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PROPERTY RIGHTS IN AUGMENTED REALITY

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ABSTRACT

Increasingly, cities, towns, and even rural communities are being slowly reshaped by a dynamic yet initially imperceptible phenomenon: the elaboration of augmented reality. Through applications that place virtual features over specific, real-world locations, layers of augmented reality are proliferating, adding new elements to an increasingly wide range of places. However, while many welcome the sudden appearance of arenas for battling digital creatures in their neighborhood or the chance to write virtual messages on their neighbor's wall, the areas being augmented oftentimes are privately owned, thereby implicating property rights. Many intrusions, of course, are de minimis: an isolated, invisible Pikachu unexpectedly appearing over the GPS coordinates corresponding with one's home can hardly be labeled a tragedy. Nevertheless, other infringements—such as the inundation of a church's façade with offensive digital messages or the establishment of a virtual center of commerce in one's backyard—seem to demand a solution. To date, however, commentators, courts, and litigants have almost universally assumed that property law does not and cannot provide recourse for such intangible invasions.

Resisting such expectations, this Essay will argue that not only can property law play a role in augmented reality, but that its application in this context leads naturally to a regime that protects real property owners' interest in the digital space linked to their property. In the process of so doing, this Essay will illuminate how recognizing real property owners' right to control relevant parcels of site-specific augmented reality does not mark a novel expansion of property law but accords—and in many ways is dictated by—existing theory and precedent. The project is divided into four parts. Part I provides an overview of augmented reality and its myriad applications, highlighting in the process the concerns many of these applications raise for real property owners. Part II then dissects a number of different property law theories and illustrates how rights to augmented reality—specifically rights inhering in the owner of the corresponding parcel of land—fit comfortably into each one. Finally, Part III analyzes case law supporting the recognition of this new property interest, focusing in particular on the

ancient ad coelum and much more recent cyberproperty lines of cases. Part IV offers a brief conclusion.

I. AUGMENTED REALITY—AN OVERVIEW

To understand the way in which property law can and should intersect with site-specific augmented reality, it is first necessary to define augmented reality and understand how it works. Augmented reality is, in short, the product of overlaying digital images and content over the real world through an electronic device such as a headset or smartphone.¹ Tom Caudell, a researcher for Boeing, first pointed to the practical benefits of augmented reality, or “AR,” in 1990, when he noted how AR could help direct workers assembling aircraft parts.² These types of GPS-neutral or location-unaware applications of AR have become common today, with current uses including tutorials on home improvements,³ assistance with industrial repairs,⁴ and previews on how products might look within a home.⁵ Nevertheless, it is the location-aware developments in AR that have attracted the most attention—and raised the most controversy—in recent months. Site-specific AR is defined by its incorporation of a user’s GPS position into the digital world. Accordingly, instead of a program that simply identifies relevant parts of a Volkswagen’s engine or projects Swedish furniture wherever the user points the camera, site-specific AR overlays specific sounds, videos, or graphics on specific real-world locations.

The now-infamous “Pokémon Go” application—released in July of 2016—provides a useful illustration of how this works. In the game, users’ movements in the real world are tracked by their avatars’ movements on a smartphone application. The avatar moves along a map that mirrors the real

1. This is fundamentally different than virtual reality, which consists of digital worlds wholly divorced from our own. See Matthew Schnipper, *Seeing Is Believing: The State of Virtual Reality*, VERGE, <https://www.theverge.com/a/virtual-reality/intro>. (last visited Sept. 22, 2017) (summarizing the promise of virtual reality as “[p]ut[ting] on . . . goggles, go[ing] nowhere, and be[ing] transported anywhere”). The arguments in this Essay are accordingly not intended as a comment on how property rights ought to apply in virtual reality.

2. Howard Yu, *What Pokémon Go’s Success Means for the Future of Augmented Reality*, FORTUNE (July 23, 2016), <http://fortune.com/2016/07/23/pokemon-go-augmented-reality/>.

