

Georgia State University Law Review

Volume 37
Issue 3 Spring 2021

Article 3

8-1-2021

Tangibility as Technology

Joao Marinotti

Indiana University Maurer School of Law, jmarinot@iu.edu

Follow this and additional works at: <https://readingroom.law.gsu.edu/gsulr>



Part of the [Intellectual Property Law Commons](#)

Recommended Citation

Joao Marinotti, *Tangibility as Technology*, 37 GA. ST. U. L. REV. 671 (2021).

Available at: <https://readingroom.law.gsu.edu/gsulr/vol37/iss3/3>

This Article is brought to you for free and open access by the Publications at Reading Room. It has been accepted for inclusion in Georgia State University Law Review by an authorized editor of Reading Room. For more information, please contact gfowke@gsu.edu.

TANGIBILITY AS TECHNOLOGY

João Marinotti*

ABSTRACT

Property law has traditionally relied on tangible boundaries to delineate legal thinghood and to inform the bounds of in rem rights and duties. Unfortunately, property doctrines have fossilized around tangibility, causing fragmentation in the legal treatment of digital assets. In the United States, for example, cryptocurrencies and non-fungible tokens (NFTs) may simultaneously be classified as commodities, securities, currencies, assets, or not property at all, depending on the jurisdiction, domain, or specific asset in question. This fragmented system of overlapping legal treatments increases the information cost of using digital assets, decreases efficiency, and ultimately hinders future innovation.

In this Article, I propose a unified and tech-neutral approach to legal thinghood, providing a theoretically coherent and robust way to increase property law's resilience in adapting to future technologies. Specifically, I deconstruct the conceptual purpose of tangibility in traditional doctrines of legal thinghood, uncovering its role as a technology (i.e., a tool) in property law to delineate rights. From this insight, I derive a coherent doctrinal test for distinguishing between digital assets that fulfill all conceptual requisites to be legal things and assets that do not. By doing so, I conclude that the traditional ontological categories of property law, such as choses in possession, are sufficiently robust to incorporate new and evolving digital assets. This tech-neutral approach paves the way toward an elegant and efficient legal treatment of digital assets and digital resource management in the twenty-first century.

* Visiting Fellow at the Information Society Project, Yale Law School; J.D., Harvard Law School; M.Sc., University of Edinburgh; M.Phil. & M.A., City University of New York; B.A., Columbia University. Many thanks to Henry E. Smith, John C.P. Goldberg, and Christopher T. Bavitz for their invaluable contributions to this piece, to the participants of the 2019 Harvard Law School Private Law Workshop, and to the Harvard Law School Project on the Foundations of Private Law.

CONTENTS

INTRODUCTION	673
I. TECH-NEUTRAL PROPERTY RIGHTS.....	681
A. <i>The Rights of Owners and the Duties of Non-Owners</i>	684
1. <i>Hohfeldian Claim-Rights, Liberty-Rights, and Duties</i> ..	687
2. <i>The Right to Use: Owners’ Liberty-Right to Use</i>	690
3. <i>The Right to Exclude: Non-Owners’ Duty Not to Interfere</i>	696
B. <i>Tangibility and Obvious Boundaries</i>	698
1. <i>Tangibility As a Technology</i>	699
2. <i>“Obvious” Boundaries: Shared Social Customs and</i> <i>Intuitions</i>	703
II. TECH-NEUTRAL PROPERTY LAW IN ACTION.....	711
A. <i>Second Life</i>	714
1. <i>Virtual Land Is Not a Rival Asset</i>	716
2. <i>‘Owners’ of Virtual Land Cannot Discern the Boundary</i> <i>of Their Liberty-Right to Use</i>	717
3. <i>‘Non-Owners’ of Virtual Land Cannot Discern the</i> <i>Boundary of Their Duty Not to Interfere</i>	719
B. <i>Bitcoin</i>	721
1. <i>Bitcoins Are Rival Assets</i>	722
2. <i>Owners of Bitcoins Can Discern the Boundary of Their</i> <i>Liberty-Right to Use</i>	725
3. <i>Non-Owners of Bitcoins Can Discern the Boundaries of</i> <i>Their Duty Not to Interfere</i>	727
C. <i>CryptoKitties</i>	728
1. <i>CryptoKitties Are Rival Assets</i>	730
2. <i>‘Owners’ of CryptoKitties Cannot Discern the Boundary</i> <i>of Their Liberty-Right to Use</i>	731
3. <i>‘Non-Owners’ of CryptoKitties Cannot Discern the</i> <i>Boundaries of Their Duty Not to Interfere</i>	733
CONCLUSION	734

INTRODUCTION

Property is the law of “legal things.”¹ It allocates ownership,² facilitates social interaction,³ and as the U.S. Supreme Court has held, “empowers persons to shape and to plan their own destiny.”⁴ State courts have even more staunchly highlighted the importance of property rights. For example, the Supreme Court of Texas has held “that strong judicial protection for individual property rights is essential to ‘freedom itself,’” noting that property rights are “‘fundamental, natural, inherent, inalienable, and not derived from the legislature,’ and ‘preexist even constitutions.’”⁵ The Supreme Court of Iowa has even held that “property rights are . . . human rights.”⁶ Availing oneself of this fundamental right, however, first requires defining the very object of property law: the legal thing

1. RESTATEMENT (FOURTH) OF PROP.: THE BASICS OF PROPERTY app. § 2 (AM. L. INST., Council Draft Sept. 13 2019) [hereinafter DRAFT RESTATEMENT] (“A legal thing is a possible subject matter of legal relations that receives treatment as a separate whole and is no more than contingently associated with any particular actor.”); see also Yun-chien Chang & Henry E. Smith, *Convergence and Divergence in Systems of Property Law: Theoretical and Empirical Analyses*, 92 S. CAL. L. REV. 785, 787 (2019) (noting that “property law employs (legal) things”).

2. See James Y. Stern, *The Essential Structure of Property Law*, 115 MICH. L. REV. 1167, 1168 (2017) (“Two people cannot both be complete owners of the same thing It may take a moment to absorb this idea—precisely because it is so obvious—but it is fundamental to the structure of property law.”); see also John A. Humbach, *Property As Prophecy: Legal Realism and the Indeterminacy of Ownership*, 49 CASE W. RES. J. INT’L L. 211, 224 (2017).

3. See Thomas W. Merrill & Henry E. Smith, *The Morality of Property*, 48 WM. & MARY L. REV. 1849, 1850 (2007) (“Property is a device for coordinating both personal and impersonal interactions over things.”).

4. *Murr v. Wisconsin*, 137 S. Ct. 1933, 1943 (2017) (“Property rights are necessary to preserve freedom.”); see also *United States v. James Daniel Good Real Prop.*, 510 U.S. 43, 61 (1993) (“Individual freedom finds tangible expression in property rights.”).

5. *Harris Cnty. Flood Control Dist. v. Kerr*, 499 S.W.3d 793, 804 (Tex. 2016) (cleaned up) (“Locke deemed the preservation of property rights ‘[t]he great and chief end’ of government, a view we echoed almost 300 years later, calling it ‘one of the most important purposes of government.’ Individual property rights are ‘a foundational liberty, not a contingent privilege.’” (first quoting JOHN LOCKE, *SECOND TREATISE OF GOVERNMENT*, ch. IX, § 124 (C.B. MacPherson ed., 1980) (1690); then quoting *Eggemeyer v. Eggemeyer*, 554 S.W.2d 137, 140 (Tex. 1977); and then quoting *Tex. Rice Land Partners, Ltd. v. Denbury Green Pipeline Tex.-LLC*, 363 S.W.3d 192, 204 n. 34 (Tex. 2012))).

6. *Iowa-III. Gas & Elec. Co. v. City of Fort Dodge*, 85 N.W.2d 28, 42 (Iowa 1957) (“Freedom is invaded when property rights are ignored”). The United Nations General Assembly has recognized property rights as human rights. See G.A. Res. 217 (III) A, *Universal Declaration of Human Rights*, ¶ 17 (Dec. 10, 1948) (noting that “[e]veryone has a right to own property,” and that “[n]o one shall be arbitrarily deprived of [their] property”).

itself.⁷ When the asset in question is a physical plot of land or a bar of gold, the task of defining the legal thing is comparatively trivial.⁸ What happens, though, when the resource in question is ephemeral information or otherwise purely digital?⁹ Does the fundamental individual right of property no longer apply?¹⁰ This question looms larger and larger as digital assets continue to replace not only “sentimental [items] like letters, scrapbooks, home videos, and shoeboxes full of photos”¹¹ but also financial assets.¹²

The speed of technological innovation has forced judges and regulators to adopt a functional rather than formal analysis of property law to answer this question and to accommodate modern economic realities.¹³ These functional case-by-case analyses have led to fragmentation and confusion in the legal treatment of digital assets, including blockchain-based cryptocurrencies.¹⁴ Just at the federal level, the Securities Exchange Commission (SEC),¹⁵ the Commodity Futures Trading Commission (CFTC),¹⁶ the Internal

7. Chang & Smith, *supra* note 1 (“Property law identifies things . . .”).

8. Merrill & Smith, *supra* note 3, at 1894 (noting that we leverage our “robust and automatic prelegal intuitions” to sufficiently delineate the legal thing in question).

9. Natalie M. Banta, *Inherit the Cloud: The Role of Private Contracts in Distributing or Deleting Digital Assets at Death*, 83 *FORDHAM L. REV.* 799, 801 (2014) (“Digital assets include an individual’s email accounts, personal webpages, blogs, social networking sites, documents, . . . photo storage sites . . . [and] domain names or accounts with stored financial value like Pay[P]al or frequent flyer memberships. Digital assets may also include an individual’s valuable media purchased in electronic format such as movies, television shows, music, and books.”).

10. JOSHUA A.T. FAIRFIELD, *OWNED: PROPERTY, PRIVACY, AND THE NEW DIGITAL SERFDOM* 13 (2017) (noting that because of “the intangibility and centralization of the internet and digital and information technologies . . . [p]roperty ownership as we know it is under attack and fading fast”).

11. Banta, *supra* note 9, at 816.

12. Glen Fernandes & Walter Verbeke, *Crypto-Assets: Crossing the Chasm?*, 11 *J. SEC. OPERATIONS & CUSTODY* 292, 296 (2019) (“Some crypto-assets are already more likely to be on the path towards the mainstream of capital markets’ financial instruments . . .”).

13. See, e.g., Shawn Bayern, *Dynamic Common Law and Technological Change: The Classification of Bitcoin*, 71 *WASH. & LEE L. REV. ONLINE* 22, 34 (2014).

14. See, e.g., Jean Bacon, John David Michaels, Christopher Millard, & Jatinder Singh, *Blockchain Demystified: A Technical and Legal Introduction to Distributed and Centralised Ledgers*, 25 *RICH. J.L. & TECH.* 2, 84 (2018) (“[W]hether tokens qualify as property may depend on the legal context . . . since an item might qualify as property in some contexts but not in others.”).

15. Press Release, U.S. Sec. & Exch. Comm’n, SEC Issues Investigative Report Concluding DAO Tokens, a Digital Asset, Were Securities (July 25, 2017), <https://www.sec.gov/news/press-release/2017-131> [<https://perma.cc/8L57-FYJT>].

16. *In re Coinflip, Inc.*, CFTC No. 15-29, 2016 WL 3137612, at *2 (Sept. 17, 2015) (“Bitcoin and other virtual currencies are . . . properly defined as commodities.”).

Revenue Service (IRS),¹⁷ the Department of Treasury's Financial Crimes Enforcement Network (FinCEN),¹⁸ and the Financial Industry Regulatory Authority (FinRA)¹⁹ have all had to independently determine the legal nature of Bitcoin before establishing whether and how they fall within each agency's jurisdiction.²⁰

Judges, too, have relied on ad hoc, functional analyses in determining whether each cause of action can be applied to bitcoins. In cases of conversion, for example, courts seem to treat bitcoins as property but frequently note that Bitcoin's legal status is far from determined. At the state level, a California superior court judge explained that "the law is unsettled whether bitcoin should be treated . . . as property for the purposes of various legal issues, [but] for the purpose of a claim for conversion bitcoin is fairly treated as property."²¹ At the federal level, too, a district court judge in Florida stated: "Whether or not bitcoin is 'money' for the purposes of a conversion claim, the Court agrees with the Plaintiffs that they have sufficiently (and with specificity) alleged a claim for conversion."²²

Without intervention, this functional, ad hoc approach to property law will not be limited solely to Bitcoin or cryptocurrencies.²³ The

17. I.R.S. Notice 2014-21, 2014-16 I.R.B. 938, <https://www.irs.gov/pub/irs-drop/n-14-21.pdf> [<https://perma.cc/A444-HBE5>] ("For federal tax purposes, virtual currency is treated as property.").

18. Guidance, Dep't of the Treasury, Fin. Crimes Enf't Network, FIN-2013-G001, Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies 3 (Mar. 18, 2013), <https://www.fincen.gov/sites/default/files/shared/FIN-2013-G001.pdf> [<https://perma.cc/AVZ2-9TRJ>].

19. Complaint at 1, Dep't of Enf't v. Timothy Tilton Ayre, Disciplinary Proc. No. 2016049307801 (Fin. Indus. Reg. Auth. Off. of Hearing Officers Sept. 11, 2018); see also Anisha Reddy, *COINSENSUS: The Need for Uniform National Virtual Currency Regulations*, 123 DICK. L. REV. 251, 271 n.170 (2018) ("Although FinRA is a non-profit organization, it is congressionally authorized under the Securities Exchange Act as a registered, self-regulatory securities organization for the broker-dealer industry.").

20. For a discussion of how the SEC, the CFTC, the IRS, FinCEN, and FinRA have each assessed the legal nature of Bitcoin, see Reddy, *supra* note 19, 268–73. For a comparative analysis, see Michelle Alvarez, *A Comparative Analysis of Cryptocurrency Regulation in the United States, Nigeria, and China: The Potential Influence of Illicit Activities on Regulatory Evolution*, 25 ILSA J. INT'L & COMP. L. 33, 40 (2018).

21. Norman v. Strateman, No. 17-556483, 2018 Cal. Super. LEXIS 884, at *2 (App. Dep't Super. Ct. Jan. 24, 2018).

22. Kleiman v. Wright, No. 18-CV-80176, 2018 U.S. Dist. LEXIS 216417, at *46 (S.D. Fla. Dec. 27, 2018).

23. The ad hoc approach is also not limited to the United States. In Iceland, cryptocurrencies are banned; in Japan, they are a means of payment; in Canada, they are assets; while in Pakistan, they are

growing interest in smart contracts,²⁴ augmented reality,²⁵ and business models built on personally identifiable information,²⁶ for example, has reopened the debate about whether and how property law should be applied to each of these digital innovations. More recently, the sale of digital art and collectibles through non-fungible tokens (NFTs) for upwards of \$69 million has also furthered the need to clarify the role of ownership and property law in this digital marketplace.²⁷

Some commentators have continued to propose functional, domain-specific solutions to these questions. For example, in the realm of digital police investigations, one proposal suggested the creation of a *sui generis* system of property-like law, which would be applicable only to internet service provider-held data.²⁸ Rather than solve problems and reduce information costs, these domain-specific and tech-dependent rules would likely lead to rapidly obsolete policies, exacerbating the fragmentation and confusion surrounding digital assets as a whole²⁹—just as they did for Bitcoin.³⁰ Separate property regimes for tax law, administrative law, criminal law, and private law will not only increase transaction and information costs but may even undermine the role of private law as a tool for planning.³¹ Therefore, a single, unified, and tech-neutral approach to

commodities. Polina Lyadnova, Ekaterina Dorokhova, & Hannah Whitney, *Cryptocurrencies in Insolvency: Evasive Reality*, EMERGING MKTS. RESTRUCTURING J., Summer 2018, at 1, 2.

24. See Adam Sulkowski, *Blockchain, Business Supply Chains, Sustainability, and Law: The Future of Governance, Legal Frameworks, and Lawyers?*, 43 DEL. J. CORP. L. 303, 337 (2019).

25. See David Jiang, *Pokémon Go's Virtual Trespass Suit Reaches Settlement Agreement*, N.Y.U. J. INTELL. PROP. & ENT. L. BLOG (Mar. 7, 2019), <https://blog.jipel.law.nyu.edu/2019/03/pokemon-gos-virtual-trespass-suit-reaches-settlement-agreement/> [https://perma.cc/DWZ5-9RYU].

26. See Michael C. Pollack, *Taking Data*, 86 U. CHI. L. REV. 77, 108 (2019).

27. See Sam Dean, *\$69 Million for Digital Art? The NFT Craze, Explained*, L.A. TIMES (Mar. 11, 2021), <https://www.latimes.com/business/technology/story/2021-03-11/nft-explainer-crypto-trading-collectible>.

28. Pollack, *supra* note 26.

29. Mark Fenwick, Wulf A. Kaal, & Erik P.M. Vermeulen, *Regulation Tomorrow: What Happens When Technology Is Faster than the Law?*, 6 AM. U. BUS. L. REV. 561, 576–77 (2017).

30. See Joshua A.T. Fairfield, *Bitproperty*, 88 S. CAL. L. REV. 805, 835 (2015) (“Clean property rules should reduce information costs. Unfortunately, the Internal Revenue Service’s (‘IRS’) attempt to treat virtual currency as property for tax purposes does not.”).

31. Christopher K. Odinet, *Bitproperty and Commercial Credit*, 94 WASH. U. L. REV. 649, 701–02 (2017) (“A single perfection system for virtual property . . . would be greatly beneficial in simplifying the otherwise fractured way courts approach virtual property.”).

legally recognizing digital property rights is required.³² As Joshua Fairfield summarized, “[i]t doesn’t matter whether our environments are physical, virtual, or an augmented reality hybrid. As long as individual self-determination remains a human demand, the idea of property will exert a powerful draw on the human imagination.”³³ Ultimately, the “extension of property principles to digital assets is . . . inevitable.”³⁴

Questions about recognizing intangible personal property through a single, unified, and tech-neutral approach, however, have been circumvented in an attempt to avoid rekindling the older and still open debate: can intangible digital property exist at all?³⁵ The scholarly debate on “virtual” property, which largely focused on the virtual world of Second Life in the early years of the twenty-first century,³⁶ did not reach a conclusion.³⁷ Strong end user license agreements (EULAs) precluded the need for a theoretically robust answer to this question by redefining the ownership of digital assets to actually mean the ownership of intellectual property rights, contract rights, or licensing rights, such as those governing consumer

32. As technology permeates property law, the importance of a tech-neutral regime becomes increasingly important. See Michael Birnhack, *Reverse Engineering Informational Privacy Law*, 15 YALE J.L. & TECH. 24, 37 (2013) (nothing that “the importance of the technology-neutral stance” has been frequently cited in “fields that have direct encounters with technology, such as intellectual property, e-commerce, telecommunications, environmental law, and, in recent years, privacy law” (footnotes omitted)).

33. FAIRFIELD, *supra* note 10, at 243.

34. *Id.*

35. See, e.g., Justin M. Ackerman, *An Online Gamer’s Manifesto: Recognizing Virtual Property Rights by Replacing End User Licensing Agreements in Virtual Worlds*, 6 PHX. L. REV. 137, 144–45, 186 (2012) (stating that some scholars vehemently argued that “virtual items should be treated as property”). But cf. Christopher J. Cifrino, *Virtual Property, Virtual Rights: Why Contract Law, Not Property Law, Must Be the Governing Paradigm in the Law of Virtual Worlds*, 55 B.C. L. REV. 235, 264 (2014) (stating that others believe that property rights over virtual assets “would be the end of the virtual world as we know it”).

36. See Ackerman, *supra* note 35, at 149–50 (“Modern virtual worlds [such as Second Life] are . . . ‘simulated social places . . . that feature software-animated objects and events . . . where users employ avatars,’ to interact with each other. A virtual world is also ‘persistent, meaning that actions taken and investments made in the simulation are expected by users to last some time,’ if not permanently.” (footnotes omitted) (first quoting GREG LASTOWKA, VIRTUAL JUSTICE 9 (2010); and then quoting *id.* at 31)).

