political mobilization). See also Margot E. Kaminski, *Technological “Disruption” of the Law’s Imagined Scene: Some Lessons from Lex Informatica*, 36 BERKELEY TECH. L. J. 882, 886 (2021) (extending Balkin and Siegel’s article to develop an account of legal disruption grounded in “‘disruption’ of the law’s imagined scenes—the paradigmatic cases that judges and regulators use to evaluate and interpret the law”).

¹⁹ See Balkin & Siegel, *supra* note 18, at 946–49.

and force courts and lawmakers to reexamine legal doctrine.²⁰ The mere fact of doctrinal change, however, is unremarkable. The interesting work on this facet of legal disruption has probed deeper into what it is about technology that poses substantive challenges for law.

Balkin's salience inquiry provides a starting point: technological change often raises substantive legal questions because it undermines key assumptions of existing law, rendering it unclear or ineffective.²¹ For a straightforward example, consider the host of automotive safety regulations premised on operation by a human driver.²² The advent of autonomous vehicles simultaneously undermines this premise while rendering it newly salient. Laws for airbag placement or truckers' sleep breaks may become superfluous or counterproductive for promoting safety as applied to vehicles without human operators.²³

An important lesson that has emerged from the study of how technology undermines doctrinal assumptions is that disruption is a two-way relationship. As Margot Kaminski explains, it is tempting but incomplete to attribute disruption to the inherent features of a new technology.²⁴ The conflict depends just as much on the features of existing law.²⁵ Kaminski offers examples from algorithmic authorship.²⁶ Consider the question of whether a novel written by an algorithm constitutes "speech" for First Amendment purposes. Supreme Court precedent directs us to answer the question by reference to whether the speaker intended to convey a message.²⁷ A work of algorithmic authorship would disrupt the doctrinal test for whether something constitutes speech if we took the doctrine's "intent" requirement literally—the absence of a sapient author would preclude any possible intent.²⁸ Kaminski explains that disruption does not follow, however, because the legal test, as actually applied by courts, inquires not into the author's intent but instead into the audience's understanding.²⁹ Whether the novel is

²⁰ See Margot E. Kaminski, *Authorship, Disrupted: AI Authors in Copyright and First Amendment Law*, 51 U.C. DAVIS L. REV. 589, 589–90 (2017) (collecting examples).

²¹ Balkin, *supra* note 15, at 50.

²² See Crootof & Ard, *supra* note 5, at 372.

²³ *Id.*

²⁴ Kaminski, *supra* note 20, at 591.

²⁵ *Id.*

²⁶ *Id.* at 609.

²⁷ *Id.*; see *Spence v. Washington*, 418 U.S. 405, 410–11 (1974).

²⁸ Kaminski, *supra* note 20, at 609.

²⁹ *Id.*

written by human or machine—and whether a machine can form intent—is thus beside the point under current doctrine.

More challenging questions often present themselves when a technology does not fit easily within an existing framework.³⁰ New technologies regularly blur existing categories or sidestep the regimes we would ordinarily look to for answers.³¹ Regulators have puzzled, for example, over whether to treat a cryptocurrency like Bitcoin as a commodity or security, leaving us to resolve indeterminacies in existing classifications.³² Or consider the struggle to reconcile 3D-printed guns with the existing gun-control regime. The existing regime is premised on a hypothetical point of sale that may not exist for a home-manufactured gun, leaving the law ineffective once this premise gives way.³³ As the next Part argues, however, the difficulty of the resulting legal questions is not strictly a function of the conflict between technological change and the assumptions of existing law. Rather, the difficulty ultimately depends on whether existing institutions are equipped to resolve the conflict.

II. AN INSTITUTIONAL ACCOUNT OF LEGAL DISRUPTION

Social impact and doctrinal challenges tell only part of the story of legal disruption. Technological change sometimes also disrupts the processes for making, enforcing, and updating the law. As with doctrinal disruption, disruptions of this sort do not arise from features of the technology or the legal system standing alone, but from the mismatch between the questions presented and the capabilities of existing institutions.

³⁰ Of course, defining disruption to include any attempt to categorize technology would effectively encompass all techlaw disputes. Crootoof & Ard, *supra* note 5, at 356–57 (situating this larger set of questions within a taxonomy of legal *uncertainties* rather than *disruptions*). For the category to have meaning, it must be limited to a subset of more challenging questions. Kaminski explains that this difficulty can vary at the substantive level, where greater doctrinal disruption occurs when technology requires us to move beyond merely “tweaking the doctrine” to reconsider deeper assumptions and theories underlying a body of law. Kaminski, *supra* note 20, at 602–04.

³¹ Ard, *supra* note 4, at 6 (“[T]his disruption arises not from changing costs per se but because practices change so that they are not readily cognizable under existing legal schemas.”); Kaminski, *supra* note 6, at 14.

³² Crootoof & Ard, *supra* note 5, at 363. *See also id.* at 352–53 (classifying these indeterminacies as application uncertainties).

³³ *Id.* at 360–61. *See also id.* at 352–53 (classifying these effectiveness questions as normative uncertainties).