37. Virtual worlds such as Second Life are structured as online three-dimensional environments in which players can buy, sell, create, and destroy virtual assets. See generally Cifrino, *supra* note 35.

e-books and music.³⁸ These license agreements were arguably sufficient to handle the legal disputes arising from digital assets in the context of recreation and entertainment.³⁹ However, contract law has not proven to be sufficiently robust to account for newer types of digital assets in light of economic and technological advancements.⁴⁰

Some fear that the traditional ontological categories of property in Anglo-American common law are simply inapplicable to intangible digital assets.⁴¹ On the one hand, digital assets are not like the prototypical image of property: they are abstractions of what ultimately boils down to ones and zeroes; they can exist on your computer, in the cloud, or even on decentralized systems like blockchains; and they are not tangible, having no obvious physical boundaries. On the other hand, digital assets do share certain characteristics with tangible property: there is a growing societal reliance on their longevity, even after death,⁴² and they must ultimately be stored on some physical medium somewhere in the world to exist.

Given these characteristics, it may be unclear whether digital assets are legal things under existing property law.⁴³ Certain theorists, such as J.G. Allen, claim that digital assets simply cannot be classified into any existing category of property, whether as choses in possession,⁴⁴ choses in action,⁴⁵ or even incorporeal

38. For a discussion on how contract law has been applied to regulate virtual assets, see Fairfield, *supra* note 30, at 810.

39. Most notably, the virtual world of Second Life involved a legal dispute. See *Bragg v. Linden Rsch., Inc.*, 487 F. Supp. 2d 593, 603 (E.D. Pa. 2007).

40. See J.G. Allen, *Property in Digital Coins*, 8 EUR. PROP. L.J. 64, 71 (2019). The EULA approach circumvents rather than answers “questions about the ontology of virtual objects. [Questions concerning virtual property] certainly have to be answered if we wish to understand legal relations concerning things like book-money, electronic securities, consumer data qua commodity—and now digital coins.” *Id.*

41. See *id.* at 65.

42. See, e.g., Banta, *supra* note 9, at 799.

43. By property law, I do not include intellectual property law, which governs nonrival information resources. This Article analyzes the law governing rival legal things and its application to digital assets.

44. For an explanation of choses in possession, see Pascale Chapdelaine, *The Undue Reliance on Physical Objects in the Regulation of Information Products*, 20 J. TECH. L. & POL’Y 65, 93 (2015) (“Personal property (‘chattels personal’) is subdivided between ‘choses in possession’ and ‘choses in action.’ Choses in possession are generally associated with ‘tangible property’ (i.e., those, ‘unfixed movables perceptible by the senses and thus capable of actual physical possession,’) or ‘corporeal things, tangible, movable and visible[;] they are always in the possession of someone.’” (alteration in

hereditaments.⁴⁶ Therefore, Allen claims that the recognition of digital property rights will require a new category of property, “*res digitales*,”⁴⁷ involving “the development of *sui generis* rules . . . governing [digital property’s] possession, transfer, [and] abandonment.”⁴⁸ Similarly, Katie Szilagyi claims that “Bitcoin eludes conceptualization through traditional philosophical frameworks,”⁴⁹ and ultimately proposes that “patrimony—a Roman law concept that persists in the civil law—provides a more coherent conceptual foundation for cryptocurrency property rights.”⁵⁰

Even if such proposals were doctrinally perfect solutions, each would require a radical overhaul of the very foundation of American property law. Such overhauls seem unlikely to occur, especially in time to address the onslaught of cases concerning digital property, cryptocurrencies, and NFTs that are surely to arise in the very near future.⁵¹ As Henry Smith notes, “aspects of the property system most

original) (footnote omitted) (first quoting W.H. HASTINGS KELKE, AN EPITOME OF PERSONAL PROPERTY LAW 2 (3d ed. 1910); and then quoting CROSSLEY VAINES, PERSONAL PROPERTY 11 (5th ed. 1973))).

45. For an explanation of choses in action, see *id.* at 93 (“[C]hoses in action’ are generally associated with ‘intangible property’ and are often negatively defined as ‘embracing all forms of property not involving actual possession or right of possession as a necessary incident’ Choses in action include debt, liquidated damages, promissory notes, shares, and copyright. ‘Choses in action’ originally referred to a tangible article which was in the possession of someone other than the owner: to recover it, the owner had to take an action at law, and later evolved to encompass ‘intangible rights existing only in contemplation of the mind, . . . all invisible and incorporeal rights.’” (footnotes omitted) (first quoting KELKE, *supra* note 44, at 2; and then quoting FRANK HALL CHILDS, PRINCIPLES OF THE LAW OF PERSONAL PROPERTY 54 (1914))).

46. See Allen, *supra* note 40, at 79–80 (stating that incorporeal hereditaments are “a raft of intangible objects of significance in the feudal system that were treated *like* land” and include “some modern-sounding things such as franchises, offices, and rights of way”).

47. *Id.* at 66 (stating that the term *res digitales* is meant to parallel the terms “*res corporales* (i.e., physical things) and *res incorporales* (i.e., reified rights)”).

48. *Id.* at 100.

49. Katie Szilagyi, *A Bundle of Blockchains? Digitally Disrupting Property Law*, 48 CUMB. L. REV. 9, 10–11 (2018) (“The availability of true digital assets has the potential to destabilize our theoretical constructs of what constitutes property, and correspondingly, property law.”); see also Kelvin F.K. Low & Ernie G.S. Teo, *Bitcoins and Other Cryptocurrencies As Property?*, 9 L. INNOVATION & TECH. 235, 267 (2017) (“[P]roperty rights over bitcoins may well represent a truly unique and novel form of property altogether . . .”).

50. Szilagyi, *supra* note 48, at 11; see also *Due v. Due*, 342 So. 2d 161, 165 (La. 1977) (“The civil law concept of patrimony includes the total mass of existing or potential rights and liabilities attached to a person for the satisfaction of his economic needs.”).

51. See Henry E. Smith, *The Persistence of System in Property Law*, 163 U. PA. L. REV. 2055, 2067 (2015).

closely associated with its architecture have changed little” and will likely continue to resist such change.⁵² Such overhauls, though, are only required because these proposals attempt to ensure that all digital assets, all *res digitales*, can be incorporated into a new property regime. But digital assets are not all the same. Certain digital assets may comply with already existing doctrinal requirements for property law, whereas others may not. In this Article, I analyze the characteristics of three types of digital assets to demonstrate how existing property doctrines, when applied in a tech-neutral fashion, can distinguish between digital personal property and non-property digital assets.⁵³ Specifically, I demonstrate that certain assets, such as bitcoins,⁵⁴ can indeed be treated as legal things and thus inherit and benefit from the body of property doctrines already in existence. I also demonstrate that NFT-based collectibles, as they currently exist, fail the test of legal thinghood—in spite of their reliance on blockchain technologies—and are therefore not governed by contemporary property law.

Instead of asking whether *all* digital assets could be legal things within a hypothetically overhauled system of property law, we should be asking whether *certain* digital assets are already legal things within the existing categories of property law.⁵⁵ In this Article, I argue, through a single, unified, and tech-neutral approach, that certain digital assets are indeed legal things. I further propose that this approach will position property law as a resilient foundation of private law in the face of evolving technologies while also addressing

52. *Id.*

53. *See infra* Part II.

54. *See* BITCOIN, <https://bitcoin.org/en/> [<https://perma.cc/CV94-N879>]. For a thorough introduction to blockchain technology and the economics of Bitcoin, see generally ARVIND NARAYANAN, JOSEPH BONNEAU, EDWARD FELTEN, ANDREW MILLER & STEVEN GOLDFEDER, *BITCOIN AND CRYPTOCURRENCY TECHNOLOGIES: A COMPREHENSIVE INTRODUCTION* (2016).

55. Some have proposed that bitcoins do fit within the traditional property category of (dematerialized) documentary intangibles. *See, e.g.*, Tycho de Graaf, *The Qualification of Bitcoins As Documentary Intangibles*, 27 EUR. REV. PRIV. L. 1051, 1051 (2019). This categorization is unsatisfactory because documentary intangibles such as “stock, shares, policies of insurance, and bills of lading were declared by the courts to be choses in action,” serving solely to reify preexisting in personam rights to facilitate “the movement of capital in secondary markets.” Allen, *supra* note 40, at 82–83. Bitcoins, as I demonstrate, are not choses in action and, therefore, are categorically not dematerialized documentary intangibles.

a current theoretical question: how do we coherently distinguish between digital assets that are property and those that are not?

This Article proceeds in the following order: in Part I, I first apply Wesley Newcomb Hohfeld's framework of rights and duties to derive a narrow working definition of property rights; I demonstrate that even under this narrow definition, tangibility is merely a technology (i.e., a tool) to delineate in rem rights; I then apply this finding to formulate a tech-neutral definition of a legal thing, the object of property law. In Part II, I leverage this definition to derive a test for legal thinghood; I then analyze three case studies to demonstrate how certain, though not all, intangible digital assets should be considered property when applying a tech-neutral and robust reformulation of the definition of legal things.

Ultimately, I conclude that we do not need to alter the traditional ontological categories of property to adequately recognize the existence of intangible digital property. Rather, new types of digital assets, including Bitcoin, may directly align with traditional notions of property within existing doctrines.⁵⁶ This indicates that the future legal treatment of digital property may, counterintuitively, rely on the existing analytical characteristics of legal things when applied in a tech-neutral manner.

I. TECH-NEUTRAL PROPERTY RIGHTS

This Article began with a single and seemingly simple statement: property is the law of “legal things.”⁵⁷ I have shown how this unified premise has been overshadowed by domain-specific functional approaches towards the regulation of digital assets and how such approaches are likely to lead to rapidly obsolete policies that intensify legal fragmentation and confusion.⁵⁸ How, though, should

56. See, e.g., Henry S. Zaytoun, *Cyber Pickpockets: Blockchain, Cryptocurrency, and the Law of Theft*, 97 N.C. L. REV. 395, 397 (2019).

57. DRAFT RESTATEMENT, *supra* note 1; see also Chang & Smith, *supra* note 1 (noting that “property law employs (legal) things”).

58. Fenwick et al., *supra* note 29.

we determine whether a digital asset is a “legal thing” under a unified approach?

A straightforward way to answer this question would be to first define the set of criteria necessary for something to be property—a legal thing—and then determine whether any digital asset fulfills these criteria. For some property theorists, this would be an easy question to answer because tangibility itself would be a requisite criterion for rivalrous assets to be legal things.⁵⁹ Such an approach has been adopted by German civil law, for example, where tangibility is a statutory requirement for personal property (the law of *Sache*, in German, i.e., *res*).⁶⁰

While discussing bitcoins, Allen rationalized this criterion by noting that “*intangible* object[s] capable of *physical* possession” would form an “unstable category” of property.⁶¹ Similarly, Szilagyi claimed that “[b]itcoins are something [entirely] new: they have no *physical* analogues” and that “the concept of [such] rivalrous *intangible* property has not previously been considered at law, or in

59. See, e.g., Simon Douglas & Ben McFarlane, *Defining Property Rights*, in PHILOSOPHICAL FOUNDATIONS OF PROPERTY LAW 219, 220 (James Penner & Henry E. Smith eds., 2013) (“[W]e reach the conclusion by employing a Hohfeldian analysis, and we argue that it compels us to give a narrow definition to property rights, limiting such rights to cases where the rest of the world is under a prima facie duty to A not to deliberately or carelessly interfere with a *physical* thing.” (emphasis added)).

60. Andreas Rahmatian, *A Comparison of German Moveable Property Law and English Personal Property Law*, 3 J. COMP. L. 197, 201 (2010) (“In German law, the meaning of ‘thing’ (*res*) is narrower than in other legal systems. For the purpose of the law, a thing (*Sache*) is defined . . . as comprising physical objects only.” (citation omitted)). Intangibles are also protected by statute in German law:

Section 903 only applies to tangibles, but a number of other statutes cover a great variety of intangible ownership interests. For example, interests in the nature of debts, such as mortgages, unsecured debts on land, and debts on personal property are covered by sections such as section 1204 of the [German Civil Code]. Freedom of construction is guaranteed and arises from the German Constitution. Patents, copyrights, and trademarks are likewise protected. Private ownership also applies to causes of action, hunting licenses, leases, and the right to run a business. Owners are granted broad recovery rights for infringements and violations of their exclusive interests, and the enforcement of property interests is ensured by an adequate number of attorneys and a well-developed judiciary

O. Lee Reed & Florian A. Stamm, *The Connection Between a Property-Based Legal System and National Prosperity: Example from a Divided Germany Reunified*, 33 GA. J. INT’L & COMP. L. 573, 592–93 (2005).

61. Allen, *supra* note 40, at 87 (emphasis added). In other work, I address how the concept of possession is indeed applicable to certain intangible assets, providing further evidence that foundational property concepts do not depend on tangibility. See generally João Marinotti, *Possessing (Digital) Property* (Ind. Legal Stud. Rsch. Paper, Paper No. 447, 2021), <https://dx.doi.org/10.2139/ssrn.3834643>.

legal theory.”⁶² Even judges have leaned on statements such as “[n]othing in our [current] frame of references allows us to accurately define or describe Bitcoin.”⁶³

The ubiquity of this tangibility criterion, alongside the admittedly exciting idea that Bitcoin could be something entirely new to law, may have led to premature conclusions that overlooked the actual similarities between bitcoins and other personal property. For example, bitcoins may be simultaneously lost to the owner, not in anyone else’s control, and still in existence. These three characteristics, respectively, demonstrate that bitcoins are separable and alienable, exclusive and rival,⁶⁴ and not simply reified rights.⁶⁵ This constellation of attributes is one “which the common law [recognizes] as a characteristic of choses in possession.”⁶⁶ Why, then, is it not straightforward to categorize bitcoins as choses in possession, or in other words, a type of legal thing?

Perhaps the reason is vestigial. The similarities between these types of digital assets and traditional in rem property rights (i.e., choses in possession) were not envisioned during the earlier

62. Szilagyi, *supra* note 49, at 16 (emphasis added).

63. *State v. Espinoza*, No. F14-2923, slip op. at 5 (Fla. Cir. Ct. July 22, 2016).

64. The ability to exclude would fulfill James Penner’s “exclusion thesis” that “the right to property is a right to exclude others from things which is grounded by the interest we have in the use of things.” JAMES E. PENNER, *THE IDEA OF PROPERTY IN LAW* 71 (1997) [hereinafter PENNER, *THE IDEA OF PROPERTY IN LAW*]; see also J.E. Penner, *The “Bundle of Rights” Picture of Property*, 43 *UCLA L. REV.* 711, 743–44 (1996) (“The right to property itself is the right that correlates to a general duty that all others have to *exclude themselves* from the property of others. It is a right of exclusion, certainly, but it is not the right physically or by order or otherwise (say by putting up fences) to actually exclude others from one’s property. The fact that we may not have the right to throw trespassers off our land, and must call the police to do so instead, for instance, does not mean that we do not have a right to the land, but only that our means of effecting the right are circumscribed. This element of the right to property is brought out when the court is faced with claims to novel kinds of property, such as property in news, sporting events, or information. The court does not ask whether the claimant has the right to effectively exclude the putative trespasser or thief from the supposed property, by not publishing news stories, or by building a wall obstructing the view of an event, or by keeping information secret; it asks whether the putative trespasser or thief has a duty to exclude himself from it.”).

65. Reified rights are legal rights “treated by the law *as if* [they] were a thing” but represent an *obligation* that can be enforced by law. Allen, *supra* note 40, at 72. Reified rights include intangibles such as choses in action (e.g., debts and shares) where “a legal right (the ‘action’)” may be bought and sold as if it were a thing. *Id.*

66. Joanna Perkins & Jennifer Enwezor, *The Legal Aspect of Virtual Currencies*, 10 *BUTTERWORTHS J. INT’L BANKING & FIN. L.* 569, 570 (2016) (noting that these are not the characteristics of a chose in action).

academic and judicial discussions of Second Life's virtual resources. The growing diversity in the characteristics of digital assets provides us with the necessary context to revisit the role of tangibility in defining legal things.

A. *The Rights of Owners and the Duties of Non-Owners*

A comprehensive analysis of the entirety of property law and theory is surely outside the scope of this Article, but whether one adheres to a bundle-of-sticks analysis of property,⁶⁷ an essentialist or architectural view of property,⁶⁸ or any other property theory,⁶⁹ it is relatively uncontroversial that property rights to a legal thing contain at least: (1) some sort of a “right to use,” and (2) some sort of a “right to exclude.”⁷⁰ This pair of rights can be formalized into a seemingly

67. THOMAS W. MERRILL & HENRY E. SMITH, *PROPERTY: PRINCIPLES AND POLICIES* 1 (3d ed. 2017) (“Many theorists adopt a . . . conception of property as a collection (‘bundle’) of rights, with content that varies according to context and policy choices.”); *see also, e.g.*, David L. Callies & J. David Breemer, *The Right to Exclude Others from Private Property: A Fundamental Constitutional Right*, 3 WASH. U. J.L. & POL’Y 39, 43 (2000) (“[T]he right to exclude is one of the most important sticks in the bundle of rights that comprise private property.”). For an application of the bundle-of-sticks approach to intellectual property, *see, e.g.*, Paul M. Schoenhard, *Who Took My IP?—Defending the Availability of Injunctive Relief for Patent Owners*, 16 TEX. INTELL. PROP. L.J. 187, 211 (2008), showing that “[v]iewed from this ‘bundle of rights’ perspective, . . . the right to exclude [from a patent is] ‘one of the most treasured strands in an owner’s bundle of property rights.’ Patent rights are thus properly recognized as property rights within the purview of the Fifth Amendment.” *Id.* (quoting *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 435–36 (1982)).

68. The essentialist view of property stems from the perspective of “property as a right to a thing good against the world.” MERRILL & SMITH, *supra* note 67; *see also, e.g.*, Thomas W. Merrill, *Property and the Right to Exclude*, 77 NEB. L. REV. 730, 730 (1998) (“[T]he right to exclude others is more than just ‘one of the most essential’ constituents of property—it is the *sine qua non*. Give someone the right to exclude others from a valued resource, i.e., a resource that is scarce relative to the human demand for it, and you give them property. Deny someone the exclusion right and they do not have property.”); Thomas W. Merrill & Henry E. Smith, *Why Restate the Bundle?: The Disintegration of the Restatement of Property*, 79 BROOK. L. REV. 681, 708 (2014) (stating the “imminent architecture in the law of property [is] . . . grounded in a basic commitment to owners’ exclusion rights, modified by select governance regimes that respond to problems generated in part by transaction costs”).

69. *See, e.g.*, Craig Anthony (Tony) Arnold, *The Reconstitution of Property: Property As a Web of Interests*, 26 HARV. ENV’T L. REV. 281, 364 (2002) (“The image of property as a web of rights is an alternative metaphor that courts, legislatures, lawyers, and scholars may wish to consider. The web of interests metaphor builds on judicial and popular attention to the things people own and on theories advancing values as diverse as environmental stewardship, a pragmatic-feminist ethic of human flourishing and personhood, and utilitarian protection of economic expectations. It envisions property as an interconnected web of relationships between people and an object, and among people.”).

70. Douglas & McFarlane, *supra* note 59, at 232 (“Proponents of the ‘bundle of rights’ view typically describe an owner of a thing as having both a ‘right to use’ the thing and a ‘right to exclude’ others from the thing.”). But this Article’s focus is not to claim that these two rights comprise the

concrete working definition of legal thinghood focusing on the rights of owners. This so-called “internal” approach defines property through “the property owner’s perspective on his or her own situation.”⁷¹

t is a legal thing if, when owned by X⁷²:

- a) X has a ‘right to use’ *t*; and
- b) X has a ‘right to exclude’ any non-owner Y from using or accessing *t*.⁷³

When attempting to apply this definition, two interpretive issues immediately emerge. What exactly are the “right to use” and the “right to exclude”? For example, can there be any limits on an owner’s right to use an asset, or would such asset no longer constitute a legal thing? Must an owner actively exclude any non-owner for an asset to be considered property?

An economic analysis of property attempts to answer these questions through what is called the Hawk/Dove Game, wherein the hawk represents the owner and the dove represents the non-owner.⁷⁴ In this game, hawks protect their possession with force, and doves

metaphysical core of property; rather, this Article’s focus on these two rights stems from their general acceptance and from the implications derived from a tech-neutral reanalysis of these rights.

71. Carol M. Rose, *Psychologies of Property (and Why Property Is Not a Hawk-Dove Game)*, in *PHILOSOPHICAL FOUNDATIONS OF PROPERTY LAW*, *supra* note 59, at 272, 281.

72. Note that this is a preliminary definition that is progressively refined in the remainder of this Section. Throughout this Article, I refer to asset *t*, owner X, non-owner Y, and action *a*. For readability and because of the scope of this Article, the definition above solely addresses the characteristics of *t* when owned (or, for the purposes of this Article, possessed). A more complete definition of legal thinghood would also encompass the characteristics of *t* when not owned or possessed. This and subsequent definitions of legal thinghood could be restated as: *t* is a legal thing if and only if (iff): {(a) when owned or possessed by X: { . . . }, (b) when not owned or possessed { . . . }[, (c) . . .]}. In other words, being owned or possessed is not a requisite for legal thinghood. The definition merely asserts that if legal thing *t* were owned or possessed, then the enumerated rights would be entailed. In the alternative, if the enumerated rights are conceptually not applicable to *t*, regardless of whether *t* is owned or possessed, then *t* would not be a legal thing.

73. Access is used as a “rough prox[y] . . . to protect a range of uses.” Henry E. Smith, *Semicommons in Fluid Resources*, 20 MARQ. INTELL. PROP. L. REV. 195, 198 (2016) (referring to “[t]respas and the *ad coelum* rule [as] . . . prototypical methods of implementing such a[n] exclusion] strategy”). Therefore, access and use may be two sides of the same coin, for the purposes of our first working definition.

74. Rose, *supra* note 71.

refrain from theft for fear of getting hurt. As Carol M. Rose summarizes, under this theory “all respect for property comes from fear on the part of the non-owner.”⁷⁵ A hawk has an unlimited right to use its things but must actively protect them against intrusions by doves. In this game, if the hawk does not actively protect its things, doves are no longer afraid of the hawk and thus have no reason not to take its things.

This cannot be the whole story, however, because in real life: (1) the right to use is, in fact, limited by at least “[n]uisance law, zoning, and environmental regulation,”⁷⁶ and (2) the “non-owner shows respect for the owner’s property even when the non-owner has little reason to fear the owner’s defence.”⁷⁷ In fact, Rose claims that “the core attribute of property is precisely that the non-owner respects the owner’s claim even when it is *not* defended.”⁷⁸ The non-owner’s perspective, then, must play a contributing role in our definition of legal things. This shift in perspective, from the owner to the non-owner, pushes our model into what is called an “external” approach where “the psychological state of the non-owner, who is confronted regularly with things that belong to others,”⁷⁹ plays a crucial role in determining what is and is not property.

James Penner’s famous parking lot example illustrates this conceptual realignment.⁸⁰ Imagine Sam strolling through a parking lot. Sam walks past a car. She does not know whether the car is owned by Jessie, or whether the car is on loan to Jessie’s cousin, or whether the car has just been sold to Jessie’s friend. What Sam does

75. James Penner & Henry E. Smith, *Introduction to PHILOSOPHICAL FOUNDATIONS OF PROPERTY LAW*, *supra* note 59, at xv, xxvi.

76. Katrina M. Wyman, *The New Essentialism in Property*, 9 J. LEGAL ANALYSIS 183, 202 (2017).

77. Rose, *supra* note 71.

78. *Id.* at 283.

79. *Id.* at 281.

80. PENNER, *THE IDEA OF PROPERTY IN LAW*, *supra* note 64, at 75–76 (“As I walk through a car park, my actual, practical duty is only capable of being understood as a duty which applies to the cars there, not to a series of owners. For all I know, all the cars are owned by the same person. The content of my duty not to interfere is not structured in any way by the actual ownership relation of the cars’ owners to their specific cars. By the same token, if one of the cars has just been sold, so that there is a new owner, or if one of the cars has been lent to the owner’s sister-in-law, again, my duty has not changed one whit. Thus transactions between an owner and a specific other do not change the duties of everyone else not to interfere with the property.”).

know, however, is that she does not own the car. From this single piece of information, Sam (i.e., the non-owner) acknowledges and upholds her duty not to take the car.⁸¹

Can this external approach help answer the original question of whether bitcoins—or any other digital assets—are legal things? A formalization of “the psychological state [and legal status] of the non-owner”⁸² does indeed lead to a more precise definition of legal things, which is then used to demonstrate that certain digital assets are legal things. This analysis also highlights the central role and mechanics of shared social customs and intuitions in tech-neutral property doctrines.

1. Hohfeldian Claim-Rights, Liberty-Rights, and Duties

The initial working definition of legal thing, as the owner’s right to use and right to exclude, insufficiently accounted for (1) limits on the owner’s right to use (e.g., through nuisance law or environmental regulations), and (2) the non-owner’s duty to respect property, even when unprotected. To address these deficiencies, a Hohfeldian reformulation of these dual rights will be explored through the lens of information theory and the New Private Law.⁸³ Although Hohfeld’s full paradigm of “jural opposites” and “jural correlatives” is not necessary for this analysis, the definitions of claim-rights, duties, liberties, and no-rights are helpful in formalizing the definition of legal thing.⁸⁴ The arguments in this Article do not require the adoption of universal rights correlativity nor do they promote the Hohfeldian reductionism of property law made prevalent by the American legal realists.⁸⁵ Rather, the rights, duties, and liberties

81. Rose, *supra* note 71, at 283 (“[M]ost non-owners are not larcenists, and they do not like larcenists. . . . [Y]ou do not have to guard your things all the time, because the ‘world’ of non-owners respects your ownership.”).

82. *Id.* at 281.

83. See WESLEY NEWCOMB HOHFELD, *FUNDAMENTAL LEGAL CONCEPTIONS AS APPLIED IN JUDICIAL REASONING AND OTHER LEGAL ESSAYS* 36 (Walter Wheeler Cook ed., 1920).

84. See, e.g., *id.*; see also, e.g., Pavlos Eleftheriadis, *The Analysis of Property Rights*, 16 OXFORD J. LEGAL STUD. 31, 31 (1996); Douglas & McFarlane, *supra* note 59, at 232.

85. For an analysis of some analytical problems inherent in Hohfeld’s paradigm, see generally David Frydrych, *Rights Correlativity*, in *THE LEGACY OF WESLEY HOHFELD: EDITED MAJOR WORKS, SELECT PERSONAL PAPERS, AND ORIGINAL COMMENTARIES* (Shyam Balganes, Ted Sichel, & Henry Smith

referred to may be taken as merely descriptive and of relevance only in this context.

According to Hohfeld's classic framework: (1) claim-rights are those rights which correlate to duties, meaning that X's claim-right and Y's duty "are two sides of the same coin";⁸⁶ (2) duties are simply defined as legal obligations to do or not do *a* (an action);⁸⁷ (3) liberty-rights, unlike claim-rights, do not correlate to duties. X's liberty to do *a* is a descriptive statement noting that there is no person Y who has a claim-right that X not do *a*;⁸⁸ and (4) no-rights correlate to liberties,⁸⁹ such that if X has a liberty to do *a* then Y has a no-right over X's liberty to do *a*.⁹⁰

Although these definitions are written with *a*, referring to an action as the object of rights, liberties, and duties, the definitions are equally applicable to *t* (a thing). For those who adopt Hohfeld's requirement that jural relationships be solely interpersonal, such a proposition may be controversial, as Hohfeld himself asserted that a "right in rem is not a right 'against a thing.'"⁹¹ Thankfully, this concern can be addressed in two ways. First, without hindering the work's main points, readers may reinterpret jural relationships written with *t* as

eds., forthcoming 2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3023807. For a critique of Hohfeldian reductionism, see J.E. PENNER, PROPERTY RIGHTS: A RE-EXAMINATION 56 (2020). The Hohfeldian reductionism of property law into an enumeration of independent rights "grants the Hohfeldian [theorist] the assumption that, in principle, at any time one could provide a complete snapshot of A's legal position, expressed as a series of Hohfeldian jural relations between identified individuals. . . . [But] this does not amount to an *analysis*. It provides no insight into the norms that make up the law and, indeed, it tends to obscure them because, purporting to be fundamental, it suggests that nothing further needs to be said." *Id.*

86. Thomas D. Perry, *A Paradigm of Philosophy: Hohfeld on Legal Rights*, 14 AM. PHIL. Q. 41, 42 (1977) ("Mr. A's right-claim that Mr. B shall do or forbear from doing X is correlative to B's duty to do or forbear; they are two sides of the same coin.").

87. HOHFELD, *supra* note 83, at 38 ("A duty or legal obligation is that which one ought or ought not to do. . . . When a right is invaded, a duty is violated.").

88. Perry, *supra* note 86 ("[A]s between A and B, A may be at liberty to do X—that is, B will have no legal right in the strict sense that A shall not do it—but this does not mean that B is under any duty toward A.").

89. HOHFELD, *supra* note 83, at 38–39.

90. The relationship between these four terms can be summarized from a first person perspective as follows: (1) "if I do not have a right to [do *a*], I have a no-right to it; and if I do not have a duty to do [a], then I have a liberty-right or am at liberty not to do it," (2) "if I am not at liberty to do [a], then I have a duty not to do it," and (3) "if it is not the case that I have a no-right to [do *a*], then I have a right to it." Perry, *supra* note 86.

91. HOHFELD, *supra* note 83, at 74.

merely shorthand for the set of all “multital” jural relationships person X may have with all other individuals over (or concerning) *t*.⁹² Even in this approach, however, the importance of legal thinghood and discernable boundaries is noteworthy because it is through the “thing” that an “in rem right can be easily broadcast to a large and indefinite set of duty bearers.”⁹³

The second and more substantive solution, however, may be that Hohfeld’s statement does *not* rule out jural relations with legal things; rather, his statement merely clarifies that property rights (e.g., fee simple) cannot be represented solely by a *single* claim-right against an object. Instead, an in rem property right is “a complex aggregate of rights (or claims), privileges, powers, and immunities.”⁹⁴ Indeed, as Ted M. Sichelman noted: “the core jural relations that are regularly used in the law [such as fee simple property ownership] are often compact ‘modules’ of complex Hohfeldian relations that serve to reduce the information costs involved in doing actual legal work.”⁹⁵ Not only does Hohfeld’s work on complex aggregates inform the formulation of the right to use and right to exclude in this analysis of property, it also reinforces the idea that the definition of property is a multi-part “compact module” of jural relations, which “reduce[s] the information costs otherwise involved in delineating the full set of Hohfeldian entitlements inhering in property.”⁹⁶

92. Wesley Newcomb Hohfeld, *Fundamental Legal Conceptions As Applied in Judicial Reasoning*, 26 YALE L.J. 710, 718 (1917) (“A multital right . . . is always *one* of a large *class* of *fundamentally similar* yet separate rights, actual and potential, residing in a *single* person (or single group of persons) but availing *respectively* against persons constituting a very large and indefinite class of people.”).

93. Andrew S. Gold & Henry E. Smith, *Scaling Up Legal Relations*, in THE LEGACY OF WESLEY HOHFELD: EDITED MAJOR WORKS, SELECT PERSONAL PAPERS, AND ORIGINAL COMMENTARIES, *supra* note 85 (manuscript at 14), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3091652.

94. Hohfeld, *supra* note 92, at 746.

95. Ted M. Sichelman, *Very Tight “Bundles of Sticks”*: Hohfeld’s Complex Jural Relations, in THE LEGACY OF WESLEY HOHFELD: EDITED MAJOR WORKS, SELECT PERSONAL PAPERS, AND ORIGINAL COMMENTARIES, *supra* note 85 (manuscript at 2), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2947912.

96. *Id.* (“I propose that the modular ‘thing’ approach to reasoning about property and other legal concepts is not only consistent with—but indeed *identical* to—a ‘bundle’ approach, at least one that that properly takes account of the complex network of legal relations, actors, and actions that constitute ‘property’ and other high-level legal concepts.”).

As such, the four fundamental jural relationships defined above contain the analytical tools necessary to address the inadequacies of the initial working definition of property. The right to use and the right to exclude will be reformulated into a set of claim-rights, duties, liberties, and no-rights, which elucidate the role of tangibility in property law.

2. *The Right to Use: Owners' Liberty-Right to Use*

What exactly is the right to use? Starting with Simon Douglas and Ben McFarlane's explanation,⁹⁷ an owner's "right to use" a thing is a liberty-right:

[W]hen an owner claims that he has a "right to use" his thing, he is not normally asserting that others owe him a legal duty to behave in a certain way; rather, he is asserting that he himself is permitted to behave in a certain way, i.e.[,] to use his chattel or his land. Put a little differently, when A [or X] claims that he has a "right to use" his thing, he is asserting that he is under no legal duty to B, C, D . . . etc.[,] not to use his thing and, in the absence of such a duty, his use is permitted. When an owner asserts a "right" in this sense, the better word is "privilege" or "liberty"⁹⁸

As stated above, this liberty to use is nothing more than a descriptive assertion of fact. It is an assertion that an owner is legally permitted to engage in certain uses of a thing. The right to use then

97. Although I ultimately disagree with Simon Douglas and Ben McFarlane's reliance on tangibility, their proposed Hohfeldian reformulations of the right to use and right to exclude are used as the next step in formalizing our working definition of legal thing. See Douglas & McFarlane, *supra* note 59, at 240.

98. *Id.* at 226 ("[A]s Cave, J., said in *Allen v. Flood*: 'it was said that a man has a perfect *right* to fire off a gun, when all that was meant, apparently, was that a man has a freedom or *liberty* to fire off a gun so long as he does not violate or infringe anyone's rights in doing so, which is a very different thing from a right the violation or disturbance of which can be remedied or prevented by legal process.' As Cave, J., thus noted, an owner's 'right to use' his thing, being no more than an assertion that his use is legally permitted, is more accurately described as a 'liberty to use.'" (cleaned up) (quoting *Allen v. Flood* [1898] AC 1 (HL) at 29)).

can be formalized, though somewhat convolutedly, as a set of all possible manners of using a thing for which there is no person to whom the owner has a duty not to use the thing in such manner. Simply put, an owner's liberty-right comprises the set of all possible uses of a thing which the owner does not have a duty to avoid.

For example, let us imagine that it is 11:59 AM, and Amy, a Nebraskan high school student, is sitting at her desk beside an open classroom window impatiently waiting for the lunch bell to ring. On Amy's desk is her pen. She plans on using her pen in some way to relieve her boredom but has not yet decided exactly how. Beside her pen is a heavy algebra textbook, which Amy rented by signing an agreement to return the book unaltered. In her dire boredom, she wants to engage in one of the following activities: (1) angrily throw the pen out of the open window; (2) write some profanity on the algebra textbook; (3) doodle on her arm; or (4) teleport her pen a few inches to the right. Which of these options fall within Amy's liberty-right? To answer this question, we must ask from which of these uses does Amy have a duty to abstain.

In Nebraska, "[a]ny person who deposits, throws, discards, or otherwise disposes of any litter on any public or private property . . . commits the offense of littering" and "shall be guilty of a Class III misdemeanor."⁹⁹ Whether or not she is aware of this law, she has a duty not to throw her pen out of the window because doing so would constitute littering.¹⁰⁰ Statutorily, then, throwing her pen out of the window is not within her liberty-right to use her pen.

Amy signed a contract under Nebraska law to rent her algebra textbook. In the contract, Amy agreed to return the book unaltered without any profanity. Therefore, regardless of whether Amy actually read the contract, she has a duty not to write in it.¹⁰¹ Contractually,

99. NEB. REV. STAT. ANN. § 28-523 (2012); *see also* State v. Martinez, No. A-19-207, 2019 WL 5595582, at *4 (Neb. Ct. App. Oct. 21, 2019) ("Littering is a Class III misdemeanor. . . . A Class III misdemeanor is punishable by a maximum of [three] months' imprisonment.").

100. Satterfield v. State, 109 N.W.2d 415, 419 (Neb. 1961) ("Ignorantia Juris neminem excusat" (Ignorance of law excuses no one) is a maxim sanctioned by centuries of experience.").

101. Eicher v. Mid Am. Fin. Inv. Corp., 702 N.W.2d 792, 804 (Neb. 2005) ("[O]ne who signs an instrument without reading it, when he can read and has the opportunity to do so, cannot avoid the effect of his signature merely because he was not informed of the contents of the instrument." (quoting Bock

then, writing profanity in the textbook is not within her liberty-right to use her pen.

Pen ink is a “minimally toxic substance” and may, if ingested, possibly lead to “occasional [gastro-intestinal] upset.”¹⁰² That being said, Amy does not have a duty to refrain from drawing on her own skin. Therefore, doodling on her arm is well within her liberty-right to use the pen, though it may not be the best idea.

Lastly, Amy has no magical powers. She does not know how to teleport the pen. There are no laws or contracts barring Amy from teleporting the pen. Without further analysis, one could potentially determine that, in spite of her inability, teleporting the pen is within Amy’s liberty-right to use. However, teleportation is not a possible use; it is an *impossible* use. This distinction means that even if teleportation is not prohibited, it is also not within the set of all possible uses that comprise Amy’s liberty-right to use.

If something cannot physically occur, it is definitionally not a use case that can be allowed or prohibited. If teleportation becomes possible, it will then enter into the set of possible uses which Amy is allowed to engage in, subject to statutory, regulatory, or contractual prohibitions.¹⁰³ Such an approach enables an intentional, as opposed to extensional, method of defining in rem rights; the “delineation of rights is often not undertaken until it is necessary,” and property rights may presumptively grant owners the liberty to engage in newly possible uses as a “starting point for legal analysis.”¹⁰⁴

Therefore, out of all four options, Amy’s liberty-right to use the pen only currently includes doodling on her arm. When a use is

v. Bank of Bellevue, 434 N.W.2d 310, 316 (1989)); see also *Universal Sur. Co. v. Jed Const. Co.*, 265 N.W.2d 219, 221 (Neb. 1978) (“[O]ne who does not read a contract before signing it cannot relieve himself of its burdens.”).

102. Michael A. McGuigan et al., *Guideline for the Out-of-Hospital Management of Human Exposures to Minimally Toxic Substances*, 41 J. TOXICOLOGY: CLINICAL TOXICOLOGY 907, 910 (2003).

103. Although this example focuses on teleportation, the point is larger. The allowance of a use cannot be defined in reference to its current state of (im)possibility. As our technological abilities change at an ever-increasing pace, newly possible abilities (or uses) will then be entered into the set of all possible uses subject to an owner’s duties to avoid. If no shared social custom or intuition exists about such new uses, then legislative intervention (as in Kansas’ “Fence In” statute example described *infra*) or time may eventually lead to a determination of whether such newly possible use is within or without an owner’s liberty-right (i.e., that an owner has a duty to avoid such use).

104. Gold & Smith, *supra* note 93 (manuscript at 8–9).

statutorily prohibited, contractually prohibited, or is not a possible use at all, it is not within one's liberty-right.

This definition may seem somewhat tautological because it is merely referential to duties externally imposed on an owner rather than substantive itself. But that is the point: limitations on an owner's right to use are not a hindrance to legal thinghood but rather an integral part. By defining owners' right to use in reference to their external duties to anyone else, the right to use is definitionally circumscribed.¹⁰⁵ Though new possible uses may be presumed to be within owners' liberty-right,¹⁰⁶ the limits to their right to use derive from any and all of their duties created through "[n]uisance law, zoning, and environmental regulation,"¹⁰⁷ or the like. From this analysis of the right to use, the working definition of legal thing is now:

t is a legal thing if, when owned by X:

- a) X has a *liberty-right* to use *t*;¹⁰⁸ and
- b) X has a 'right to exclude' any non-owner Y from accessing or using *t*.

This new definition alleviates concerns that property rights may prevent government regulation of digital assets.¹⁰⁹ Environmental regulations and anti-money laundering statutes, for example, would simply impose duties onto owners not to use their legal things in defined ways. As the Supreme Court of California stated:

Although one owns property, he may not do with it as he

105. One could imagine a situation in which X's external duties to Y are so stringent that X has no more ways in which X is allowed to use *t*. Would *t* still be X's property? As I will discuss in the following Section, the right to exclude will ensure that X's liberty-right to *t* will include at least a liberty-right to exclude Y (alongside the claim-right discussed below).

106. Gold & Smith, *supra* note 93 (manuscript at 8–9).

107. Wyman, *supra* note 76.

108. In each revised definition of legal thing, I use italics to represent the change stemming from each analytical step.