A. Institutional Capabilities

Standard legal processes are disrupted when technological change presents problems that outstrip the capabilities of existing institutional configurations. Assessing these capabilities requires attending to questions of authority, competence, and legitimacy.³⁴

Authority is the most straightforward. It requires identifying whether the institution charged with regulating a technology has the formal or de facto power to address the impacts of technological change, usually by creating, enforcing, or updating the affected parties' obligations.³⁵ Courts have authority to hear most cases involving new technologies so long as there is a cognizable cause of action. That caveat may pose an obstacle if the harms posed by a technology are sufficiently novel; judicial refusal to recognize some breaches of privacy as harms for the purpose of standing has left aggrieved parties without recourse.³⁶ New communications and transportation technologies have also frequently raised questions of jurisdiction following the proliferation of greater cross-border conduct.³⁷ Technologies that span different institutions' regulatory mandates (GMOs, for example, implicate both the EPA's and FDA's authority³⁸) or skirt established regulatory categories (as Uber has attempted to do by distancing itself from taxi regulations³⁹ and employer-employee obligations⁴⁰) also pose questions for existing institutions' authority. As private firms have taken on

³⁴ See Crootof & Ard, *supra* note 5, at 367–77.

³⁵ See *id.* at 377–78; Kaminski, *supra* note 6, at 20–23 (identifying similar jurisdictional questions as indicators of institutional disruption).

³⁶ JULIE E. COHEN, BETWEEN TRUTH AND POWER: THE LEGAL CONSTRUCTIONS OF INFORMATIONAL CAPITALISM 147–49 (2019); see *Spokeo, Inc. v. Robins*, 578 U.S. 330, 339–43 (2016).

³⁷ It is no accident that the *Erie* doctrine arose in the context of the railroad. See *Erie Railroad Co. v. Tompkins*, 304 U.S. 64 (1938). Meanwhile, questions of internet jurisdiction that flummoxed late 20th century courts, compare, e.g., *CompuServe, Inc. v. Patterson*, 89 F.3d 1257 (6th Cir. 1996) (transmission of software from Texas to servers in Ohio from which software was subsequently advertised and sold sufficient for jurisdiction in Ohio) with, e.g., *Cybersell, Inc. v. Cybersell, Inc.*, 130 F.3d 414 (9th Cir. 1997) (passively advertising on the internet insufficient for jurisdiction in Arizona), persist even two decades later. See *Microsoft Corp. v. United States*, 138 S. Ct. 1186 (2018) (addressing the application of U.S. law to data stored on servers outside the United States).

³⁸ Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23,302 (June 26, 1986).

³⁹ See Katrina M. Wyman, *Taxi Regulation in the Age of Uber*, 20 LEG. & PUB. POL'Y 1 (2017).

⁴⁰ See Charlotte S. Alexander & Elizabeth Tippet, *The Hacking of Employment Law*, 82 MO. L. REV. 973 (2017).

greater de facto lawmaking and adjudicatory power, they have also asserted authority of their own.⁴¹

The competence of institutions has been a concern since at least the days of Legal Process Theory.⁴² Within this framework, courts were thought to be suited to reasoned elaboration of established principles; the elected branches to making policy on contested issues, subject to the constraints of democratic accountability; and administrative agencies to pragmatic decision-making on the basis of subject matter expertise.⁴³ Sometimes competence may be tested by the sheer technical complexity of new developments. But often the problem arises because new technologies blur established categories and present questions in unanticipated contexts,⁴⁴ putting courts in positions that require some degree of subject matter expertise and agencies in situations where policy decisions—even if disclaimed—are unavoidable.⁴⁵ Further complications have arisen in contexts where new technologies have been designed to be intentionally opaque and where the law has upheld their secrecy.⁴⁶

Taking established institutions outside the bounds of their competence also creates problems for legitimacy because the traditional Legal Process framework was one that closely tied competence and legitimacy: a legal decision was entitled to deference to the extent it reflected a given institution’s comparative

⁴¹ See COHEN, *supra* note 36, at 204.

⁴² See generally HENRY M. HART, JR. & ALBERT M. SACKS, *THE LEGAL PROCESS: BASIC PROBLEMS IN THE MAKING AND APPLICATION OF THE LAW* (William N. Eskridge & Philip P. Frickey eds., 1994). See also NEIL K. KOMESAR, *IMPERFECT ALTERNATIVES* (1994) (emphasizing the comparative dimensions of institutional analysis).

⁴³ HART & SACKS, *supra* note 42, at 145–52, 164–66. One might say “we are all process theorists now.” Cf. Harvard Law School, *The Antonin Scalia Lecture Series: A Dialogue with Justice Elena Kagan on the Reading of Statutes*, YOUTUBE (Nov. 25, 2015) <https://www.youtube.com/watch?v=dpEtszFT0Tg> (declaring “we are all textualists now”). While Hart and Sacks are seldom expressly invoked, their conception of comparative institutional competence, particularly the importance of expertise to the competence and legitimacy of the administrative state, continues to inform contemporary techlaw debates. See, e.g., Ryan Calo & Danielle Keats Citron, *The Automated Administrative State: A Crisis of Legitimacy*, 70 EMORY L. J. 797, 844 (2021) (explaining how the rise of automation—with the ensuing loss of expertise, discretion, and flexibility—“undermine[s] the very qualities that justify agencies to begin with”).

⁴⁴ See *supra* note 31 and accompanying text.

⁴⁵ See COHEN, *supra* note 36, at 170–73.

⁴⁶ See Hannah Bloch-Wehba, *Access to Algorithms*, 88 FORDHAM L. REV. 1265, 1290–92 (2020); Rebecca Wexler, *Life, Liberty, and Trade Secrets: Intellectual Property in the Criminal Justice System*, 70 STAN. L. REV. 1343, 1346 (2018).

competence.⁴⁷ The delegation of greater authority to private actors via new institutional configurations also raises concerns.⁴⁸ These delegations may be appealing in the face of increasing technical complexity insofar as industry actors are likely to possess subject matter expertise in their field.⁴⁹ But another feature of the Legal Process account is that it ties legitimacy to the checks and balances associated with specific institutional roles.⁵⁰ The lack of meaningful checks by disinterested parties thus raises legitimacy concerns when legal regimes move toward industry self-regulation.⁵¹

These criteria—authority, competence, and legitimacy—have implications for disruption in two different senses. First, they have explanatory power for why some technologies are disruptive in what I called out in the introduction as the “third sense,” presenting questions that are difficult for the legal system to dispose of through standard processes. Even the thorniest doctrinal question would be of no moment if the legal system could immediately update the law to address any indeterminacy or changed circumstances; the technological changes that present the greatest challenges are those that expose the system’s inability to update the law effectively. Second, they provide a framework to assess the disruption in the “fourth sense”: institutional disruption. I do not identify institutional change on its own as disruption—like doctrinal change, institutional change should be expected from a functional legal system. Instead, I reserve the term institutional disruption for the further problems of authority, competence, and legitimacy that sometimes result from institutional change. To make these points more concrete, consider the following examples from privacy and copyright law.

B. *Disruption in Fourth Amendment Law*

Technological change has repeatedly posed new questions for the courts with respect to application of the Fourth Amendment. These technologies engender public concern because of their social impacts (disruption in the first sense).⁵² Tools employed by the

⁴⁷ HART & SACKS, *supra* note 42, at 163–65.

⁴⁸ See COHEN, *supra* note 36, at 187–89.

⁴⁹ See Calo & Citron, *supra* note 43, at 833 (observing that “contractors—whether technically public or private employees—are capable of acting as repositories of expertise”).

⁵⁰ HART & SACKS, *supra* note 42, at 163–65.

⁵¹ See Cohen, *supra* note 3, at 1046–49.

⁵² See Part I.A *supra*.

police, like aerial photography,⁵³ infrared cameras,⁵⁴ and various location-tracking technologies⁵⁵ have had the effect of diminishing privacy by removing physical barriers and cost constraints.⁵⁶ Meanwhile, the introduction of technologies like the telephone, automobile, and encryption have arguably made it easier to plan or execute criminal activity outside the reach of law enforcement.⁵⁷ The courts have been called upon repeatedly to mediate these shifts in the capabilities of law enforcement and the consequences for the wider public's privacy rights relative to the state.

The difficulty of these questions is in part a function of the mismatch between the assumptions of existing doctrine and the realities of new search technologies (disruption in the second sense).⁵⁸ The fundamental Fourth Amendment question has remained the same: the courts must make a binary decision on whether specific police conduct constitutes a search that is unlawful without a warrant. Beyond generating new fact patterns, however, new technologies have prompted courts to rethink what constitutes the paradigmatic search. The paradigmatic search at the time of the founding was largely coextensive with trespass; courts could therefore determine whether a Fourth Amendment violation took place by reference to the common law of trespass.⁵⁹ Telephone wiretaps required a different rule. Police could accomplish a wiretap without so much as touching a suspect's property, yet it was apparent that such surveillance was subject to abuse. The Supreme Court thus fashioned the principle that the Fourth Amendment protects one's reasonable expectations of privacy⁶⁰ as well as the third-party doctrine, which establishes that one has no reasonable expectation of privacy in information turned over to a third party,⁶¹ as new guideposts for adjudicating Fourth Amendment rights.

Though it has long been controversial, the third-party doctrine itself has been under fire in recent years owing to further technological developments. Many people now share a constant stream of intimate data with their smartphone service providers, with innumerable app providers, and with the manufacturers of their

⁵³ *E.g.*, *California v. Ciraolo*, 476 U.S. 207 (1986).

⁵⁴ *Kyllo v. United States*, 533 U.S. 27 (2001).

⁵⁵ *E.g.*, *United States v. Jones*, 565 U.S. 400 (2012).

⁵⁶ Surden, *supra* note 8, at 1617.

⁵⁷ Kerr, *supra* note 13, at 487.

⁵⁸ See Part I.B *supra*.

⁵⁹ *Jones*, 565 U.S. at 405; LESSIG, *supra* note 8, at 158.

⁶⁰ *Katz v. United States*, 389 U.S. 347 (1967); *Smith v. Maryland*, 442 U.S. 735 (1979).