109. Christopher Serkin, *The Missing Rung: Challenging Regulatory Barriers to Property Acquisition*, 6 BRIGHAM-KANNER PROP. RTS. CONF. J. 275, 278 (2017) ("Strong protection for private property substantially limits regulatory authority, and vice versa.").

pleases, any more than he may act in accordance with his personal desires. As the interest of society justifies restraints upon individual conduct, so also does it justify restraints upon the use to which property may be devoted. It was not intended by these constitutional provisions to so far protect the individual in the use of his property as to enable him to use it to the detriment of society. By thus protecting individual [property] rights, society did not part with the power to protect itself or to promote its general well-being.¹¹⁰

This more accurate definition also begins to shed light on one of the possible roles of tangibility in property law. As stated above, an owner's liberty-right to use comprises the set of all possible uses of a legal thing that the owner does not have a duty to avoid. To define such a set, we first "need to know what the resource [i.e., the legal thing] *is*"¹¹¹ before determining "what actions are allowed with respect to that resource."¹¹² This question refers to "the 'compositional' dimension of property rights: what collection of attributes is treated as a unit for describing permitted or forbidden activities."¹¹³

If I own a 1990 Toyota, may I use the brand-new BMW parked down the street? As much as I might want to, the answer is surely and unfortunately no. The bounds of my liberty-right do not extend to the BMW. I must first be able to determine what the asset is and, therefore, the bounds of my liberty-right to determine which uses are allowed or prohibited.¹¹⁴

110. *Robins v. Pruneyard Shopping Ctr.*, 592 P.2d 341, 345 (Cal. 1979), *aff'd*, 447 U.S. 74, 79 (1980); *see also* *Bitterrooters for Planning, Inc. v. Mont. Dep't of Env't Quality*, 401 P.3d 712, 719 (Mont. 2017) (noting the "Legislature's constitutional duty to maintain and provide for a clean and healthful environment . . . [by] protecting our environment in balance with the right to use and enjoy private property free from undue government regulation").

111. Henry E. Smith, *Exclusion Versus Governance: Two Strategies for Delineating Property Rights*, 31 J. LEGAL STUD. S453, S454 (2002) (emphasis added).

112. *Id.*

113. *Id.*

114. High school student Amy, in the example *supra*, needed to understand the bound object that was her pen before brainstorming its possible uses. Just as with Amy's pen, X's contractual or regulatory

When an asset is tangible, determining the collection of attributes that is treated as a unit, and therefore the bounds of my liberty-right, is rather straightforward because it frequently relies heavily on deep-seeded perceptual biases.¹¹⁵ Even in infancy, human cognition shows a propensity to categorize and assign identities to “solid objects,” or “bodies that are cohesive, bounded, spatiotemporally continuous, and solid or substantial.”¹¹⁶ The perceptual salience of tangible boundaries in defining the collection of attributes that is treated as a thing is demonstrated by the fact that even infants “conceptualize solid objects in a way that distinguishes them from non-solid substances”¹¹⁷ and assign meaning and value to bounded objects more quickly than to unbounded substances.¹¹⁸

Tangibility, therefore, leverages the cognitive effects of human perception to delineate the collection of attributes treated as the single unit, defining the bounds of an owner’s liberty-right in the process. Tangibility, in this way, has served as a rough proxy for discreteness,¹¹⁹ for treating or intuiting the asset as “a separate whole,”¹²⁰ and ultimately for the ability to clearly delineate the boundaries of an owner’s liberty-right. Our question, however, is not whether tangibility *helps* define property; rather, our question is whether tangibility is conceptually *required* to define an owner’s right to use.

duties also alter the bounds of X’s liberty-right.

115. Note that as used here, bias is not normatively negative. Rather, perceptual biases are commonly analyzed as “simple heuristics in complex, unfamiliar, uncertain, and/or time-constrained situations because we can only process a limited amount of the available information.” Johan E. Korteling, Anne-Marie Brouwer, & Alexander Toet, *A Neural Network Framework for Cognitive Bias*, 9 FRONTIERS PSYCH., Sept. 2018, at 1, 2 (describing the standard “cognitive-psychological” perspective on cognitive and perceptual biases).

116. Nancy N. Soja, Susan Carey, & Elizabeth S. Spelke, *Ontological Categories Guide Young Children’s Inductions of Word Meaning: Object Terms and Substance Terms*, 38 COGNITION 179, 183 (1991) (noting that solid objects “move as connected wholes, independently of one another, on connected paths though unoccupied space”).

117. *Id.*

118. Lance J. Rips & Susan J. Hespos, *Concepts of Objects and Substances in Language*, 26 PSYCHONOMIC BULL. & REV. 1238, 1240–41 (2019).

119. Thomas W. Merrill, *The Property Strategy*, 160 U. PA. L. REV. 2061, 2063 (2012) (“The property strategy applies to ‘things’—discrete resources.”).

120. DRAFT RESTATEMENT, *supra* note 1.

Tangibility is not required. It is not tangibility but rather an “obvious” boundary around the liberty-right that is required to define X’s liberty-right to use *t*.¹²¹ The word “obvious” is perhaps no more helpful than our starting point—the “right to use”—but through the analysis of the right to exclude, a working definition of “obvious” is addressed below. Thus, our definition becomes:

t is a legal thing if, when owned by X:

- a) X has a liberty-right to use *t*
 - i. *X’s liberty-right has an obvious boundary*; and
- b) X has a ‘right to exclude’ any non-owner Y from accessing or using *t*.

Notably, in this analysis, tangibility has been used as a “technology,” meaning a tool, method, or manner of accomplishing a task.¹²² Specifically, tangibility has been used to ensure a clearly delineated liberty-right to use. In Section I.B, below, tangibility’s role as a technology is further clarified and expanded upon to demonstrate how other cognitive effects, shared social customs, and intuitions can perform the same function as tangibility with equal success. But property doctrines have calcified around the proxy, the technology, instead of its conceptual purpose. Before clarifying and expanding upon this argument, its consequences, and the definition of “obvious” below, I now turn to the second prong of our working definition of legal things: the right to exclude.

3. *The Right to Exclude: Non-Owners’ Duty Not to Interfere*

The right to exclude requires reformulation to account for the fact that the “non-owner shows respect for the owner’s property even

121. Douglas & McFarlane, *supra* note 59, at 239. The authors used the term “obvious boundary” in delineating the non-owners’ duty not to deliberately interfere, but the same obvious boundary standard applies to other Hohfeldian jural relationships, such as this liberty-right. *Id.*

122. *Technology*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/technology> [https://perma.cc/97RS-RDVD] (defining “technology” as “a manner of accomplishing a task especially using technical processes, methods, or knowledge”).

when the non-owner has little reason to fear the owner's defence."¹²³ Beginning again with Douglas and McFarlane's analysis, the right to exclude can be analyzed as a Hohfeldian claim-right.¹²⁴ It imposes onto non-owners a duty.

The "right to exclude," as a claim-right *prima facie* binding on the rest of the world, correlates to duties owed by the rest of the world to [X]. This legal duty can be readily inferred from tort law. A tort, which is a type of civil wrong, involves the breach of a legal duty. This means that if a third party, let us say [Y], is held to have committed a tort by physically interfering with [X]'s chattel or land, we can infer from [Y]'s liability in tort law that he is under a legal duty to [X] . . . not to physically interfere with [X]'s thing. It is the law of torts, therefore, which recognizes that the holder of a clear property right in a thing is owed a legal duty by all others not to physically interfere with the thing.¹²⁵

Specifically, this reanalysis concludes that the owner's right to exclude is the non-owner's duty not to "deliberately or carelessly interfere" with the legal thing.¹²⁶ Such a duty also entails that asset is rival. Nonrival goods, such as intellectual property, information, or data, "can be copied or emulated freely. Moreover, each copy or instance can be put to simultaneous parallel uses without direct mutual interference."¹²⁷ Other than for purposefully tortious reasons, non-owners have no reason to interfere with an owner's nonrival asset when they could make full use of it (or a copy of it) without inflicting any interference onto the owner. Therefore, implied in the

123. Rose, *supra* note 71, at 282.

124. See Douglas & McFarlane, *supra* note 59, at 240.

125. *Id.* at 224 (cleaned up).

126. See Douglas & McFarlane, *supra* note 59. For those that reject such identity relationships in the context of rights correlativity, this statement can be read descriptively as X's right, in this context, coexists with Y's duty. See *supra* note 80 and accompanying discussion.

127. Konrad S. Graf, *Commodity, Scarcity, and Monetary Value Theory in Light of Bitcoin*, 3 J. PRICES & MARKETS 52, 56 (2014).

non-owners' duty not to deliberately interfere is the rivalrousness of legal things.¹²⁸

Returning to Penner's parking lot example, the "actual, practical duty" of the pedestrian strolling through the parking lot is, in fact, the stroller's duty not to interfere with any car that the stroller does not own.¹²⁹ The true owner of each car, whoever it is, imposes a duty onto non-owners not to interfere with that car. This duty applies regardless of who the owner is, where the owner is, or what the owner intends to do with the car. As a matter of general practice, then, "non-owners are expected to and often do respect others' property rights," regardless of whether the non-owner knows anything about the owner.¹³⁰ The owner's right to exclude must, therefore, be defined solely in terms of the non-owner. From this analysis of the right to exclude, the working definition of legal thing is now:

t is a legal thing if, when owned by X:

- a) X has a liberty-right to use *t*
 - i. X's liberty-right has an obvious boundary; and
- b) All non-owners *Y* have a *prima facie* duty not to deliberately or carelessly interfere with rival asset *t*.

B. Tangibility and Obvious Boundaries

Douglas and McFarlane's ultimate conclusion, which I refute in the following Subsection, is that a Hohfeldian analysis leads to a "narrow definition" of property rights, limiting such rights to "*physical thing[s]*."¹³¹ In other words, they require that legal things

128. One could make the argument that it is not *t* that must be rival, but rather the use of *t*. This reformulation would open the door to incorporate intellectual property and other nonrival intangible assets with statutorily rival uses into our theory. However, if *t* were not a rival asset, owner X's right to exclude would be interpreted as a right to economic monopoly. Non-owner Y's interference would need to be that of owner X's economic monopoly rights, not of X's right to exclude X from access or non-economic use of *t*. Future analysis will be helpful in determining whether nonrival assets with statutorily rival uses will fit into or fragment this theory of property. For an exposition of nonrival assets without statutorily rival uses (e.g., data), see *infra* note 222.

129. PENNER, THE IDEA OF PROPERTY IN LAW, *supra* note 64, at 75–76.

130. Penner & Smith, *supra* note 75.

131. Douglas & McFarlane, *supra* note 59 (emphasis added).

be tangible. In this Section, I analyze the rationales proposed for the tangibility criterion and develop a tangibility-neutral equivalent to generate our final working definition of legal thinghood.

1. *Tangibility As a Technology*

Douglas and McFarlane's rationale for this tangibility criterion can be seen in their comparison between in personam contractual rights and in rem property rights. "A strict, general duty not to interfere with another's contractual rights would be unduly burdensome on strangers to a contract . . . as it would impose unduly high information costs on such parties."¹³² Because (1) there is no limit to the content of X's contractual rights, and (2) there is "no obvious means for a stranger to discover the content" of X's contractual rights,¹³³ such a general duty on Y cannot exist.

By juxtaposing contractual and property rights over tangible assets, the authors then claim that "when we move away from physical things, . . . there is no physical thing around which the general duty owed by the rest of the world can coalesce."¹³⁴ Therefore, "compliance with the strict general duty not to deliberately interfere with a physical thing is much easier [when compared to contractual rights], as the tangible thing itself sets the boundaries of the stranger's duty."¹³⁵ To incorporate this tangibility criterion, the definition of property would then be:

t is a legal thing if, when owned by X:

- a) X has a liberty-right to use *t*
 - i. X's liberty-right has an obvious boundary; and
- b) All non-owners Y have a prima facie duty not to deliberately or carelessly interfere with rival asset *t*.
 - i. *t* is *tangible*

132. *Id.* at 239.

133. *Id.*

134. *Id.* at 240.

135. *Id.* at 239.

Intangibles are problematic for Douglas and McFarlane because there are no “obvious means” to discover the “boundaries” of the “general duty owed by the rest of the world.”¹³⁶ Various commentators have attempted to explain this same issue: Penner, in applying his exclusion and separability theses onto intangibles, noted that “the division in personal property between choses in possession and choses in action may be regarded as an artifact of” the reality that “while the factual possession of land or chattels is at least possible, one cannot obviously possess a chose in action or intangible property like a patent or copyright.”¹³⁷ Similarly, Larissa Katz summarized that “the more detached property rights are from physical boundaries, the heavier the informational load presented by rights/duties of exclusion.”¹³⁸ Even the American Law Institute’s Council Draft of the *Restatement of Property (Fourth) (Draft Restatement)* states that its criteria for legal thinghood, namely separateness and lack of personalization,¹³⁹ “will be harder to apply to intangibles because there are no physical borders distinguishing intangibles.”¹⁴⁰

All of these analyses seem to point to the following interrelated problems: an inability to exclude others from intangibles; the nonrivalrousness of intangibles; and the increased information cost in determining the rights and duties surrounding intangibles. For all examples given by these commentators, namely contractual rights, choses in action, or even intellectual property, these issues are indeed concerning. And from this array of intangible exemplars, Douglas and McFarlane generalize that intangibility itself must, therefore, be incompatible with in rem property rights. In other words, they argue that tangibility is a conceptual requisite for in rem property rights.¹⁴¹

Such a generalization is not warranted. Bitcoin, an intangible cryptocurrency described in the case studies below, demonstrates that the theoretical complications frequently attributed to intangible assets

136. *Id.* at 239–40.

137. PENNER, *THE IDEA OF PROPERTY IN LAW*, *supra* note 64, at 145–46.

138. Larissa Katz, *Exclusion and Exclusivity in Property Law*, 58 U. TORONTO L.J. 275, 283 n. 30 (2008).

139. DRAFT RESTATEMENT, *supra* note 1, § 2 cmt. d.

140. Wyman, *supra* note 76, at 197–98.

141. *See generally* Douglas & McFarlane, *supra* note 59.

cannot be generalized to all intangibles. As Part II describes in more detail, unlike intellectual property, bitcoins are rivalrous and non-owners can be easily excluded.¹⁴² Unlike choses in action and contract rights, property rights over bitcoins are indeed in rem and do provide a clear delineation of rights and duties. Thus, bitcoins are an example of a new type of digital asset that provides an “obvious means for a stranger to discover” the boundaries of their “strict general duty not to deliberately [or recklessly] interfere.”¹⁴³ Ultimately, these new digital assets provide the counterexamples necessary to invalidate the tangibility criterion in property law.

In fact, such digital assets also demonstrate how tangibility is traditionally assumed within the concept of possession in property law. For tangible assets, the logic of property law has generally been that “by defining things that can be possessed, complementary attributes are grouped together under the control of the possessor”; in other words, possession helps define the boundary of the legal thing.¹⁴⁴ Reframed through the lens of efficiency, possession-based norms may be the best approximation to an efficient allocation of rights in the face of positive transaction costs.¹⁴⁵ To optimize “investment, specialization, and autonomy,” the possession-based norms are formalized through a system of property law, which persists “even when actual control or proximity is attenuated,” as long as possession is nonetheless clearly demarcated.¹⁴⁶ Once formalized, property law may then “displace possessory rules that would ‘otherwise’ apply.”¹⁴⁷

In the context of digital assets, however, two distinctions emerge. First, as will be discussed in more detail in Part II, the set of

142. Susan Athey, Ivo Parashkevov, Vishnu Sarukkai, & Jing Xia, *Bitcoin Pricing, Adoption, and Usage: Theory and Evidence 2* (Stanford Univ. Graduate Sch. of Bus., Paper No. 16-42, 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2826674.

143. Douglas & McFarlane, *supra* note 59, at 239.

144. Henry E. Smith, *The Economics of Property Law*, in 2 THE OXFORD HANDBOOK OF LAW AND ECONOMICS: PRIVATE AND COMMERCIAL LAW 148, 149 (Francesco Parisi ed., 2017).

145. *Id.* at 152–53 (“Property law owes its actual contours to positive transaction costs. . . . Property [law] is a shortcut over the [economically efficient allocations of rights] that could be achieved in the zero transaction cost world.”).

146. *Id.* at 156.

147. *Id.* at 157.

complementary attributes that make up some digital assets are bundled through their definitional code. There is no need for possessory norms to serve as the first attempt to efficiently allocate complementary attributes. Second, as will also be explained in more detail below, in the case of blockchain-based cryptocurrencies, for example, the title *is* the asset. There are no possessory norms to displace. Thus, such examples demonstrate that physical possession-based norms are not conceptual priors to a fully functioning system of property law for certain rival digital assets.¹⁴⁸

These findings “expose the law’s hidden assumptions” about role of tangibility in property law and “to the extent that we manage to uncover the hidden assumptions of the law in such a manner, we pierce the facade of the law’s *technology neutrality*.”¹⁴⁹

But what does tech-neutral mean in this context? The answer lies in why property law has traditionally relied on tangibility in the first place. Henry Smith has argued that because in rem rights are definitionally directed at a large and indefinite audience of duty holders, the shape of legal things must be standardized so as to avoid high information costs.¹⁵⁰ Non-owners know “not to enter Blackacre without permission and not to steal a car from a parking lot without needing to know what the land or the car is being used for” or even who the owner is.¹⁵¹ In these cases, “the tangible thing itself sets the boundaries of the strangers’ duty,”¹⁵² which makes “compliance with the strict general duty not to deliberately interfere . . . much easier.”¹⁵³

So far, we have seen tangibility used as a technology—a tool, method, or manner of accomplishing a task¹⁵⁴—for two similar but distinct purposes in property law: (1) to delineate the owner’s

148. In fact, the entire “property process,” encompassing the concepts of “thinghood” and “possession,” is agnostic towards its medium, whether physical, digital, or otherwise. Marinotti, *supra* note 61, at 45.

149. Birnhack, *supra* note 32, at 90 (emphasis added).

150. Henry E. Smith, *Property As the Law of Things*, 125 HARV. L. REV. 1691, 1706 (2012).

151. *Id.*

152. Douglas & McFarlane, *supra* note 59, at 239.

153. *Id.*

154. *Technology*, *supra* note 122.

liberty-right to use; and (2) to delineate non-owner's duty not to interfere. But tangibility is only one manner of delineating boundaries; it is not the *only* manner. A tech-neutral approach, therefore, must be a tangibility-neutral approach. More concretely, this means that if the characteristics of an asset entail obvious bounds to both the owner's liberty-right to use and the non-owner's duty not to interfere, then tangibility is not relevant; the asset is a legal thing, and property doctrines should apply.

Tangibility, therefore, is not a conceptual requisite in existing property law and, thus, should not be a doctrinal requisite either. From this analysis of tangibility, the working definition of legal thing is now:

t is a legal thing if, when owned by X:

- a) X has a liberty-right to use *t*
 - i. X's liberty-right has an obvious boundary; and
- b) All non-owners Y have a prima facie duty not to deliberately or carelessly interfere with rival asset *t*.
 - i. *Y's duty has an obvious boundary*

This definition is not a drastic reformulation; rather it is simply a tech-neutral reanalysis of legal things. The next question in our analysis is rather obvious: what does "obvious" mean?

2. "Obvious" Boundaries: Shared Social Customs and Intuitions

To define the word "obvious," let us begin with a cow. Her name was Bessie.¹⁵⁵ In early twentieth century Washington, Mr. and Mrs. Garnero were out walking their cow. As it happened, the couple found a grazing patch for Bessie right outside Mr. Smith's garden. As was the custom, they leashed Bessie to a stake and left her to dine.¹⁵⁶ Out of the corner of her eye, Bessie saw that, as always, the grass was greener on the other side; in fact, it was the greenest inside Mr.

155. There is no indication that the cow's name was Bessie.

156. This was indeed the socially accepted custom of Mr. and Mrs. Garnero's time and place. *Smith v. Garnero*, 194 P. 375, 376 (Wash. 1920).

Smith's garden. She reached her head over the fence and took a bite. But Bessie could not stop after just one bite. She took bite after bite until she ate everything that was within reach of her leash. Distraught, Mr. Smith sued Mr. and Mrs. Garnero for Bessie's alleged trespass.