⁶¹ *United States v. Miller*, 425 U.S. 435, 443 (1976).

fitness trackers and other internet-of-things devices.⁶² The Supreme Court's decisions in *Riley* and *Carpenter* to require a warrant to search a cell phone or obtain phone GPS data may represent a partial recognition of how the third-party doctrine, as traditionally conceived, would swallow any expectation of privacy under the Fourth Amendment in the face of contemporary data flows.⁶³

The difficulty of these questions is also in significant part a function of the capabilities and constraints of the courts as the institutions tasked with answering them (approaching disruption in the third sense).⁶⁴ Fourth Amendment questions are fundamentally about values and policy. Courts are at the height of their competence when they extract, extend, and elaborate on the settled policy judgments embedded in legislative enactments or societal consensus.⁶⁵ But technological change may lead to questions where there is no such guidance. Police use of GPS tracking, for example, makes following a suspect cheaper and thereby removes a de facto constraint on the scope of police surveillance.⁶⁶ We lack consensus on how to think about these technologies because, while these constraints were in place, there was no need for serious deliberation on whether limits should attach to police monitoring of a suspect's movements on public roads. The reason these questions are difficult is not that the technologies are new or difficult to understand, nor even that they require rethinking the paradigmatic search; these questions are hard because technological change has put the courts in the position of making policy around fast-moving developments on unsettled policy questions.

This is not to say, however, that these technologies necessarily disrupted the processes of enforcing and updating Fourth Amendment law. We may scrutinize whether an institution like the judiciary faces greater difficulty answering particular types of questions—we may even be able to explain why these questions are hard by reference to the limits of that institution—without concluding that these questions have rendered standard processes ineffective. Institutional analysis is nonetheless fundamental to understanding legal disruption, even at the substantive level,

⁶² See Note, *If These Walls Could Talk: The Smart Home and the Fourth Amendment Limits of the Third Party Doctrine*, 130 HARV. L. REV. 1924, 1939–42 (2017).

⁶³ See *Riley v. California*, 573 U.S. 373 (2014); *Carpenter v. United States*, 138 S. Ct. 2206 (2018).

⁶⁴ See Part II.A *supra*.

⁶⁵ See *supra* note 43 and accompanying text.

⁶⁶ Bankston & Soltani, *supra* note 11, at 350.

because the ultimate question is whether the institutions with authority to address these matters have the full complement of capabilities needed to actually address them. Indeed, the following discussion of copyright shows that misalignment between emerging developments and extant institutions may boil over into disruption even in the absence of doctrinal foment.

C. Disruptive Impact of Filesharing

It has become cliché to observe that peer-to-peer filesharing disrupted copyright. The technology undoubtedly rendered copyright law less effective by making copying much more accessible than contemplated under prior legal and economic arrangements (disruption in the first sense).⁶⁷ To the extent it disrupted law, though, it is not because it raised difficult questions or prompted transformation at the level of substantive copyright doctrine (disruption in the second sense).⁶⁸ The extension of pre-digital copyright law to Napster and its progeny was doctrinally straightforward. Rather, filesharing demonstrated the limits of the judicial system as a means for addressing widespread infringement (disruption in the third sense)⁶⁹ and expedited the development of alternative institutional configurations that compounded concerns with the legitimacy of decision-making in this space (disruption in the fourth sense).⁷⁰

The social impacts are clear from the vantage of the copyright industries, particularly the recording industry. Before filesharing, the industry enjoyed protection from copying via architectural constraints.⁷¹ Services like Napster removed the constraints.⁷² For anyone with an internet connection, copying was free, effortless, and in many ways more convenient than going to the store to purchase music—Napster launched four years before iTunes began selling authorized MP3s.⁷³ The relative anonymity of digital file-sharing also undermined the regulatory force of law and norms: consumers faced less risk of being caught and punished (in accordance with law) or shamed (in accordance with norms).⁷⁴ It is

⁶⁷ See Part I.A *supra*.

⁶⁸ See Part I.B *supra*.

⁶⁹ See Part II.A *supra*.

⁷⁰ See *id.*

⁷¹ See *supra* note 8 and accompanying text.

⁷² See *A&M Records, Inc. v. Napster, Inc.*, 239 F.3d 1004 (9th Cir. 2001).

⁷³ See BJ Ard, *Taking Access Seriously*, 8 TEX. A&M L. REV. 225, 244 (2021).

⁷⁴ See *supra* note 10 and accompanying text.

thus no surprise that the music industry mounted an aggressive legal response.⁷⁵

Yet filesharing was not disruptive with respect to copyright doctrine *per se*. Defendants' downloading and uploading of copyrighted files established a *prima facie* case for infringement of the copyright owners' reproduction and distribution rights.⁷⁶ The case for vicarious liability against services like Napster was also straightforward. While these cases required courts to refine the scope of third-party copyright liability,⁷⁷ the underlying policy—to prohibit largescale piracy—was taken as settled and extending liability did not require close scrutiny of copyright's purposes or founding assumptions.⁷⁸ True, the phenomenon prompted some scholars to opine we should reconsider our whole approach to the regulation of creative output. Terry Fisher famously advocated that all music should be available via a "celestial jukebox" paid for via broad levies.⁷⁹ These cases also brought scrutiny to copyright's statutory damages following crushing awards against filesharing plaintiffs like graduate student Joel Tenenbaum.⁸⁰ But these concerns did not translate into doctrinal change.

The ensuing legal disruption stemmed from the inability of existing institutions to effectively enforce and update the law. The court-centered approach to enforcement that dominated U.S. law since the Copyright Act of 1790 was ill-equipped to deal with file-

⁷⁵ See Christopher Jensen, Note, *The More Things Change, the More They Stay the Same: Copyright, Digital Technology, and Social Norms*, 56 STAN. L. REV. 531, 554–57 (2003). See also *supra* note 14 and accompanying text.