The Supreme Court of Washington began its analysis by noting that, doctrinally, "[i]f [the Garneros'] cow was trespassing at the time of the infliction of the injuries,"¹⁵⁷ they would be held liable for the damage to Mr. Smith's garden.¹⁵⁸ Whether trespass occurred would be dispositive in determining liability.

Did Bessie enter into Mr. Smith's garden? Yes. Did Bessie trespass? Actually, no. The court offered two explanations. First, the court noted that because Bessie had previously engaged in this behavior without Mr. Smith's complaints, she had an implied license to continue doing so.¹⁵⁹ Second, and more importantly for our analysis, the court noted that "[i]n a *community* where cows were commonly kept staked out as this one was, [the Garneros] seem to have followed the *general custom* of tethering the cow wherever she could find feed, relying upon any one objecting to make his objections known."¹⁶⁰ This latter point is not merely a generalization of the former. Rather, the court is noting that in this community, where such social customs are communally known and accepted, Bessie did not even have a *prima facie* duty not to reach her head into

157. For Washington's definition of trespass at the time, see *Welch v. Seattle & M.R.*, 105 P. 166, 167 (Wash. 1909) ("[I]n the limited and confined sense, in which we are at present to consider it, [trespass] signifies no more than an entry on another man's ground without a lawful authority, and doing some damage, however inconsiderable, to his real property. The essential idea seems to have been the breaking of a close by force, the words of a writ of trespass commanding the defendants to show cause *quare clausum querentis fregit* [i.e., the burden of proof was on the defendant], and it was frequently called trespass *vi et armis* [i.e., the trespass in and of itself immediately harmed the plaintiff]. So great a regard did the law have for a man's close or premises that it presumed damages would accrue from the breaking into or penetrating such close, even if it was no more than the trampling of the herbage therein." (emphasis added)).

158. The court clarified that Bessie's temperament was not relevant to the trespass claim. *Garnero*, 194 P. at 376 ("[I]t need not be shown that [Bessie] was vicious, or, if so, that the [Garneros] had knowledge of it."). Regardless, to clarify any misconceptions, the Court found "no reason to believe the cow to be other than gentle and harmless." *Id.*

159. *Id.*

160. *Id.* (emphasis added).

Mr. Smith's garden. She did not have a prima facie duty to abstain from interfering with Mr. Smith's garden in this way.¹⁶¹

In this case, the tangible boundary of Mr. Smith's garden did not align directly with Bessie's "strict general duty not to deliberately interfere."¹⁶² Instead, a system of shared social customs and intuitions defined the boundaries of Bessie's duty. I do not mean that the garden's physical boundary did not play a role. Rather, the physical boundaries (the tangible fence) informed shared social customs and intuitions, which then informed the boundaries of non-owner's general strict duty not to interfere.

Notably, Bessie's case was not an exception. It turns out that many cattle, sheep, and chickens roam without the permission of their owners. If they enter another's property, does such entry render their owners liable for trespass? In answering a version of this question, not only did the Supreme Court of Iowa acknowledge the role of local custom, but it also acknowledged that "all would be shocked"¹⁶³ if the law of trespass did not accommodate shared customs. "The customs and habits of our people, with reference to the care of poultry, are *so well established and so thoroughly understood* that we think all would be shocked, to say the least, by a pronouncement from this court that they must fence them in, and that in the event any of them flew out and alighted on a neighbor's field the owner was liable in trespass."¹⁶⁴ In a similar fowl-roaming case, the Supreme Court of Kentucky acknowledged that "*by long usage and custom* the people of Kentucky" could establish "a common law which allows the running of fowls at large without the owner incurring liability for their foraging," but only if the Kentucky legislature and constitution do not preempt such a custom from becoming law.¹⁶⁵

161. For a modern empirical study of social customs about residential gardens in Vancouver, Canada, see generally Nicholas Blomley, *The Boundaries of Property: Complexity, Relationality, and Spatiality*, 50 L. & SOC'Y REV. 224 (2016).

162. Douglas & McFarlane, *supra* note 59, at 239.

163. *Kimple v. Schafer*, 143 N.W. 505, 507 (Iowa 1913). For modern cases that interpret Iowa's subsequent "Fence In" statute, cf. *Wenndt v. Latare*, 200 N.W.2d 862 (Iowa 1972).

164. *Kimple*, 143 N.W. at 507 (emphasis added).

165. *Adams Bros. v. Clark*, 224 S.W. 1046, 1048 (Ky. 1920) (noting that trespass occurs when entry is without the owner's "consent").

Since the era of these cases, most state legislatures have passed so-called “Fence In” statutes, which now deem as trespassers even the gentlest of cows and the most harmless of fowl.¹⁶⁶ According to our working definition of legal things, such legislative intervention seems strange because it is meant to statutorily alter the boundaries of non-owners’ duties, who presumably do not wait until they have read through the most updated state codes before interacting (or not) with others’ property. If property’s in rem rights and related duties were solely derived from tangible boundaries, such legislative meddling should not be possible. Yet, if non-owners’ duties derive solely from shared social customs and intuitions, legislative meddling should also fail when it is unaligned with these very same customs and intuitions.

In the case of “Fence In” statutes, many were enacted because a shared social intuition did not exist; tangible boundaries did not align with the diverging expectations of crop farmers and stock raisers. The growing economic and political power of crop farmers resulted in an increasing number of disputes and disagreements, which forced the legislature to intervene in an attempt to create a new, shared social custom and to instill a new shared intuition. In Kansas, for example, such statutes were the “products of the power struggle in the Kansas legislature between the stock raisers, who favored the ‘open-range’ policy . . . and the crop farmers, who favored a return to the strict liability principle of the common law. In resolving this conflict between incompatible interests the experience of Kansas paralleled that of some other states.”¹⁶⁷ Competing general expectations and the lack of a single social custom created a situation

166. See, e.g., *Blizzard v. Walker*, 32 Ind. 437 (1869), for a superseding “Fence In” statute in Indiana. See *Durham v. Musselman*, 2 Blackf. 96, 97 (Ind. 1827), for Indiana’s previous custom-derived common law. *Id.* (“This case seems to rest in some measure upon the peculiar customs of this country. It is well known, that horses and cattle are permitted to run at large through the country, and particularly in the new settlements, in one of which this transaction took place; and are not considered as trespassing by entering the unenclosed lands of any person. So that the defendant cannot resist this action, on the ground that the mare and colt of the plaintiff were trespassing on his lands when they were killed.”).

167. Robert C. Casad, *The Kansas Law of Livestock Trespass: A Study in Statutory Underpainting*, 10 U. KAN. L. REV. 55, 62 (1961).

in which the legislature's power was invoked to reunify the law under a new single and shared social custom.

The *Draft Restatement (Fourth) of Property* mirrors the importance of shared social customs. In defining legal things, the *Draft Restatement* notes two requirements: a “legal thing is a possible subject matter of legal relations that [(a)] receives treatment as a separate whole and [(b)] is no more than contingently associated with any particular actor.”¹⁶⁸ To fulfill requirement (a), the authors explain that “[w]hether an object is perceived as a separate and distinct whole is partly a function of *physical facts* and partly a function of the context in which the perception occurs, including economic and *social practices* and *social norms* and *customs*.”¹⁶⁹ The *Draft Restatement* places physical facts and social norms as parallel factors in defining the bounds of property. This structural parallelism, however, leaves open questions when analyzing intangibles in property law. Although the authors aim to allow intangibles to be legal things,¹⁷⁰ a consequence of their doctrinal parallelism is that further clarification is needed: “[w]here intangibles are concerned, one cannot draw upon the existence of physical separateness or physical boundaries to help identify things. Consequently, economic and social practice and social norms and customs will play a larger role in delineating things.”¹⁷¹

I argued above for a two-step alternative to the *Draft Restatement's* parallelism. Physical boundaries, when they exist, are merely one of a set of factors that first inform shared social customs and intuitions, which in turn inform the boundaries of owners' liberty-rights and non-owners' general strict duty not to interfere. This two-step approach would obviate the need for any clarification specific to intangibles. If the goal is tech-neutral (tangibility-neutral)

168. DRAFT RESTATEMENT, *supra* note 1.

169. *Id.* § 2 cmt. b (emphasis added).

170. *Id.* § 2 cmt. d (“Intangible items . . . can be things for purposes of property law, provided [as any other legal thing] they are regarded as a separate whole that is only contingently related to any particular actor.”).

171. *Id.*

property law, then property doctrines should aim to avoid the need for tech-specific or medium-specific clarifications.

One could argue that the two-step approach is merely punting the restatement's clarification. That is not the case. Tech-neutral property law conceptually requires the removal of "physical facts" from the definition of legal thing. It is true, however, that the two-step alternative does not in and of itself explain how its factors, including tangible boundaries, are combined to delineate property rights. Therefore, the *Draft Restatement's* list of alternative factors is still helpful in determining the existence of shared social customs and intuitions. These factors include: (1) having value if considered apart from any other thing; (2) consisting of mutually complementary attributes; (3) having value without regard to the identity of the person who holds it; and (4) being commonly transferred or bought and sold on a stand-alone basis.¹⁷² These factors, which the *Draft Restatement* offer specifically for intangibles, are equally applicable to tangible assets. They are merely instantiations or applications of the original requirements for legal thinghood: "treatment as a separate whole and [being] no more than contingently associated with any particular actor."¹⁷³

The role of shared intuitions is separately mirrored in the *Draft Restatement* through its analysis "of thinghood as contextual," which "is consistent with [Henry] Smith's prior scholarship" on salience.¹⁷⁴ In summarizing Smith's scholarship on salience, Katrina Wyman notes:

"[S]alience" is important in determining what counts as a thing. Salience has a psychological dimension. We tend to group "the lesser . . . with the greater," as when we assign the calf to the owner of the mother cow under the doctrine of increase. Salience also has an economic component; we tend to group things together that can be usefully exploited

172. *Id.*

173. *Id.* § 2.

174. Wyman, *supra* note 76, at 196.

as a package.¹⁷⁵

In sum, social customs and intuitions can stem from the cognitive effects of human perception,¹⁷⁶ as well as from learned associations, whether economic, social, or otherwise.¹⁷⁷ The consequence of such shared social customs and intuitions is that tangible boundaries are but one of a number of factors defining the bounds of property rights and duties. The cultural evolution of shared social customs and intuitions then explains why “the law of nuisance, landlord-tenant, future interests, servitudes, trusts, private contracting, and regulation can at various times soften and supplement exclusion rights.”¹⁷⁸ Ultimately, from the analyses above, we can expand our final working definition of property to include working definitions of “obvious” and of “shared social customs and intuitions.”

175. *Id.* (footnote omitted) (citations omitted) (quoting Professor Henry Smith of Harvard Law School).

176. While the terms “salience” and “intuition” in this Article are used to describe factors in legal or pre-legal decision-making, the definitions roughly follow the definition of salience and the consequent intuitions as used in “the field of associative learning and value-based decision making,” which “uses the term [salience] to describe the . . . importance that a stimulus has acquired through association with an incentive outcome.” Thorsten Kahnt & Philippe N. Tobler, *Reward, Value, and Salience*, in *DECISION NEUROSCIENCE: AN INTEGRATIVE PERSPECTIVE* 109, 113 (Jean-Claude Dreher & Léon Tremblay eds., 2017).

177. See Rips & Hespos, *supra* note 118, at 1239 (signifying a cognitive effect rendering object boundaries as highly salient because “[e]vidence from studies of infants suggests that they understand the difference between solid objects and nonsolid substances At [two] or [three] months, infants react as if they believed that an object occupies a connected region of space, moves as a whole, and cannot occupy the same place as another object at the same time”); see also Soja et al., *supra* note 116, at 179 (stating notably that infants exhibit what is called an object bias in lexical acquisition: infants more easily assign meaning and names to objects over substances).

178. Merrill & Smith, *supra* note 3, at 1891 (noting that the authors attributed “[s]uch refinements outside of the core of property” to “a wider range of moral concerns, and entail judgments that reflect pragmatism, expert knowledge, and balancing”).

Thus, the final working definition of “legal thing” becomes:

- 1) *t* is a **legal thing** if, when owned by X:
 - a) X has a liberty-right to use *t*
 - i. X’s liberty-right has an obvious boundary; and
 - b) All non-owners Y have a prima facie duty not to deliberately or carelessly interfere with rival asset *t*.
 - i. Y’s duty has an obvious boundary
- 2) **Boundaries are obvious if they are discernable from shared social customs and intuitions.*
- 3) **Shared social customs and intuitions stem from cognitive perceptual effects and learned associations, whether economic, social, or otherwise.*¹⁷⁹

The following non-exhaustive list contains examples of shared social customs or intuitions, which alone are neither necessary nor sufficient, but may cumulatively lead to discernable obvious boundaries of an owner’s liberty-right and a non-owner’s duty:

- a) *t* is treated or intuited as being a separate whole,¹⁸⁰
- b) *t* is treated or intuited as having value if considered apart from any other thing,
- c) *t* is treated or intuited as having value without regard to the identity of the person who holds it,
- d) *t* is treated or intuited as being no more than contingently associated with any particular actor, or
- e) *t* is commonly transferred or bought and sold on a stand-alone basis.

179. The methodology of how, when, or whether perceptual effects and learned associations result in sufficiently robust shared social customs or intuitions to result in property rights is a field for continued theoretical and empirical research.

180. Although I have demonstrated that tangible boundaries are not conceptually required for property rights and may not fully align with such rights and duties, I do not argue against the idea that tangible assets may be more likely to correlate with sufficiently robust shared social customs and intuitions from which the boundaries of X’s liberty-right and Y’s duties can be discerned. As discussed *supra* note 176, physical boundaries serve as highly salient features in human perception, weighing heavily in the factors above.

Notably, this definition of legal thing seems to be the logical conclusion of what the U.S. Court of Appeals for the Ninth Circuit began detailing in *Kremen v. Cohen*.¹⁸¹ There, the court held that “an intangible good is a property interest if it meets three requirements: (1) the interest must be ‘capable of precise definition,’ (2) ‘it must be capable of exclusive possession and control,’ and (3) some individual must be able to make a ‘legitimate claim of ownership.’”¹⁸² The first requirement, that digital assets be “capable of precise definition,” maps onto our requirement of obvious boundaries around an owner’s liberty-right to use. The second requirement, that digital assets be “capable of exclusive possession and control,” maps onto our requirement of obvious boundaries around a non-owner’s duty not to deliberately or carelessly interfere. The third requirement, that “some individual be able to make a ‘legitimate claim of ownership,’” highlights the role of shared social custom and intuition in defining legal things.¹⁸³ Thus, this tech-neutral (tangibility-neutral) definition of legal thing could offer doctrinal certainty to courts who attempt to define digital property, which would otherwise be the amorphous “broad concept that includes ‘every intangible benefit and prerogative susceptible of possession or disposition.’”¹⁸⁴

II. TECH-NEUTRAL PROPERTY LAW IN ACTION

With this final set of working definitions, this Part demonstrates that certain digital assets, like bitcoins, do fulfill all tech-neutral requirements for legal thinghood. Other digital assets, including

181. 337 F.3d 1024, 1029–30 (9th Cir. 2003) (holding that internet domain names are a form of intangible property under California law (quoting *G.S. Rasmussen & Assocs., Inc. v. Kalitta Flying Serv., Inc.*, 958 F.2d 896, 903 (9th Cir. 1992))).

182. Zaytoun, *supra* note 56, at 413; *see also Kremen*, 337 F.3d at 1030.

183. Notably, the requirement that some individual be able to make a legitimate claim of ownership opens the door for the same doctrinal circularity problem as found in “[t]he Fourth Amendment ‘reasonable expectation of privacy’ standard,” which “is tautological and circular. Both the individual and the societal expectations of privacy depend on judicial rulings—while judges, in turn, use these expectations as the basis for their rulings.” Amitai Etzioni, *Eight Nails into Katz’s Coffin*, 65 CASE W. RES. L. REV. 413, 413 (2014). Such possible circularity in shared social customs and intuitions in property law is a fruitful area for future research.

184. *Kremen*, 337 F.3d at 1030 (quoting *Downing v. Mun. Ct.*, 198 P.2d 923 (Cal. Ct. App. 1948)).

many NFT-based collectibles, do not. To apply our analysis to these case studies, the definition of legal thing can be converted into a series of questions, all of which must be answered affirmatively for asset *t* to be subject to property doctrines:

- 1) Is *t* a rival asset?
- 2) From shared social customs and intuitions (which may stem from the cognitive effects of human perception or learned associations, whether economic, social, or otherwise):
 - a) Can owner X discern the boundary of her liberty-right to use *t*?¹⁸⁵
 - b) Can non-owner Y discern the boundary of her prima facie duty not to deliberately or carelessly interfere with *t*?

Three case studies were chosen to demonstrate how the theoretical framework developed in Part I can explain the non-property status of videogame assets and many NFT-based collectibles, while acknowledging that certain digital assets are indeed legal things. The case studies are: (a) virtual land in the virtual world of Second Life, (b) the blockchain tokens in Bitcoin, and (c) the NFT-based digital collectibles in CryptoKitties. These examples should alleviate concerns raised in the literature that by recognizing the legal thinghood of certain digital assets, a floodgate of new property rights would be opened.¹⁸⁶ As will be shown below, even amongst

185. Because X's liberty-right to use *t* can be circumscribed by any regulatorily or contractually imposed duty which X is per se expected to understand, this question primarily focuses on X's understanding of what is not *t* and what, therefore, lies outside of X's liberty-right.

186. See, e.g., Josef Drexler, *Designing Competitive Markets for Industrial Data: Between Propertisation and Access*, 8 J. INTELL. PROP. INFO. TECH. & ELEC. COM. L. 257, 277 (2017) ("[I]f everybody contributing to the generation of data in a value network is vested with ownership, this allocation could easily run the risk of creating too many property rights, which would block efficient exploitation of big data in particular."); see also Peter K. Yu, *Data Producer's Right and the Protection of Machine-Generated Data*, 93 TUL. L. REV. 859, 889 (2019) ("[A]llocating property rights to data producers—both individual and corporate—could create major market barriers, leading to what Rebecca Eisenberg and Michael Heller have described as the 'tragedy of the anticommons.'").

blockchain-based crypto assets, not all fulfill the requirements for legal thinghood.

Although the underlying technologies behind blockchain may raise interesting legal questions themselves,¹⁸⁷ this Article focuses solely on the emergent characteristics of each digital asset being analyzed. That is not to say that any intricacies or vulnerabilities introduced by the underlying technology should be disregarded; rather, understanding all of these features is crucial to this legal analysis, but the focus is on the emergent features themselves (i.e., the consequences of the technology, not the underlying technology itself). This is a fundamental principle of tech-neutral analysis.¹⁸⁸ Therefore, by encapsulating the engineering components,¹⁸⁹ the following description of Second Life assets, Bitcoin, and CryptoKitties will focus on the interface between these digital assets and those who interact with them,¹⁹⁰ describing the underlying technology only when necessary to explain its consequences.

Lastly, it is also important to note that although the case studies refer heavily to relevant EULAs, such agreements are not dispositive of whether property rights and resulting legal claims exist. In fact, courts have even refused to enforce contractual waivers of liability when the core principles of property law would be violated.¹⁹¹ Thus,

187. See, e.g., Low & Teo, *supra* note 49 (noting the possible legal repercussions of blockchain forks on judicial judgments and the relationship between owners of cryptocurrencies, exchanges, and other intermediaries).

188. See Birnhack, *supra* note 32, at 39 (“Instead of naming technologies, technology-neutral legislation focuses on its functions or on the related human behavior.”).

189. By encapsulating, I do not mean generalizing or summarizing; rather, I mean encapsulation in the cognitive or computational sense, in which all internal machinery of a module is accounted for and all relevant features of the module are described solely at its interface. See Brian P. Keane, *Contour Interpolation: A Case Study in Modularity of Mind*, 174 COGNITION, May 2018, at 1, 2.

190. Applying Professor Thomas W. Merrill and Professor Henry Smith’s conceptualization of encapsulation and modularity, the “activity inside a module involves lots of highly specialized knowledge and information. Most of this activity and information, however, remains opaque to outside observers. What is important to those outside the module is what the module produces, not the means by which this production is achieved.” Thomas W. Merrill, *Property As Modularity*, 125 HARV. L. REV. F. 151, 155 (2012).