⁷⁶ *Napster*, 239 F.3d at 1013. As one court opined in a case dealing with a different sort of unauthorized MP3 platform: "The complex marvels of cyberspatial communication may create difficult legal issues; but not in this case. Defendant's infringement of plaintiff's copyrights is clear." *UMG Recordings, Inc. v. MP3.com*, 92 F. Supp. 2d 349, 350 (S.D.N.Y. 2000).

⁷⁷ See, e.g., *Napster*, 239 F.3d at 1021–22 (denying the application of Sony's safe harbor due to Napster's "actual knowledge" of infringement); *Aimster Copyright Litig.*, 334 F.3d 643, (7th Cir. 2003) (disregarding Aimster's lack of actual knowledge because of its "willful blindness"); *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd.*, 545 U.S. 913, 938–41 (holding Grokster liable despite its lack of actual knowledge because it intentionally "induced" infringement).

⁷⁸ Cf. Peter S. Menell & David Nimmer, *Legal Realism in Action: Indirect Copyright Liability's Continuing Tort Framework and Sony's De Facto Demise*, 55 UCLA L. REV. 143, 187 (2007) (explaining the courts' decisions reflect their assessment of blameworthiness).

⁷⁹ WILLIAM W. FISHER III, PROMISES TO KEEP: TECHNOLOGY, LAW, AND THE FUTURE OF ENTERTAINMENT 203–58 (2004).

⁸⁰ See *Sony BMG Music Ent. v. Tenenbaum*, 719 F.3d 67 (1st Cir. 2013) (upholding an award of \$675,000 in damages—representing statutory damages of \$22,500 for the willful infringement of the copyright in 30 songs).

sharing. Even setting aside the volume of litigation necessary to go after individual infringers and the reputational harm of suing one's own customers, the music industry faced considerable difficulty shutting down the platforms.⁸¹ In the early years, each time the industry enjoined one service, a new one appeared to take advantage of a perceived legal loophole left open in the prior judgment.⁸² Once U.S. soil proved inhospitable to file-sharing services, the infringing services moved overseas and beyond U.S. courts' jurisdiction.⁸³ Courts lacked the capability to effectuate the law.

When copyright owners could not achieve their objectives through litigation, they had historically succeeded in obtaining the protections they desired through Congress. Indeed, many commentators argue the entertainment industry has exerted undue influence over copyright legislation.⁸⁴ But this strategy, too, proved largely ineffective for addressing industry complaints about file-sharing. The industry's primary legislative success was enactment of the Digital Millennium Copyright Act (DMCA), which established a notice-and-takedown regime for removing infringing materials from mainstream sites and services;⁸⁵ its impact against dedicated pirates was limited to the extent they evaded the courts' jurisdiction.⁸⁶ The notice-and-takedown regime also proved unwieldy even with respect to mainstream sites like YouTube because it is fundamentally reactive rather than proactive: so long as the service provider does not have "red flag" knowledge of infringement,⁸⁷ copyright owners are charged with monitoring for the upload of their materials and sending individualized takedown notices for each instance of infringement.⁸⁸

The industry's other efforts to combat file-sharing through legislation proved even less successful. Through the Audio Home Recording Act of 1992, the industry had attempted to proactively

⁸¹ See Yafit Lev-Aretz, *Copyright Lawmaking and Public Choice: From Legislative Battles to Private Ordering*, 27 HARV. J. L. & TECH. 203, 220 (2013).

⁸² See *supra* note 77.

⁸³ See Lev-Aretz, *supra* note 81, at 220.

⁸⁴ E.g., JESSICA LITMAN, *DIGITAL COPYRIGHT: PROTECTING INTELLECTUAL PROPERTY ON THE INTERNET* (2001).

⁸⁵ See 17 U.S.C. § 512.

⁸⁶ See *supra* note 83 and accompanying text. The DMCA's provisions making it unlawful to circumvent technological protection measures or traffic in circumvention tools, 17 U.S.C. § 1201(a)–(b), had similarly mixed impact. These provisions meant anti-circumvention tools were not available on mainstream websites but did little to halt their circulation among determined pirates.

⁸⁷ See 17 U.S.C. § 512(c)(1)(A).

⁸⁸ Xiyin Tang, *Privatizing Copyright*, 121 MICH. L. REV. (forthcoming 2023) (manuscript at 5), available at <https://ssrn.com/abstract=4057573>.

impose design restrictions on recording equipment but found their efforts thwarted for failure of the act to anticipate that users might employ general-purpose computers to copy music.⁸⁹ When they sought to create a new regime that would have given the Department of Justice authority to seek court orders blocking infringing overseas websites through the proposed Stop Online Piracy Act (SOPA) and Protect IP Act (PIPA) in 2011, they were rebuffed following public protest.⁹⁰

The most viable solution to piracy was, ultimately, for the copyright industries to partner with the ascendant digital platforms. In doing so, they achieved a new equilibrium of constraints and affordances not by operation of law, or changes to it, but through the redesign of the architecture and business models for distributing music and other copyrighted content. Consider music streaming services. These services have come close to embodying Fisher's celestial jukebox⁹¹ by providing on-demand listening for a fixed subscription fee.⁹² Consumers who use these services lack easy access to the underlying music files and therefore cannot easily make or distribute unauthorized copies; the architecture is less amenable to copying than the CDs or standalone MP3s of prior decades. The motive for consumers to seek pirated copies is also diminished to the extent that the music they wish to hear is already included in their subscription plans.