191. See, e.g., *Miller’s Mut. Fire Ins. Ass’n of Alton v. Parker*, 65 S.E.2d 341, 344 (N.C. 1951) (noting that because bailments are subject to property law, not contract law, a “[p]roprietor of parking lots . . . engaged in the business of accepting automobiles for parking for hire, who required owner-bailor to surrender keys to automobile to facilitate parking, could not contract away all his liability for his negligence, though he had erected signs of nonresponsibility for fire or theft, and had

courts place significant effort in determining whether a property right is at stake before determining the applicable body of law.¹⁹² EULAs, however, may provide evidence of shared social customs and intuitions, especially when they are routinely enforced and sufficiently understood by the signing parties. Finally, for the analysis of an owner's liberty-right to use, it is important to note that EULAs *do* create legally binding duties,¹⁹³ even when such users do not read the terms and conditions before agreeing.¹⁹⁴

A. *Second Life*

As mentioned above, the virtual assets of *Second Life* were at the core of early discussions surrounding digital property. *Second Life* is a video game developed by Linden Lab (Linden) in 2003.¹⁹⁵ More

told owner-bailor that he would not be responsible for loss by fire or theft, for parking of automobiles in cities is matter of public concern, and it would be against public interest to give force and effect to exculpatory agreements which would relieve such professional bailees from all liability for their own negligence" (emphasis added)).

192. See, e.g., *Day & Co. v. Texland Petroleum, Inc.*, 786 S.W.2d 667, 669 (Tex. 1990) (noting that property rights cannot be treated as "subject to principles of contract and agency law" and that the "transfer of executive rights [to minerals, a property right,] is best governed by principles of real property and oil and gas law, and not by principles of contract law pertaining to agency and powers of attorney"); see also *Olin Corp. v. Cargo Carriers, Inc.*, 673 S.W.2d 211, 217 (Tex. App. 1984) ("[A] common law bailment action for negligent care of property lies in [the property tort of] negligence and is not an action founded upon contract [law] . . .").

193. See, e.g., *Doe v. Epic Games, Inc.*, No. 19-CV-03629, 2020 WL 376573, at *3–4 (N.D. Cal. Jan. 23, 2020) (noting that EULAs are binding under California law); see also *id.* ("Under California Family Code section 6710, '[e]xcept as otherwise provided by statute, a contract of a minor may be disaffirmed by the minor before majority or within a reasonable time afterward[s].' . . . However, the 'infancy defense may not be used inequitably to retain the benefits of a contract while renegeing on the obligations attached to that benefit.' . . . Accordingly, if a minor seeks to disaffirm a contract, 'equitable principles dictate that [the minor] "must disaffirm the entire contract, not just the irksome portions."') (alterations in original) (citations omitted) (first quoting CAL. FAM. CODE § 6710 (West 2021); then quoting *I.B. ex rel. Fife v. Facebook, Inc.*, No. C 12-1894 CW, 2013 WL 6734239, at *4 (N.D. Cal. Dec. 20, 2013); and then quoting *id.*)).

194. See Cifrino, *supra* note 35, at 244–45 ("EULAs have been characterized as 'clickwrap,' a reference to real-world 'shrinkwrap' contracts that are accepted upon removing the shrinkwrap from a product. Upon launching a virtual-world program, users are faced with the terms of the agreement, and can either click 'I accept' (opening the virtual shrinkwrap and proceeding), or 'I do not accept' (terminating the program). This take-it-or-leave-it approach has led to criticism that developers are exploiting unequal bargaining power, with users not getting a fair deal for all the rights they relinquish via the EULA. Such agreements have also been criticized as too long and too confusing, which can discourage users from even reading them. Criticism notwithstanding, courts generally uphold such click wrap contracts, analyzing them as they would any other contract.").

195. See *Who We Are: About Linden Lab*, LINDEN LAB, <https://www.lindenlab.com/about> [<https://perma.cc/Q2PL-9QV8>].

specifically, the game is a persistent “virtual world environment.”¹⁹⁶ Such games are “simulated social places . . . that feature software-animated objects and events . . . where users employ avatars,’ to interact with each other.”¹⁹⁷ Because these worlds are persistent, “actions taken and investments made in the simulation are expected by users to last some time,’ if not permanently.”¹⁹⁸ Generally, virtual worlds also contain virtual economies in which players buy, sell, create, and destroy virtual assets.¹⁹⁹ Second Life not only had a virtual economy but also planned to distinguish itself from its competitors by advertising its recognition of “virtual property rights.”²⁰⁰ This advertising approach, however, led to the infamous (though ultimately settled) case of *Bragg v. Linden Research*.²⁰¹ As Judge Robreno of the U.S. District Court for the Eastern District of Pennsylvania noted in 2007:

This case is about virtual property maintained on a virtual world on the Internet. Plaintiff, March Bragg, Esq., claims an ownership interest in such virtual property. Bragg contends that Defendants, the operators of the virtual world, unlawfully confiscated his virtual property and denied him access to their virtual world. Ultimately at issue in this case are the novel questions of what rights and obligations grow out of the relationship between the owner and creator of a virtual world and its resident-customers. While the property and the world where it is found are “virtual,” the dispute is real.²⁰²

Although the virtual world of Second Life was first launched in 2003, over fifteen years ago, it is still in active use today. In 2017, its

196. See generally *Second Life Terms and Conditions*, LINDEN LAB (Jul. 31, 2017), <https://www.lindenlab.com/legal/second-life-terms-and-conditions> [<https://perma.cc/X3JL-2CLU>].

197. Ackerman, *supra* note 35, at 149–50 (footnote omitted) (quoting LASTOWKA, *supra* note 36).

198. *Id.* at 150 (quoting LASTOWKA, *supra* note 36, at 31).

199. See generally Cifrino, *supra* note 35.

200. *Bragg v. Linden Rsch., Inc.*, 487 F. Supp. 2d 593, 603 (E.D. Pa. 2007).

201. *Id.* at 595.

202. *Id.*

monthly active users totaled over 800,000.²⁰³ According to Peter Gray, Linden’s Senior Director of Global Communications as of that year, Second Life “remains a healthy . . . business” whose profit “largely comes from virtual goods transactions within the Second Life community, and these virtual goods are at the heart of what Second Life has become.”²⁰⁴ For Linden, then, the legal status of such virtual goods has become more important than ever before. This is evidenced by the care taken in describing digital assets and circumscribing users’ rights in both Linden’s general EULA covering any product by Linden Lab and the Second Life-specific product policy.²⁰⁵

These user agreements describe the characteristics of Second Life’s virtual assets, including virtual land, virtual currency, and all other virtual goods. The terms of service vary slightly between these three categories, but Linden clearly asserts throughout its current EULAs that, rather than property rights, users are merely granted a “limited license” to access virtual assets.²⁰⁶ As mentioned above, Linden’s own legal conclusion that its users do not have property interests is not dispositive, whether from a judicial perspective,²⁰⁷ or from our theoretical analysis. Therefore, we must continue to analyze the legal characteristics of the assets in question by answering our three questions. As virtual land, virtual currency, and all other virtual goods in Second Life are governed by similar terms of service, this analysis focuses on virtual land, the primary asset in dispute in *Bragg*.

1. *Virtual Land Is Not a Rival Asset*

“A rival good is one for which consumption by one person reduces the amount of good or service available to others, as is the case with

203. Samuel Axon, *Returning to Second Life*, ARS TECHNICA (Oct. 23, 2017, 12:30 PM) <https://arstechnica.com/gaming/2017/10/returning-to-second-life/> [https://perma.cc/S5YS-567X].

204. *Id.*

205. *Terms of Service*, § 1.1, LINDEN LAB (Jul. 31, 2017) <https://www.lindenlab.com/tos> [https://perma.cc/5CUS-9ZKL].

206. *Second Life Terms and Conditions*, *supra* note 196, §§ 3.1, 3.4.

207. *See supra* notes 193–194.

apples”²⁰⁸ In the digital realm, a *rival* asset “is *not* copiable with perfect remainder of the original and is *not* useable by multiple actors simultaneously without mutual interference.”²⁰⁹ Virtual land in Second Life fails both of these requirements. Not only can Linden create a practically unlimited supply of virtual land, its EULA asserts a legal right to do so. “Linden Lab makes no guarantee as to . . . the availability or *supply* of Virtual Land.”²¹⁰ Furthermore, Linden may create functionally infinite perfect copies of existing land, the “virtual unit(s) of space corresponding to the identifiers of the Virtual Land within Second Life,” without affecting the originals.²¹¹ Therefore, virtual land in Second Life is not a rival asset.

Because virtual land units (and all other virtual assets) in Second Life are not rival assets, they immediately fail our test for legal thinghood and therefore property rights.

2. *‘Owners’ of Virtual Land Cannot Discern the Boundary of Their Liberty-Right to Use*

Because virtual land is not rival, we know that it will fail the test for legal thinghood. For the sake of explanation, however, let us assume that virtual land in Second Life *is* rival (i.e., that somehow it “is not copiable with perfect remainder of the original and is not useable by multiple actors simultaneously without mutual interference”).²¹² Even then, owners could not discern the boundary of their liberty-right to use virtual land because virtual land itself is not well-defined. The total set of possible uses for virtual land and the set of uses which owners have a duty to avoid are both constantly in flux. Therefore, the boundary around owners’ liberty-right to use is unclear.

208. Thomas C. Brown, John C. Bergstrom, & John B. Loomis, *Defining, Valuing, and Providing Ecosystem Goods and Services*, 47 NAT. RES. J. 329, 357 (2007) (noting also that rivalrousness and exclusiveness are independent factors: “[a]n exclusive good or service is one from which consumers can be excluded unless they meet the conditions prescribed by the party controlling the good or service”).

209. Graf, *supra* note 127.

210. *Second Life Terms and Conditions*, *supra* note 196, § 3.4 (emphasis added).

211. *Id.*

212. Graf, *supra* note 127.

One reason for this is that virtual land in Second Life is subject to “the short-term operation of virtual worlds,” including the “unforeseen consequences of intentional changes or undetected errors in the underlying virtual-world code.”²¹³ For example, “a new interface feature in Second Life may be bugged, allowing users to create items that are one-hundred times larger than intended. In such cases, the developers must take swift action to correct the problems before they spread. Such action could consist of an adjustment to . . . objects in the world, or, in extreme cases, a rollback of the entire world to an earlier point in time.”²¹⁴ Such interface updates are not merely theoretical; Linden issues press releases when significant changes and features are added, removed, or altered in Second Life.²¹⁵ Not only does the user community accept such changes, it expects and discusses them communally.²¹⁶ Thus, it is difficult to imagine that a clear boundary around owners’ right to use virtual land is discernable because (1) the underlying asset in question is expected to undergo visual and functional upgrades, altering the set of possible uses, and (2) the expected updates to Second Life’s user interface, altering the set of prohibited uses for virtual land.

Section 3.4 of the EULA explicitly notes two uses that *are* allowed: (1) users “may permit or deny other users to access your Virtual Land on terms determined by you,” and (2) ownership of virtual land may generally be transferred, though it may not be “encumbered, conveyed or made subject to any right of survivorship or other disposition.”²¹⁷ These two enumerated uses, however, do not change the fact that the mutable nature of the asset creates an

213. Cifrino, *supra* note 35, at 256.

214. *Id.*

215. For an example of an early press release detailing the changes made to the Second Life interface and the addition of virtual land auctions, see *Press Releases: Second Life Updates 3D Online World*, LINDEN LAB (Dec. 22, 2003), <https://www.lindenlab.com/releases/second-life-updates-3d-online-world> [<https://perma.cc/YL8Z-QP4J>].

216. For a discussion of the 2019 updates in Second Life, see Inara Pey, *Living in a Modem World: Second Life, Virtual Worlds and Virtual Reality*, MODEM WORLD (Mar. 8, 2021), <https://modemworld.me> [<https://perma.cc/943G-P8JT>]; and Adi Robertson, *Second Life Updates Graphics, Promises Oculus Rift Support ‘Soon,’* THE VERGE (Sept. 27, 2013, 11:04 AM), <https://www.theverge.com/2013/9/27/4776854/second-life-updates-graphics-promises-oculus-rift-support-soon> [<https://perma.cc/8CHR-KR3H>].

217. *Second Life Terms and Conditions*, *supra* note 196, § 3.4.

ever-changing set of possible uses or that the mutable nature of the interface renders it impossible to ensure which of those possible uses are allowed. The boundary of an owner's liberty-right to use, in this case, is not discernable.

3. *'Non-Owners' of Virtual Land Cannot Discern the Boundary of Their Duty Not to Interfere*

Even if virtual land were a rival asset, non-owners do not have a prima facie duty not to deliberately or carelessly interfere with virtual land. Although the EULA notes that users "may permit or deny other users to access your Virtual Land on terms determined by you," this ability is specific to controlling the access of other *users*.²¹⁸ The definition of legal thing does not distinguish between non-owner users and non-owner nonusers. The general duty not to interfere, if it exists, must be applicable to *all* non-owners.

What about the engineers who have direct access to the code behind Second Life? Is there a shared social custom or intuition that such engineers have a duty not to interfere with users' virtual land? To the contrary, "Linden Lab has the right to manage, regulate, control, modify and/or eliminate such Virtual Land as it sees fit[,] and . . . Linden Lab shall have no liability to you based on its exercise of such right."²¹⁹ As noted above, users expect updates and upgrades; they expect bug-fixes; and they want the virtual world managed in such a way that will render it enjoyable. Each of these expectations entails a responsibility of the engineers to "manage, regulate, control, modify and/or eliminate" the virtual assets.²²⁰ Furthermore, although not dispositive of the legal classification, Linden concludes and behaves as if the "Virtual Land is a limited

218. *Id.*

219. *Id.* (noting also that "Linden Lab *may revoke* the Virtual Land License at any time without notice, refund or compensation in the event that: (i) Linden Lab determines that fraud, illegal conduct or any other violations . . . are associated with the holders Account or Virtual Land; or (ii) the holder becomes delinquent on any of that user's Account's payment requirements, ceases to maintain an active Account or terminates any of the Agreements").

220. *Id.*

license right and is not a real property right or actual real estate, and it is not redeemable for any sum of money from Linden Lab.”²²¹

In *Second Life*, software engineers, server operators, and third parties feel both legally and technologically empowered, if not compelled, to interfere with users’ digital assets.²²² In video games, more broadly, software engineers retain control over every in-game asset for the purpose of maintaining a safe and fun virtual world. Even when players purchase virtual assets with real-world currency, “game developer companies have complete, unilateral control over access to content purchased.”²²³ Users may log in to find that the aesthetics, specifications, or even existence of their purchased digital assets have changed overnight. The technological ability of a centralized authority to dictate the contents, uses, and even existence of these digital assets means that a general duty not to interfere with a user’s assets in this context does not exist. Specifically, the shared social customs and intuitions surrounding these nonrival assets actually reinforce the lack of a general duty of non-owners not to

221. *Id.* (noting that “the use of the words ‘Buy,’ ‘Sell’ and similar terms carry the same meaning of referring to the transfer of the Virtual Land License as they do with respect to the Linden Dollar License”).

222. Even when describing its virtual currency, the most distinct of *Second Life*’s virtual assets, Linden’s EULA notes “*Second Life* includes a component of virtual tokens” called Linden Dollars, “each of which constitutes a limited license permission to use features of *Second Life*.” *Id.* § 3.1. “Each Linden Dollar is a virtual token representing contractual permission from Linden Lab to access features of *Second Life*. Linden Dollars are available for Purchase or distribution at Linden Lab’s discretion, and are not redeemable for monetary value from Linden Lab.” *Id.* Although the token “can be traded and/or transferred in *Second Life* with other users (and/or Linden Lab) in exchange for permission to access and use specific Content, applications, services, and various user-created features, . . . Linden Dollars may not be sublicensed, encumbered, conveyed or made subject to any right of survivorship or other disposition by operation of law or otherwise.” *Id.* Importantly, “Linden Lab may revoke any Linden Dollar at any time without notice, refund or compensation in the event that: (i) the Linden Dollar program is suspended or discontinued; . . . [or] (iv) the holder’s Account is terminated for violation of these Terms of Service.” *Id.* In summary, the user must agree that “Linden Lab has the right to manage, regulate, control, and/or *modify the license rights underlying such Linden Dollars as it sees fit, and may revalue or make such license rights more or less common, valuable, effective, or functional, and that Linden Lab will have no liability to you based on its exercise of this right.*” *Id.* §§ 3.1–3.3 (emphasis added) (noting that “Linden Dollars are not currency or any type of currency substitute or financial instrument, and are not redeemable for any sum of money from Linden Lab at any time”).

223. Chelsea King, *Forcing Players to Walk the Plank: Why End User License Agreements Improperly Control Players’ Rights Regarding Microtransactions in Video Games*, 58 WM. & MARY L. REV. 1365, 1371 (2017).

deliberately interfere. These assets are not legal things; they are not property.

B. Bitcoin

Bitcoin is a cryptocurrency. Cryptocurrencies are “digital or virtual assets that use high-level cryptography through a decentralized system for trading purpose and to keep . . . assets secure.”²²⁴ They “enable people to transfer assets directly between two people without any need for a ‘trusted’ third party like a bank.”²²⁵ Notably, most are not created by nation states and “are largely outside state control for the present.”²²⁶ As of May 2018, over seventeen million bitcoins were in circulation, with an estimated 35 million Bitcoin wallets (discussed below) and over 100,000 companies accepting bitcoins as payment.²²⁷ At its peak in 2017, the daily trading volume of Bitcoin exceeded \$5 billion, with the “volume across all cryptocurrencies on Dec. 20, 2017[,] exceeding \$50 billion.”²²⁸

Unlike traditional bank accounts, “Bitcoin does not distribute digital monetary units to users. Instead, a public ledger maintains a list of every transaction made by all Bitcoin users.”²²⁹ Individuals interact with the Bitcoin ecosystem through the use of a “wallet,” which is just a set of cryptographically generated public and private keys.²³⁰ Each public key functions as a Bitcoin address, which “[l]ike a bank account number . . . consists of a string of letters and numbers.”²³¹ To send bitcoins, all you need to know is the recipient’s Bitcoin address. “In turn, when you share your address with others,

224. Richard Aikens, *Foreword* to CRYPTOCURRENCIES IN PUBLIC AND PRIVATE LAW (David Fox & Sarah Green eds., 2019).

225. *Id.*

226. *Id.*

227. David Easley, Maureen O’Hara, & Soumya Basu, *From Mining to Markets: The Evolution of Bitcoin Transaction Fees*, 134 J. FIN. ECON. 91, 92 (2019).

228. *Id.*

229. Shayan Eshkandari, David Barrera, Elizabeth Stobert, & Jeremy Clark, *A First Look at the Usability of Bitcoin Key Management*, NDSS SYMPOSIUM, Feb. 7, 2015, at 1, 2.

230. For example, “13tQ1fbTMB6GxUJfMqCSDgivc8fvkHEh3J” is one such public key, and “5J2ae37Jwqzt7kSp9rE17Mi2LbkHXx4tzNSzbq7xDp2cQJCzhYo” is one such private key. CONRAD BARSKI & CHRIS WILMER, BITCOIN FOR THE BEFUDDLED 10–11 (2014).

231. *Id.* at 10.

they can send you bitcoins.”²³² Each private key functions “more like a PIN: You need it to authorize a withdrawal or an expenditure.”²³³ But “[u]nlike a PIN, which both you and the bank know, *only you know the private key*. The risk you take in this circumstance is if you lose the private key to an address in which you’ve stored bitcoins, those bitcoins will remain locked in that address forever.”²³⁴

Each transaction simply records the source account(s), the destination account(s), the number of bitcoins transferred, and a digital signature. The source and destination accounts are identified by their Bitcoin addresses. The digital signature employs a cryptographic function to allow third parties to verify that a transaction was digitally signed by the private key associated with the source address, without ever knowing the address’s private key itself.²³⁵ The ledger onto which all transactions are recorded is called the blockchain.²³⁶ “Thus users do not maintain any kind of units of currency; they maintain a set of keys that provide them signing authority over certain accounts recorded in the ledger.”²³⁷

In other words, bitcoins do not exist as entities separate from the transactions recorded on the ledger. An owner’s bitcoins are the combination of (1) the transactions recorded on the blockchain transferring Bitcoins into the owner’s Bitcoin address and (2) the owner’s ability, through the use of their private key, to transfer or spend the bitcoins received.