The increasing consolidation of online activity on a handful of leading platforms has also made it easier for industry to police infringement. The dominant strategy is not to sue renegade platforms like Napster but to make mutually beneficial arrangements with leading platforms like YouTube. One of the best-known arrangements is YouTube's Content ID system, which automatically scans each upload for copyrighted material and allows the copyright owner to remove or monetize the submission without the need for takedown notices.⁹³ While Content ID solved the volume problem from the industry's perspective, it has sustained criticism for failure to incorporate the procedural protections of the DMCA or the substantive allowances for fair use and for its general

⁸⁹ Ard, *supra* note 73, at 239–40.

⁹⁰ Lev-Aretz, *supra* note 81, at 220–26.

⁹¹ See note 79 *supra* and accompanying text.

⁹² Jacob Victor, *Reconceptualizing Compulsory Copyright Licenses*, 72 STAN. L. REV. 915, 972 n.309 (2020).

⁹³ See Matthew Sag, *Internet Safe Harbors and the Transformation of Copyright Law*, 93 NOTRE DAME L. REV. 499, 541 (2018).

lack of transparency.⁹⁴ Critics warn that the system represents the displacement of copyright law—it has replaced public copyright law with private rulemaking and private enforcement.⁹⁵

This reconfiguration qualifies as institutional disruption because it has undermined the accountability, transparency, and overall legitimacy of the regime. The same pattern is evident in the judicial enforcement of consumer license agreements that override the substantive rights provided by public copyright law.⁹⁶ Recent work by Xiyin Tang documents still further displacement through a set of confidential agreements through which major social media platforms and record labels have effectively supplanted copyright law with their own rules.⁹⁷

Peer-to-peer filesharing led to major disruptions in copyright law, but it did not do so by altering substantive law or forcing deep meditation on the goals of copyright. Instead, filesharing proved disruptive because it exposed the limits of courts and Congress. Further disruption followed when industry stakeholders replaced the operative institutions for making and enforcing copyright law with private alternatives, raising questions of legitimacy. As the next Part explains, similar transformations are occurring throughout the legal system.

III. CONFRONTING INSTITUTIONAL LIMITS IN TECHLAW

Confronting the institutional dimensions of legal disruption is important because these issues are at the heart of the most pressing questions in law and policy. This approach also offers a richer vantage point for anticipating whether a new development is likely to be disruptive—a weakness in other accounts of disruption⁹⁸—because it reorients our thinking to consider how technologies intersect with the design of the legal system. Confronting these aspects is also important because, as Julie Cohen documents in her account of the law of informational capitalism, the evolution of our legal institutions is already well underway.⁹⁹ Privatized adjudication

⁹⁴ See, e.g., *id.* at 556; Rebecca Tushnet, *All of This Has Happened Before and All of This Will Happen Again: Innovation in Copyright Licensing*, 29 BERKELEY TECH. L. J. 1447, 1460–64 (2014).

⁹⁵ E.g., Tang, *supra* note 88, at 32.

⁹⁶ See, e.g., Mark A. Lemley, *Intellectual Property and Shrinkwrap Licenses*, 68 S. CAL. L. REV. 1239 (1995); David Nimmer, Elliot Brown & Gary N. Frischling, *The Metamorphosis of Contract into Expand*, 87 CALIF. L. REV. 17 (1999).

⁹⁷ Tang, *supra* note 88, at 17.

⁹⁸ See Liu et al., *supra* note 12, at 256.

⁹⁹ COHEN, *supra* note 36, at 172–73, 237.

and rulemaking has only accelerated since scholars first observed the displacement of courts by arbitration,¹⁰⁰ and an array of new international and multi-national fora have emerged as alternatives to conventional domestic legislation.¹⁰¹

Fortunately, the work has already begun. Many branches of techlaw and adjacent scholarship provide perspective on the problems of authority, competence, and legitimacy that give rise to legal and institutional disruption.¹⁰² The early pioneers in cyberlaw concerned themselves with authority by way of perceived gaps and overlaps in jurisdiction: questions of whether the internet was subject to any state's laws and how to deal with cross-border activities.¹⁰³ More recent work on robotics¹⁰⁴ and embodied software¹⁰⁵ has highlighted the problems that arise as technological convergence, or the adoption of similar features across a range of different devices, has given rise to regulatory convergence, with regulators as disparate as the Copyright Office, the FDA, the EPA, and the National Highway Traffic Safety Administration weighing in on the regulation of internet-of-things devices.¹⁰⁶ Many scholars have also analyzed the privatization of adjudication and rulemaking around new technologies—especially on digital platforms—developments that mark the de facto exercise of authority by private firms.¹⁰⁷

¹⁰⁰ See, e.g., Rory Van Loo, *The Corporation as Courthouse*, 33 YALE J. ON REG. 547 (2016).

¹⁰¹ See, e.g., Margot E. Kaminski, *The U.S. Trade Representative's (USTR's) Democracy Problem*, 35 SUFFOLK TRANSNAT'L L. REV. 519 (2012).

¹⁰² See Part II.A *supra*.

¹⁰³ See, e.g., David R. Johnson and David Post, *Law and Borders—The Rise of Law in Cyberspace*, 48 STAN. L. REV. 1367 (1996); JACK GOLDSMITH & TIM WU, WHO CONTROLS THE INTERNET? ILLUSIONS OF A BORDERLESS WORLD (2006).

¹⁰⁴ Ryan Calo, *The Case for a Federal Robotics Commission*, BROOKINGS (Sept. 2014), <http://www.brookings.edu/research/reports2/2014/09/case-for-federal-robotics-commission>.

¹⁰⁵ Paul Ohm & Blake Reid, *Regulating Software When Everything Has Software*, 84 GEO. WASH. L. REV. 1672 (2016).

¹⁰⁶ See *id.*

¹⁰⁷ See, e.g., Jack M. Balkin, *The Future of Free Expression in a Digital Age*, 36 PEPP. L. REV. 427, 427 (2009) (“[T]he most important decisions affecting the future of freedom of speech will not occur in constitutional law; they will be decisions about technological design, legislative and administrative regulations, the formation of new business models, and the collective activities of end-users.”); Kate Klonick, *The New Governors: The People, Rules, and Processes Governing Online Speech*, 131 HARV. L. REV. 1598 (2018); Rory Van Loo, *Federal Rules of Platform Procedure*, 88 U. CHI. L. REV. 829 (2021).

Some arrangements have complicated the divide between public and private oversight. Jack Balkin has traced the state's co-option of these expanded

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Those of a deregulatory bent may seek to justify the privatization of regulation due to the state's lack of competence relative to industry actors. Though that framing often betrays motivated reasoning, conscientious scholars have mapped genuine issues where the legal system lacks the capacity, expertise, and speed to meet emerging challenges. Arbitration and intra-firm dispute resolution processes are widely utilized in part because the courts do not have the capacity to hear the sheer volume of low-level disputes that arise for today's consumers.¹⁰⁸ The increased complexity and opacity of new technologies and the business models built around them have been shown in some cases to outstrip regulators' expertise and to create obstacles even to the basic monitoring and data-collection necessary for effective regulation.¹⁰⁹

The very premise of ideas like the "pacing problem" is that

surveillance and enforcement apparatuses, *Old-School/New-School Speech Regulation*, 127 HARV. L. REV. 2296 (2014), and Daniel Solove and Woody Hartzog detail the interplay of the FTC and private industry in fashioning a de facto common law of privacy via consent decrees, *The FTC and the New Common Law of Privacy*, 114 COLUM. L. REV. 583 (2014). A parallel discussion on public versus private rule-making and enforcement has played out across the literature on intellectual property's "negative space." See Amy Kapczynski, *Order Without Intellectual Property Law: Open Science in Influenza*, 102 CORNELL L. REV. 1539, 1542–47 (2017).

¹⁰⁸ See Van Loo, *supra* note 100.

¹⁰⁹ See, e.g., Rory Van Loo, *Regulatory Monitors: Policing Firms in the Compliance Era*, 119 COLUM. L. REV. 369 (2019); K. SABEEL RAHMAN, *DEMOCRACY AGAINST DOMINATION* 126–29 (2017). Opacity also creates problems for accountability and thereby impugns the legitimacy of legal processes that leave corporate secrecy undisturbed. See, e.g., Bloch-Wehba, *supra* note 46, at 1290–92.

Speaking to this problem, several scholars call for experimental and experimentalist modes of legislation to correct lawmakers' lack of access to pertinent information on complex social problems and make law-making more data driven. This literature has called for strategies including policy variation, see, e.g., Yair Listokin, *Learning Through Policy Variation*, 118 YALE L. J. 479 (2008), controlled policy experiments, see, e.g., Michael Abramowicz, Ian Ayres & Yair Listokin, *Randomizing Law*, 159 U. PENN. L. REV. 929 (2011), and experimentalist modes of governance, see, e.g., Charles F. Sabel & William H. Simon, *Minimalism and Experimentalism in the Administrative State*, 100 GEO. L. J. 53 (2011) (describing experimentalism as a regime where local units make autonomous decisions subject to coordination and monitoring by a central authority). These modes of lawmaking often utilize sunset provisions to force later reexamination of the circumstances. See *infra* note 120. Lisa Ouellette provides a comprehensive analysis of the strengths and weaknesses of each of strategy in her work applying these techniques to patent law. See Lisa Larrimore Ouellette, *Patent Experimentalism*, 101 VA. L. REV. 65 (2015).

legal institutions move too slowly relative to technology.¹¹⁰ And these are not new concerns. Historical accounts point to industrial-era technologies—and the challenges they posed—as important drivers in the rise of the administrative state and its expert bureaucracy.¹¹¹

Scholars in recent years have also explicitly addressed the legitimacy deficit of contemporary institutional configurations. Smart contracts and similar crypto-legal structures present a very intentional move to defer to code and to coders¹¹²—but not without challenges to the legitimacy and viability of displacing public law and traditional regulators.¹¹³ Legitimacy also waivers where technological developments undermine the normative basis for particular institutions' legitimacy. When agencies adopt algorithmic decision-making systems that they do not understand and cannot easily override, for example, they undermine any claim to expertise grounded in agencies' relative expertise, flexibility, and nimbleness.¹¹⁴

Work to build a comprehensive framework for assessing these institutional concerns is newer. Recent scholarship has been explicit in bringing the insights of Legal Process Theory—the origin for the aforementioned account of agency legitimacy—to bear on innovation law and policy, bringing renewed attention to questions of comparative institutional competence.¹¹⁵ Many scholars have, to varying degrees, highlighted the link between exceptional or disruptive technologies and structural transformation of the legal system.¹¹⁶ The growing body of work on the role of ideology and

¹¹⁰ See generally Gary Marchant, *The Growing Gap Between Emerging Technologies and the Law*, in *THE GROWING GAP BETWEEN EMERGING TECHNOLOGIES AND LEGAL-ETHICAL OVERSIGHT: THE PACING PROBLEM* 19 (Gary E. Marchant, Braden R. Allenby & Joseph R. Herkert eds., 2011).