1. *Bitcoins Are Rival Assets*

To determine whether bitcoins are rival assets, it is useful to compare bitcoins with digital files, such as standard Microsoft Word

232. *Id.*

233. *Id.* at 11.

234. *Id.* at 12.

235. *Id.*

236. Eshkandari et al., *supra* note 229 (“The ledger (known as the *blockchain*) is maintained and updated by a decentralized network using a novel method to reach consensus that involves incentivizing nodes in the network with the ability to generate (known as mining) new Bitcoin and collect transaction fees. The details of the Bitcoin consensus model are not relevant to this paper, but we note that clients in the network participate in the consensus model by downloading and cryptographically verifying the integrity of the blockchain.”).

237. *Id.*

documents. Remember that a rival digital asset is one that “is *not* copiable with perfect remainder of the original and is *not* useable by multiple actors simultaneously without mutual interference.”²³⁸ A Microsoft Word document *can* be perfectly copied, leaving a perfect remainder of the original file. Therefore, it is usable by multiple actors simultaneously without mutual interference. Under this analysis, Microsoft Word documents are not rival assets.²³⁹ Are bitcoins? As Konrad S. Graf noted:

238. Graf, *supra* note 127.

239. It is noteworthy that although certain courts have treated nonrival electronic documents and data as property for the purposes of conversion, there is significant disagreement among courts and commentators. *See, e.g.*, *Thyroff v. Nationwide Mut. Ins.*, 864 N.E.2d 1272, 1278 (N.Y. 2007) (“[E]lectronic documents and records stored on a computer can also be converted by simply pressing the delete button.”); *see also* *Integrated Direct Mktg., LLC v. May*, 495 S.W.3d 73, 76 (Ark. 2016) (“[E]lectronic data, standing alone and not deemed a trade secret, can be converted if the actions of the defendant are in denial of or inconsistent with the rights of the owner or person entitled to possession.”). *But cf.* *Epic Sys. Corp. v. Tata Consultancy Servs. Ltd.*, No. 14-CV-748, 2016 WL 4033276, at *27 (W.D. Wisc. July 26, 2016) (“[T]here is, at least so far, no support from Wisconsin courts for such an expansion of this state’s common law [to recognize conversion claims of electronic data]”); *Wells v. Chattanooga Bakery, Inc.*, 448 S.W.3d 381, 392 (Tenn. Ct. App. 2014) (“[A]n action for the conversion of intangible personal property is not recognized in Tennessee.”). Some commentators do claim that many more forms of nonrival data deserve property protections (as distinct from intellectual property protections). *See, e.g.*, Lawrence Lessig, *The Architecture of Privacy*, 1 VAND. J. ENT. L. & PRAC. 56, 63 (1999) (“Information is an asset. It is a resource which has become extremely valuable. . . . So the trick is to construct a regime where those who would use the data internalize this cost, by paying those whose data are used. The laws of property are one such regime. If the law gave individuals the rights to control their data, or more precisely, if those who wanted to use that data had first to secure the right to use it, then a negotiation would occur over whether, and how much, data should be used. The market could negotiate these rights, if a market in these rights could be constructed. The benefits of a market would be many.”); *see also* Paul M. Schwartz, *Property, Privacy, and Personal Data*, 117 HARV. L. REV. 2055, 2125–26 (2004) (“A strong conception of personal data as a commodity is emerging in the United States, and individual Americans are already participating in the commodification of their personal data. This Article’s goal has been to develop a model for the pertization of personal information that also exhibits sufficient sensitivity to attendant threats to personal privacy. . . .”); *id.* at 2094 (“[T]he understanding of property as a bundle of interests rather than despotic dominion over a thing helps frame a viable system of rights with respect to personal data. Moreover, these property interests are to be shaped through legal attention to five areas: inalienabilities, defaults, a right of exit, damages, and institutions.”). But others note the inherent dangers and conceptual difficulties in creating property rights in data. *See* Pamela Samuelson, *Privacy As Intellectual Property?*, 52 STAN. L. REV. 1125, 1129 (2000) (“A property rights model for protecting personal data nevertheless presents many problems.”). For example, “[c]reating a property right in personal data may . . . be objectionable to those who consider information privacy to be a fundamental civil right.” *Id.* at 1142. Note, too, that certain scholarly attempts at granting property rights over nonrival digital assets do so by first converting them into rival assets. *See, e.g.*, Jeffrey Ritter & Anna Mayer, *Regulating Data As Property: A New Construct for Moving Forward*, 16 DUKE L. & TECH. REV. 220, 263 (2018) (suggesting that “[w]hile conventional discussions suggest data files can be duplicated, when properly enveloped or associated with related metadata and provenance, and bundled by suitable encryption or other controls, any data file can, in fact, be unique and incapable of perfect duplication”). The sheer

Even though bitcoins are part of the normally copiable and therefore nonrival digital realm, they *cannot* [be] copied. Instead . . . their current state of address assignment can be altered only with the required digital signatures on a transaction that becomes included in the blockchain. Such ‘spending’ of Bitcoin is a transfer of control assignment.

Although Bitcoin is informational, the protocol and network nevertheless operate to deliver rival scarcity of units. This enables Bitcoin to function in the social role of facilitating indirect exchange. It could not do so if it were a nonrival digital good, and almost all digital goods prior to Bitcoin were nonrival.²⁴⁰

It is also noteworthy that Bitcoin’s “rival scarcity does not result from appending special legal status or technical protections to otherwise pre-existing nonrival digital objects”; rather, Bitcoin’s rival scarcity “is instead among the *inseparable defining characteristics* of bitcoins as they exist, and they exist in no sense other than as integral attributes of the cryptographic data structures of the Bitcoin blockchain, protocol, and network.”²⁴¹

Though whole blockchains themselves may be copied and “are therefore nonrival goods, cryptocoin units themselves nevertheless still function as rival goods.”²⁴² In sum, bitcoins are rival assets.

number of competing viewpoints among courts and academics demonstrates that resource management of nonrival digital assets (as well as intellectual property, *see supra* note 128) deserves significant attention. The question, though, is not whether such resources require an efficient management regime (they do); but rather, the question is whether property law, including its doctrines, underlying policies, and emergent effects, is the most efficient or equitable regime for this task. Although the answer to this question is beyond the scope of this Article and deserves further consideration, this current analysis of tangibility retains the traditional doctrinal requirement of rivalrousness.

240. Graf, *supra* note 127, at 57.

241. *Id.*

242. *Id.* To explore how hard forks may affect property rights in blockchains, it may be helpful to look at the Decentralized Autonomous Organization (DAO) hack on the Ethereum blockchain. A smart contract written on the Ethereum Blockchain launched the DAO. It “was meant to operate like a venture capital fund for the crypto and blockchain space.” Antonio Madeira, *The Dao, the Hack, the Soft Fork and the Hard Fork*, CRYPTOCOMPARE (Mar. 12, 2019), <https://www.cryptocompare.com/coins/guides/the-dao-the-hack-the-soft-fork-and-the-hard-fork/> [https://perma.cc/G2E5-5TS8]. The smart contract was hacked by attackers who were:

[A]ble to “ask” the smart contract (DAO) to give the Ether back multiple times before

2. *Owners of Bitcoins Can Discern the Boundary of Their Liberty-Right to Use*

“An individual ‘owns’ a Bitcoin if there is a ledger entry moving the Bitcoin to an address belonging to the individual; if the individual has the appropriate passcode, then the individual can in turn authorize a ledger entry assigning it to another individual’s address.”²⁴³ This transaction entry into the blockchain *is* the Bitcoin unit of value. Other than this entry, no other Bitcoin entity exists. Therefore, “the individual with the passcode associated with an address has full control over its disposition, and that Bitcoin balance is not linked to anything else.”²⁴⁴

Bitcoins by definition, then, have only two possible uses: keeping or spending. This is because the full definition of Bitcoin ownership is technologically dictated as having nothing more than the private key associated with the Bitcoin address of the recipient of the transaction entries on the blockchain ledger. The user interface, unlike in *Second Life*, does not create the limitation of possible uses. In *Second Life*, engineers could at any point alter the virtual land’s visuals, possible uses, and allowed uses. Here, the cryptographic architecture of Bitcoin and the fact that bitcoins are merely entries in

the smart contract could update its own balance. There were two main faults that made this possible: the fact that when the DAO smart contract was created the coders did not take into account the possibility of a recursive call, and the fact that the smart contract first sent the ETH funds and then updated the internal token balance.

Id. “To amend the fallout from the hack and return stolen funds, the Ethereum foundation, the developer of the blockchain on which DAO was based, made a decision to change the protocol (implement a hard-fork), effectively annulling all transactions on the Ethereum blockchain past a certain date.” G. Ishmaev, *Blockchain Technology As an Institution of Property*, 48 *METAPHILOSOPHY* 666, 668 (2017). The hard fork created a non-backwards-compatible duplicate of the entire blockchain, but importantly, the developers did not create the hard fork to amend a vulnerability in the blockchain itself; it was meant to reset time before an attacker hacked a vulnerability in the smart contract. Though the new blockchain was promoted as the Ethereum blockchain, the old blockchain was not deleted; it is a blockchain and cannot be deleted by any single entity. Many users continued to use the original blockchain and called it Ethereum Classic. Madeira, *supra*. Such hard forks have raised questions regarding the property status of blockchain tokens, but as Graf noted, even when hard forks occur, each version of the crypto token is still rival. Graf, *supra* note 127, at 57. Each post-fork crypto token is merely the equivalent of subdividing a tangible asset into two, where each subdivision is valued based on the market value of the respective fork. No property interests are lost.

243. Athey et al., *supra* note 142.

244. *Id.* (“Unlike a bank balance that can be viewed or manipulated digitally, an individual’s Bitcoin balance is not an ‘IOU’ or a promise to provide funds on demand . . .”).

a trustless public ledger (blockchain)²⁴⁵ create an asset whose uses are solely keeping and spending.²⁴⁶ This architecture means that no one, not even software engineers, have the ability to alter the defined set of possible uses for bitcoins.

If an owner means to keep bitcoins, no action is required. If an owner wants to spend bitcoins, there are a finite number of possible transaction types: Pay-to-Pubkey (P2PK),²⁴⁷ Pay-to-PubkeyHash (P2PKH),²⁴⁸ Pay-to-ScriptHash (P2SH),²⁴⁹ Multisig,²⁵⁰ and Nulldata.²⁵¹ Although these various transaction types vary in their output (i.e., who will receive and how to receive), they all require the same input from the bitcoin's owner: (1) a cryptographic signature generated using the owner's private key, which defines the authority to spend; and (2) a hash generated from the bitcoin's transaction history, which defines the integrity of the asset being transferred, assuring it has not been double spent within the blockchain.

In this case, then, shared social customs and intuitions are both generated and enforced by cryptographic imperatives. Users have no

245. Joshua A.T. Fairfield, *Smart Contracts, Bitcoin Bots, and Consumer Protection*, 71 WASH. & LEE L. REV. ONLINE 35, 36–37 (2014) (“[T]he central technology underlying Bitcoin [is] the ‘trustless public ledger’ (TPL). The ledger is public because anyone can download a copy. It is trustless because the underlying mathematical rules make it extraordinarily difficult to unilaterally change the list in the face of an opposing consensus. It is disintermediated because no single entity can control or manipulate the list.”).

246. *Id.* at 38 (“The trustless ledger system permits them to transfer and hold money in large amounts on their own account.”).

247. Pay-to-Pubkey transactions are those in which “the sender transfers Bitcoins directly to the owner of a public key.” Krzysztof Okupski, *Bitcoin Developer Reference* 18 (Technische Universiteit Eindhoven, Working Paper, 2016), https://www.lopp.net/pdf/Bitcoin_Developer_Reference.pdf [<https://perma.cc/HN82-9VSS>].

248. Pay-to-PubkeyHash transactions are similar to Pay-to-Pubkey transactions, but hashing the recipient's public address conceals the full public address of the recipient. *Id.* at 19.

249. Pay-to-ScriptHash transactions are those the sender does not assign a standard public key address as the recipient of bitcoins; rather, the transaction assigns the bitcoins to a Pay-to-ScriptHash address where if a redeemer has “[k]nowledge of the redemption script serializedScript corresponding to scriptHash,” the redeemer (instead of the sender) can then assign the bitcoins to a standard Pay-to-Pubkey address. *Id.* at 21. This transaction type is useful as it shifts the “responsibility of supplying the conditions for redeeming the transaction” from the sender to the recipient. *Id.* The spender does not have to know the recipient's public key address; the spender need only share with the recipient the key to the redemption script. *Id.*

250. A Multisig transaction is one where “the sender transfers Bitcoins to the owner of m-of-n public keys” instead of a single public key. *Id.* at 23.

251. Nulldata transactions can have a value of zero and are frequently used to “to allow inclusion of [up to 40 bytes of] arbitrary data in transactions in a controlled fashion.” *Id.* at 25.

choice: the boundary of an owner's liberty-right to use bitcoins is cryptographically defined by requiring access to the owner's private key and requiring that any bitcoins spent by the owner be verifiably, previously assigned to the owner and not already spent by the owner.²⁵² Owners of bitcoins, therefore, can discern the boundary of their liberty-right to use.

3. *Non-Owners of Bitcoins Can Discern the Boundaries of Their Duty Not to Interfere*

In the world of blockchain, no centralized authority, no software engineer, and no individual has the technological ability to interfere with anyone else's bitcoins, and although large Bitcoin exchanges have emerged, Bitcoin trading does not require a centralized authority.²⁵³ Just as the boundaries of an owner's liberty-right to use bitcoins were cryptographically created and enforced, so too is the bitcoin non-owner's duty not to deliberately interfere. Without the owner's private key, non-owners simply cannot spend bitcoins. This cryptographic requirement creates—or at least demonstrates the existence of—a *prima facie* duty not to deliberately interfere. The lack of technological ability to interfere with others' bitcoins makes the boundaries of non-owners' duty not to deliberately interfere extremely clear.

In most cases, non-owners need not even actively acknowledge the boundary of their duty not to interfere because the boundary is functionally impenetrable. If bitcoins were analogized to the cars in Penner's example, the individual strolling through the parking lot would be met with a forcefield around each car. This scenario creates and enforces a shared social custom to respect others' property, even if one did not previously exist. Therefore, even if somehow a non-owner gained knowledge of an owner's private key, a shared social custom has already been created. Each non-owner knows or

252. Cryptography, then, alongside government regulation, imposes duties onto X and fully defines the boundary of X's liberty right.

253. See Rainer Böhme, Nicolas Christin, Benjamin Edelman, & Tyler Moore, *Bitcoin: Economics, Technology, and Governance*, 29 J. ECON. PERSPS. 213, 215 (2015).

should know that it is socially and legally wrongful to spend others' bitcoins. Non-owners have a prima facie duty not to interfere with bitcoins, even if they can.

This analysis demonstrates that it is not the cryptographic enforcement of exclusion that makes the boundaries of a non-owner's prima facie duty "obvious"; rather, the cryptographic enforcement of exclusion allowed the establishment of a shared social custom and intuition about how bitcoins are used and what non-owners may or may not do. This is the case even without a EULA, which Bitcoin does not have.²⁵⁴ Therefore, even non-cryptographically enforced rival digital assets may have sufficiently clear shared social customs and intuitions to warrant legal thinghood and property rights.

C. *CryptoKitties*

"CryptoKitties is a digital collectible gaming platform in which players can buy, sell, trade, and breed digital cats."²⁵⁵ Developed by Dapper Labs,²⁵⁶ the CryptoKitties website promotes that "[e]ach cat is one-of-a-kind and 100% owned by you; it cannot be replicated, taken away, or destroyed."²⁵⁷ Once users own a CryptoKitty (kitty), they "can breed, buy and sell within the Cryptokitties platform or race, dress, or battle [their] Cryptokitty in other Ethereum games."²⁵⁸ Like Bitcoin, CryptoKitties is also based on blockchain technology but relies on NFTs to represent each digital cat's "uniqueness, scarcity and, of course, demand."²⁵⁹ Users have spent as much as \$170,000 for a single cat,²⁶⁰ one of the rarest of these digital kitties.

254. Gheorghe H. Popescu, *The Economics of the Bitcoin System*, 2 PSYCHOSOCIOLOGICAL ISSUES HUM. RES. MGMT. 57, 57 (2014). "[T]here are no terms of service or user agreement in mining or using Bitcoins," though there may be agreements to use the services of Bitcoin exchanges. *Id.*

255. Tonya M. Evans, *Cryptokitties, Cryptography, and Copyright*, 47 AIPLA Q.J. 219, 223 (2019).

256. See *Our Products*, DAPPER LABS, <https://www.dapperlabs.com/#products> [<https://perma.cc/DM3H-DHVQ>].

257. CRYPTOKITTIIES, <https://www.cryptokitties.co/> [<https://perma.cc/XM9A-SBNQ>].

258. Evans, *supra* note 255.

259. *Id.* at 247–48.

260. See Chuong Nguyen, *Cat Got Your Wallet? CryptoKitties Virtual Feline Fetches \$170K in Crypto Cash*, DIGITAL TRENDS (Sept. 5, 2018), <https://www.digitaltrends.com/computing/dragon-cryptokitties-most-expensive-virtual-cat/> [<https://perma.cc/6SGH-AR4Q>]. This was not a single fluke; other cats have also been sold for upwards of \$140,000. See Elisa Mala, *Who Spends \$140,000 on a CryptoKitty?*, N.Y. TIMES (May 18, 2018), <https://www.nytimes.com/2018/05/18/style/cryptokitty->

At one point, CryptoKitties was so popular that it slowed down the entire Ethereum blockchain.²⁶¹

It is important to note that although this case study focuses on CryptoKitties, Dapper Labs has relied on essentially the same digital infrastructure with similar terms of service to sell NFT-based collectibles of NBA highlights, earning the company over \$500 million in sales as of April 2021.²⁶² Other NFT-based collectibles and NFT-based digital art follow the same technological and legal schema such that this CryptoKitties case study demonstrates how the NFT “craze” may be based on a misunderstanding of what rights consumers actually buy through NFTs.²⁶³

Unlike Bitcoin, the CryptoKitties ecosystem consists of both a blockchain ledger to keep track of ownership and a separate proprietary, closed-source algorithm. On the blockchain side, each kitty is identified through its “DNA,” a single unique ID number assigned to each cat.²⁶⁴ Each ID number is unique but contains no information about the rarity or the features of the resulting visualized cat, which is generated, stored, and displayed exclusively by the proprietary algorithm. It is noteworthy that the CryptoKitties proprietary algorithm is “replaceable by the CEO [of Dapper Labs], for any reason at all.”²⁶⁵ Newly released special edition or

auction.html [https://perma.cc/Y5JB-P47N].

261. Alesja Serada, Tanja Sihvonen, & J. Tuomas Harviainen, *CryptoKitties and the New Ludic Economy: How Blockchain Introduces Value, Ownership, and Scarcity in Digital Gaming*, 16 SAGE J.S.: GAMES & CULTURE 457, 470 (2021).

262. 7.6 million “Top Shot Moments” have been sold (totaling over \$500 million in sales) through Dapper Labs’ NBA Top Shop service. *See NBA Top Shot*, NBA TOP SHOT, <https://nbatopshot.com/> [https://perma.cc/2XYW-KS2B].

263. Kal Raustiala & Christopher Jon Sprigman, *The One Redeeming Quality of NFTs Might Not Even Exist*, SLATE (Apr. 14, 2021, 4:59 PM), <https://slate.com/technology/2021/04/nfts-digital-art-authenticity-problem.html> [https://perma.cc/L2HD-TSUT] (“[T]he ‘nonfungible’ in ‘nonfungible token’ refers to the token itself—that is, to the block of code that makes up the NFT, and not to the artwork that an NFT is associated with. . . . NFTs identify a particular digital artwork only in the most general way: They contain a ‘hash’ of the artwork as part of the code that makes up the NFT, and some contain a link to an internet address that displays a copy of the artwork.”).