¹¹¹ See William J. Novak, *Willard Hurst, Technological Change, and the Transformation of American Public Law*, 2022 WIS. L. REV. FORWARD 12, 13; Ryan Calo, *Robotics and the Lessons of Cyberlaw*, 103 CALIF. L. REV. 513, 553 (2015).

¹¹² See Carla L. Reyes, *Conceptualizing Cryptolaw*, 96 NEB. L. REV. 384, 423–27 (2017).

¹¹³ Mark Verstraete, *The Stakes of Smart Contracts*, 50 LOY. U. CHI. L. J. 743, 790–95 (2019) (analyzing consequences for the law's descriptive and normative legitimacy).

¹¹⁴ Calo & Citron, *supra* note 43, at 804.

¹¹⁵ See Shyamkrishna Balganesh, *Copyright as Legal Process: The Transformation of American Copyright Law*, 168 U. PA. L. REV. 1101 (2020).

¹¹⁶ *E.g.*, Calo, *supra* note 111, at 550 (linking “exceptional” technologies to systemic changes to law); Liu et al., *supra* note 12, at 242–46; Reyes, *supra* note 112, at 427–33.

other concerns of political economy is also vital to piecing together how these disruptive transformations are taking shape and how they might in turn be disrupted.¹¹⁷

Meanwhile, the literature on institutional design and the timing and implementation of regulation—in and beyond the technology context—is highly relevant to framing effective responses to the challenges of emerging technologies. Decades of scholarship on how courts ought to deploy reasoning by analogy shed light on the potential and the limitations of the judiciary in confronting new technologies.¹¹⁸ Debates over the windows of opportunity for regulation,¹¹⁹ sunsets and similar implementation strategies,¹²⁰ and the choice between tech-neutral and tech-specific law¹²¹ likewise implicate fundamental questions for the operation of law-making institutions.

CONCLUSION

Disruption is an important lens for understanding the intersections of law and technological change. It has its limits: to focus exclusively on the most dramatic conflicts surrounding technology would mean missing the significance of more

¹¹⁷ See, e.g., COHEN, *supra* note 36, at 104 (confronting “deep capture,” i.e., capture at the level of ideology); Ari Ezra Waldman, *Power, Process, and Automated Decision-Making*, 88 FORDHAM L. REV. 613, 622–32 (2019) (identifying the ideology and practices of neoliberal managerialism as a systemic obstacle to reform with respect to automated decision-making systems).

¹¹⁸ E.g., Julie E. Cohen, *Cyberspace as/and Space*, 107 COLUM. L. REV. 210 (2007); A. Michael Froomkin, *The Metaphor is the Key: Cryptography, The Clipper Chip, and the Constitution*, 143 U. PA. L. REV. 709 (1995); Mark A. Lemley, *Place and Cyberspace*, 91 CAL. L. REV. 521 (2003); Genevieve Lakier, *The Problem Isn't the Use of Analogies but the Analogies Courts Use*, KNIGHT FIRST AMENDMENT INST. (Feb. 27, 2018), <https://knightcolumbia.org/content/problem-isnt-use-analogies-analogies-courts-use>.

¹¹⁹ Gaia Bernstein, *When New Technologies Are Still New: Windows of Opportunity for Privacy Protection*, 51 VILL. L. REV. 921 (2006). The timing debate also implicates the precautionary principle. See Cass R. Sunstein, *Beyond the Precautionary Principle*, 151 U. PA. L. REV. 1003 (2003) (dismissing the precautionary principle as “paralyzing”); Noah M. Sachs, *Rescuing the Strong Precautionary Principle from Its Critics*, 2011 U. ILL. L. REV. 1285 (2011) (discussing strategies for implementing it).

¹²⁰ See, e.g., SOFIA RANCHORDAS, CONSTITUTIONAL SUNSETS AND EXPERIMENTAL LEGISLATION: A COMPARATIVE PERSPECTIVE (2014); Jacob E. Gersen, *Temporary Legislation*, 74 U. CHI. L. REV. 247, 259–60 (2007).

¹²¹ See Crootof & Ard, *supra* note 5, at 405–13. See also Paul Ohm, *The Argument Against Technology-Neutral Surveillance Laws*, 88 TEX. L. REV. 1685, 1701 (2010) (suggesting tech-specific law carries the benefit of a built-in sunset provision).

incremental changes and the innumerable episodes where the legal system proves resilient to change. Examining techlaw from the perspective of disruption nonetheless enriches our analysis because it sharpens our ability to see the limits of existing institutions. It gives us the power to explain why some problems are hard quite apart from the intricacies of doctrine. Crucially, it also refocuses our attention on the challenge of better structuring legal institutions to meet the challenges of ongoing technological change.