264. Each unique ID number consists solely of an integer between 0 and $(2^{256})-1$. *See* Luke Zhang, *Your CryptoKitty Isn’t Forever — Why DApps Aren’t As Decentralized As You Think*, MEDIUM (Dec. 3, 2017), <https://medium.com/loom-network/your-crypto-kitty-isnt-forever-why-dapps-aren-t-as-decentralized-as-you-think-871d6acfea> [https://perma.cc/6WR4-3JYT].

265. *Id.*

holiday-themed kitties demonstrate that this mutability is integral to the CryptoKitties ecosystem.²⁶⁶

Unlike Second Life's contemporary EULA, CryptoKittie's terms of service assert that users *do* have property rights to each kitty, claiming that "[e]ach CryptoKitty is a non-fungible token (an 'NFT') on the Ethereum blockchain. When you purchase a CryptoKitty, you own the underlying NFT completely."²⁶⁷

1. *CryptoKitties Are Rival Assets*

The CryptoKitties website claims that "each CryptoKitty is one-of-a-kind and 100% owned by you," and that the number of kitties is finite, with a maximum of 50,000 "Gen 0" kitties—kitties created and sold by Dapper Labs itself.²⁶⁸ Users can breed an unlimited number of other kitties, though each time kitties breed, users must pay a breeding fee of 0.008 ETH,²⁶⁹ and the cats must undergo a subsequent "cooldown" period,²⁷⁰ during which they cannot breed again.²⁷¹ Thus, the time and money invested into this process limit the total number of kitties bred, just as with any other physical asset (e.g., crop or manufactured good). Each kitty's NFT on

266. See, e.g., CryptoKitties Team, *Meet a Bewitching New Fancy Cat*, CRYPTOKITTIES, <https://www.cryptokitties.co/blog/post/meet-a-bewitching-new-fancy-cat/> [https://perma.cc/DH6D-RADP]; see also, e.g., CryptoKitties Team, *Rock Out with Our Latest Fancy Cat*, CRYPTOKITTIES, <https://www.cryptokitties.co/blog/post/rock-out-with-our-latest-fancy-cat/> [https://perma.cc/5RZ2-NCDF].

267. *Terms of Use*, CRYPTOKITTIES § 3(B)(i), <https://www.cryptokitties.co/terms-of-use> [https://perma.cc/RZ8F-FKTJ] (Nov. 15, 2018) ("Own" means, with respect to a CryptoKitty, a CryptoKitty that you have purchased or otherwise rightfully acquired from a legitimate source, where proof of such purchase is recorded on the relevant blockchain. 'Purchased Kitty' means a Kitty that you Own.').

268. *About*, CRYPTOKITTIES, <https://www.cryptokitties.co/about> [https://perma.cc/CAC9-BZ5S]; WHITE PA-PURR, CRYPTOKITTIES: COLLECTIBLE AND BREEDABLE CATS EMPOWERED BY BLOCKCHAIN TECHNOLOGY 6, https://drive.google.com/file/d/1soo-eAaJHzhw_XhFGMJp3VNcQoM43byS/view (last visited June 21, 2021).

269. *Cost to Play*, CRYPTOKITTIES, <https://guide.cryptokitties.co/guide/gas/cost-to-play> [https://perma.cc/Y9AY-BS65]. On April 4, 2020, 0.008 ETH was worth \$1.15 USD. *Cryptocurrency Converter and Calculator Tool*, COINMARKETCAP, <https://coinmarketcap.com/converter/> [https://perma.cc/NN9L-KMGJ].

270. A kitty's generation determines the cooldown periods. Gen 0 kitties have a one-minute cooldown period. As the Kitty's generation increases, so does the length of its cooldown period. Gen 26+ kitties have a cooldown period of one week. *Cooldown Speed*, CRYPTOKITTIES, <https://guide.cryptokitties.co/guide/cat-features/cooldown-speed> [https://perma.cc/4NLA-DMKF].

271. *FAQ*, CRYPTOKITTIES, <https://www.cryptokitties.co/faq> [https://perma.cc/J9L9-LQR7].

the Ethereum blockchain has a unique ID that definitionally cannot be replicated in another kitty.

Thus, CryptoKitties are rival, just as bitcoins are. They are “not copiable with perfect remainder of the original” because they are not copiable at all.²⁷² They are “not useable by multiple actors simultaneously without mutual interference” because only a single user may use (e.g., breed) a CryptoKitty at a time. CryptoKitties are rival assets.

2. *‘Owners’ of CryptoKitties Cannot Discern the Boundary of Their Liberty-Right to Use*

CryptoKitty owners cannot discern the boundary of their liberty-right to use Cryptokitties because the boundaries of the asset itself are not as clear as Dapper Labs claims. The CryptoKitty and its underlying NFT on the Ethereum blockchain are not the same thing. This difference between the kitty and the NFT is crucial, in spite of Dapper Lab’s assertion that “[e]ach CryptoKitty is a non-fungible token (an ‘NFT’) on the Ethereum blockchain.”²⁷³ Note Dapper Lab’s alternative phrasing in the very next sentence of their EULA: “[w]hen you purchase a CryptoKitty, you own the underlying NFT completely.”²⁷⁴ You own the underlying NFT but not the kitty itself. What does this distinction mean?

The terms of service note that ownership of a kitty’s NFT “means that you have the right to trade your NFT, sell it, or give it away,”²⁷⁵ as well as the right to merely keep it in your wallet. Ownership of an NFT, however, does not equate to ownership of the CryptoKitty in two important ways.

First, ownership of the NFT does not include the right to “trade,” “breed,” or even “visualize” the owned kitties, such that what is owned is not a CryptoKitty at all.²⁷⁶ According to the terms of service, “your purchase of a CryptoKitty [NFT], whether via the App

272. Graf, *supra* note 127.

273. *Terms of Use*, *supra* note 267.

274. *Id.*

275. *Id.*

276. *See id.*

or otherwise, does not give you any rights or licenses in or to the Dapper Materials,” which include “without limitation, all Art, designs, systems, methods, information, computer code, software, services, ‘look and feel,’ organization, compilation of the content, code, data, and all other elements of the App.”²⁷⁷ But it is the proprietary App, not the Ethereum blockchain, that enables users to “breed genetically unique digital cats, which can then be visualized.”²⁷⁸ Therefore, without access to the App, owners of NFTs cannot make full use of the kitties owned; owners cannot even see their kitties.

Second, and relatedly, ownership of the NFT does not include the ownership of the visual representation of the cat but merely its unique numerical ID. The kitties’ visualizations are not stored on the NFT in the blockchain but rather are only available through the App and stored in Dapper Labs’ private servers. For non-commercial uses, the purchase of a CryptoKitty does grant users a “worldwide, non-exclusive, non-transferable, royalty-free license to use, copy, and display the Art for your Purchased Kitties,” but for commercial uses, Dapper only grants users a “limited . . . license to use, copy, and display the Art . . . provided that such Commercial Use does not result in you earning more than One Hundred Thousand Dollars (\$100,000) in gross revenue each year.”²⁷⁹ If “[e]ach CryptoKitty is a non-fungible token,” and “[w]hen you purchase a CryptoKitty, you own the underlying NFT completely,”²⁸⁰ then how could Dapper have the ability to deny users a “license” to use aspects of the kitty that are integral to its identity: its ability to breed and its visualization (i.e., the only ways to determine its scarcity and, thus, its market value)?

The answer is that the CryptoKitty is not the NFT. Rather, the CryptoKitty is the combination of the NFT and all the features and uses of the CryptoKitties App, which is owned and controlled by Dapper Labs. The allocation of usage rights and unclear distinction

277. *Id.* § 3(B)(ii) (cleaned up).

278. *Id.* at pmbl.

279. *Terms of Use*, *supra* note 267, § 3(C)(i)–(ii).

280. *Id.* § 3(B)(i).

between the NFTs on the blockchain and the CryptoKitties on the App demonstrate that although an owner's liberty-right to use the NFT may have clear boundaries, an owner's liberty-right to use the CryptoKitties does not.

3. *'Non-Owners' of CryptoKitties Cannot Discern the Boundaries of Their Duty Not to Interfere*

Although the NFT used by CryptoKitties is a blockchain-based token similar to Bitcoin, the discussion above demonstrates that CryptoKitties are not merely their underlying NFTs. Therefore, Dapper's assurance that "[o]wnership of the NFT is mediated entirely by the Smart Contract and the Ethereum Network" is not as satisfying as it first appears.²⁸¹ On the one hand, "at no point will [Dapper Labs] seize, freeze, or otherwise modify the ownership of any CryptoKitty[']s NFT]," but on the other, Dapper Labs "may, at [its] sole and absolute discretion, without notice to you . . . immediately suspend or terminate your user account and/or delete your CryptoKitties' images and descriptions from the App and the Site."²⁸² Without the ability to breed and without a visualization, is a CryptoKitty still a CryptoKitty? No, it is merely an NFT. Dapper Labs retains the right to functionally delete all Cryptokitties at its sole discretion. This conclusion is reinforced by Dapper's own differential usage of the terms CryptoKitties and NFTs in its clarification that "[i]f we delete your CryptoKitties' images and descriptions from the App and/or the Site, such deletion will not affect your ownership rights in any NFTs that you already Own," though they will now be forever worthless.²⁸³

Just like for bitcoins, there is a technologically enforced, shared social custom and subsequent intuition about a non-owner's prima facie duty not to interfere with an owner's NFT. But just like for Second Life assets, there is not a shared social custom or intuition

281. *Id.*

282. *Id.* § 3(B)(i), (G).

283. *Id.* § 3(G).

about a non-owner's prima facie duty not to interfere with an owner's CryptoKitty.

CONCLUSION

Property law has long relied on tangibility to delineate legal thinghood and to inform the bounds of in rem rights and duties. Unfortunately, property doctrines have fossilized over tangible boundaries, hindering property law from adequately addressing the everchanging landscape of emerging technologies, whether cryptocurrencies, NFTs, or other digital assets. The status quo has led to a fragmented system of legal treatments that increases the information cost of using digital assets, decreases efficiency, and ultimately hinders future innovation.

Through the unified and tech-neutral approach to legal thinghood proposed in this Article, property law can embrace a theoretically coherent and robust way to increase its resilience in adapting to future technologies. Moreover, by deconstructing the conceptual purpose of tangibility in traditional property doctrines, this Article has shown that tangibility is itself a technology. Therefore, by applying a tech-neutral lens, this Article derived a coherent doctrinal test for distinguishing between digital assets that fulfill all conceptual requisites to be legal things and assets that do not.

To reach these conclusions, the primary question asked in this Article was not whether *all* digital assets could be legal things under an overhauled system of property doctrines. Such an overhaul would certainly not be adopted in time to address the onslaught of cases concerning digital assets that are sure to arise in the near future.²⁸⁴ Rather, this Article's primary question was whether it is possible to integrate *certain* digital assets into *existing* property law, which was answered affirmatively.

By deriving a working definition of property rights, informed by the information theory of property, the New Private Law, and Hohfeldian jural relations, this Article has shown that digital assets

284. See Smith, *supra* note 51.

can conform to legal thinghood and should not be categorically dismissed from discussions of personal property rights. This analysis exposed the law's underlying assumptions about the role of tangibility and its purpose in delineating legal things and in shaping property rights. Specifically, tangibility has been a useful shortcut to delineate in rem rights by leveraging social and perceptual salience. From this finding, a tech-neutral (i.e., tangibility-neutral) definition of legal thinghood was derived.

Legal thinghood requires that (1) an owner's liberty-right to use and (2) a non-owner's duty not to deliberately or carelessly interfere have boundaries that are easily discernable from shared social customs or intuitions. Such shared customs and intuitions can stem from the cognitive effects of human perception,²⁸⁵ as well as from learned associations. It is the cultural evolution of shared customs and intuitions that explain when, why, and how property rights are applicable and when, why, and how they can be limited.²⁸⁶ Ultimately, this tech-neutral (tangibility-neutral) definition of legal thinghood can offer doctrinal certainty to courts attempting to define digital property rights, which can otherwise be an amorphous, "broad concept that includes every intangible benefit and prerogative susceptible of possession or disposition."²⁸⁷

As more of our lives take place online, it is crucial that we understand the role property law plays as a fundamental individual right, regardless of its medium. Without clarity, questions over the characterization of digital assets quickly become overwhelming and potentially destructive. Two prime examples demonstrate the need for a clear, tech-neutral analysis of digital assets. On December 22, 2020, the SEC announced a lawsuit against Ripple Labs, Inc. (Ripple) for selling unregistered securities.²⁸⁸ The company had

285. See Rips & Hespos, *supra* note 118; see also Soja et al., *supra* note 116, at 179.

286. Merrill & Smith, *supra* note 3, at 1891. Note, however, that Merrill and Smith attributed "[s]uch refinements outside of the core of property" to "a wider range of moral concerns, and entail[ed] judgments that reflect pragmatism, expert knowledge, and balancing." *Id.*

287. *Kremen v. Cohen*, 337 F.3d 1024, 1030 (9th Cir. 2003).

288. Press Release, U.S. Sec. & Exch. Comm'n, SEC Charges Ripple and Two Executives with Conducting \$1.3 Billion Unregistered Securities Offering (Dec. 22, 2020), <https://www.sec.gov/news/press-release/2020-338> [<https://perma.cc/RQ5J-PH7M>].

raised over \$1.3 billion through the sale of a digital asset called XRP, but continued to claim that the asset was not a security but rather a cryptocurrency just like Bitcoin. Unlike Bitcoin, however, which is created and distributed through an ongoing “mining process,” Ripple created “100 billion units” of XRP “all at once.”²⁸⁹ Of these units, Ripple retained ownership of 6.4 billion, granting the current and former CEOs “a good chunk of it” as well.²⁹⁰ Without a clear and intuitive definition of property, the purchasers of XRP may have been fooled into purchasing an asset whose value and use were under complete control of Ripple, with some parallels to the CryptoKitties case-study. In fact, a hedge fund investor noted that “the increase in XRP value is heavily dependent on the success of Ripple.”²⁹¹ An *ex ante* analysis of XRP could have clarified this situation, avoiding a costly and possibly destructive lawsuit.

Another more innocuous example also demonstrates this point: at a time when over 300 million Americans were under stay-at-home orders due to COVID-19,²⁹² the *LA Times*,²⁹³ the *Washington Post*,²⁹⁴ NBC News,²⁹⁵ and even NPR,²⁹⁶ all reported on the “massive” popularity of *Animal Crossing: New Horizons* on the Nintendo

289. Alex Castro, *SEC Says Third-Largest Cryptocurrency Was Sold All Wrong*, THE VERGE (Dec. 22, 2020), <https://www.theverge.com/2020/12/22/22196064/ripple-sec-cryptocurrency-security-currency-xrp> [https://perma.cc/CG9G-CLN5].

290. *Id.* (noting that “[a]nother 48 billion XRP are held in reserve, for periodic sales”).

291. *Id.*

292. Holly Secon & Aylin Woodward, *An Interactive Map of the U.S. Cities and States Still Under Lockdown — and Those That Are Reopening*, BUS. INSIDER (June 3, 2020), <https://www.businessinsider.com/us-map-stay-at-home-orders-lockdowns-2020-3?op=1> [https://perma.cc/97R5-QJ44].

293. Todd Martens, *How ‘Animal Crossing’ Was Built to Be Ubiquitous in Coronavirus Time — Back in 2001*, L.A. TIMES (Apr. 11, 2020, 8:15 AM), <https://www.latimes.com/entertainment-arts/story/2020-04-11/animal-crossing-coronavirus-quarantine-ubiquitous-origins> [https://perma.cc/QAG3-BJL5].

294. Petula Dvorak, *‘Animal Crossing’ Is ‘Fortnite’ for Moms: The Videogame Couldn’t Have Come at a Better Time*, WASH. POST (Apr. 6, 2020, 3:08 PM), https://www.washingtonpost.com/local/animal-crossing-is-fortnite-for-moms-the-video-game-couldnt-have-come-at-a-better-time/2020/04/06/3a2036e6-780b-11ea-b6ff-597f170df8f8_story.html [https://perma.cc/BMP9-98YH].

295. Ani Bundel, *‘Animal Crossing: New Horizons’ Is the Coronavirus Distraction We Needed*, NBC NEWS (Mar. 29, 2020, 3:10 PM), <https://www.nbcnews.com/think/opinion/animal-crossing-new-horizons-coronavirus-distraction-we-needed-ncna1170521> [https://perma.cc/BUR8-XDNC].

296. Megan Manata, *Newest Nintendo ‘Animal Crossing’ Arrives*, NPR (Apr. 7, 2020, 4:06 PM), <https://www.npr.org/2020/04/07/829092017/newest-nintendo-animal-crossing-arrives> [https://perma.cc/DU7D-8KDC].

Switch.²⁹⁷ *New Horizons* is the newest installment of *Animal Crossing*, “a social simulation game” series developed by Nintendo.²⁹⁸ In *New Horizons*, “[t]he user creates a customizable character who . . . can do whatever they like, from lying on the beach to catching fish to picking fruit. As one runs around collecting resources, the ability to make tools and create buildings are presented.”²⁹⁹

Notably, one of the game’s main mechanics and “[o]ne of the more challenging projects in the game is paying off the mortgage on one’s house. *Animal Crossing* allows players to upgrade their homes, but doing so requires paying off a large note [the mortgage] the player must take out to start the game in the first place.”³⁰⁰ The narrative of *Animal Crossing* centers on ownership of a virtual house and its related mortgage payments.

Is the ownership of an *Animal Crossing* house a property interest? Do users have any property claims against Nintendo because of its restrictions against users transferring their data to a new Switch console or saving their progress to Nintendo’s own cloud back-up service?³⁰¹ Similarly, would users have property claims if the government, without warning, outlawed the game (functionally destroying digital assets which may have taken hundreds of in-game hours to create), just as China did in 2020?³⁰² By focusing on discernable boundaries around an owner’s right to use and a non-owner’s duty not to deliberately or carelessly interfere with a rival asset, this tech-neutral definition of legal thing allows us to determine that, just like the virtual land in *Second Life*, the virtual homes in

297. Ben Gilbert, *Some ‘Animal Crossing’ Players in China Are Using the Game to Protest Government Policies, and Now the Chinese Government Is Banning the Game*, BUS. INSIDER (Apr. 10, 2020, 2:10 PM), <https://www.businessinsider.com/animal-crossing-new-horizons-nintendo-switch-banned-in-china-protests-2020-4> [<https://perma.cc/3RC4-3PKT>].

298. Bundel, *supra* note 295.

299. *Id.*

300. Ian Bogost, *The Rhetoric of Video Games*, in THE ECOLOGY OF GAMES: CONNECTING YOUTH, GAMES, AND LEARNING 117, 117 (Katie Salen ed., 2008).

301. *Nintendo: Animal Crossing Fans Upset by Cloud Restrictions*, BBC NEWS (Feb. 21, 2020), <https://www.bbc.com/news/technology-51589920> [<https://perma.cc/VNE4-A33N>].

302. China banned the sale of *Animal Crossing: New Horizons* on Taobao, a re-selling marketplace, because the user-generated content feature was used to protest government policies. Gilbert, *supra* note 297.

Animal Crossing: New Horizons are not legal things and, therefore, not subject to property law.

Although this latter example may not be as consequential as analyses of rapidly evolving financial assets or new NFT-based digital art, it demonstrates that a single, unified, and tech-neutral definition of legal thinghood in property law is necessary to allocate ownership and facilitates social interaction in almost all aspects of life in the twenty-first century. By avoiding ad hoc functional solutions that will fragment the doctrines and policies underlying the law of property, this definition will prevent the creation of rapidly obsolete rules that would undermine the role of private law as a tool for planning.³⁰³ Only a tech-neutral approach will allow property law to fulfill what the U.S. Supreme Court held as its purpose: to “[empower] persons to shape and to plan their own destiny.”³⁰⁴

303. See Fenwick et al., *supra* note 29; Odinet, *supra* note 31 (“A single perfection system for virtual property . . . would be greatly beneficial in simplifying the otherwise fractured way courts approach virtual property.”).

304. *Murr v. Wisconsin*, 137 S. Ct. 1933, 1943 (2017) (“Property rights are necessary to preserve freedom.”); see also *United States v. James Daniel Good Real Prop.*, 510 U.S. 43, 61 (1993) (“Individual freedom finds tangible expression in property rights.”).