3. Matt Vella, *The Pokémon Fad Shows the Unnerving Future of Augmenting Reality*, TIME (July 13, 2016), <http://time.com/4405053/pokemon-augmented-reality/> (describing how a prototype AR headset can “provide instructions for fixing a busted bathroom sink”).

4. Yu, *supra* note 2 (detailing how a Volkswagen application that “projects visual labels and instructions in real time to guide mechanic[s]”).

5. Ben Rossi, *What’s Next After Pokémon Go? The Future of Augmented Reality as Business Tool*, THE TELEGRAPH (Aug. 11, 2016, 4:40 PM), <http://www.telegraph.co.uk/connect/media-and-technology/augmented-reality-inspired-by-pokemon-go/> (reporting on an application by the furniture retailer IKEA that allows users to “visualize how furniture will look in their own home before buying it”).

world but includes overlaid “gyms” and “stops,”⁶ where users can interact with each other and the game by either battling their Pokémon—small, animated, collectable creatures—or amassing items that can aid in finding or battling Pokémon.⁷

Pokémon also appear before the user in a site-specific way. As a user moves through the real world—and, by extension, moves his avatar through the game’s map—she can monitor a list of nearby Pokémon. Once the user is within a several-meter radius of a Pokémon, she is alerted to its presence by the application. At this point, the user “enter[s] a part of the game where the Pokémon is superimposed over whatever [her] smartphone camera is trained on at that moment.”⁸ The goal then becomes to capture the Pokémon by throwing balls—also projected onto the real world through the smartphone’s camera—at the digital creature. The more Pokémon a user collects, the further she advances in the game, thus encouraging users to explore as much of the real world as possible.

What is noteworthy here is that, unlike in a completely virtual video game, Pokémon Go directly overlays its gameplay onto the real world. Thus, specific gyms, stops, and Pokémon exclusively appear at specific GPS coordinates. In the case of gyms and stops, the game’s developer, Niantic, aimed to locate them at “publicly accessible places such as historical markers, public art installations, museums, and monuments.”⁹ Nevertheless, some gyms and stops were ultimately placed over locations not intended to be publicly accessible, leading to certain unwelcome consequences. For instance, after a converted church in Massachusetts was further repurposed as a Pokémon Go gym, it took less than a day for the home to become overrun with people “all intently staring at [the] house through their phone screens.”¹⁰ In other situations, publicly accessible places, including the Holocaust Museum and Arlington National Cemetery, have protested Niantic’s use of their GPS locations without their consent, with each respectively having to explain that catching Pokémon on “hallowed ground” or in space “dedicated to the vic-

6. These maps notably feature nearly all of a town or city’s roads, alleys, and freeways and thus resemble navigation applications such as Google Maps. See Lily Hay Newman, *What is Pokémon Go, and Why is Everyone Playing It?*, SLATE (July 12, 2016, 2:57 PM), http://www.slate.com/articles/technology/future_tense/2016/07/a_comprehensive_guide_to_pokemon_go.html.

7. *Id.*

8. *Id.*

9. Adi Robertson, *What Can You Do When Pokémon Go Decides Your House is a Gym?*, THE VERGE (July 12, 2016, 4:46 PM), <http://www.theverge.com/2016/7/12/12159422/pokemon-go-turned-house-into-gym-augmented-reality-privacy>.

10. Madelline Bills, *This Church-Turned-House is Also Unwillingly a Pokémon Gym*, BOSTON (July 11, 2016, 4:50 PM), <http://www.bostonmagazine.com/property/blog/2016/07/11/church-house-pokemon-go-gym/>.

tims of Nazism” is inappropriate.¹¹ And with respect to the placement of the Pokémon themselves, the game’s algorithm “places the monsters more or less at random.”¹² Thus, while Niantic provides procedures for the removal of gyms and stops,¹³ there is currently no way for a property owner to free her GPS coordinates of the virtual critters.¹⁴

This digital augmentation of reality comes at a concrete cost. For one, players in search of Pokémon or attempting to access a misplaced gym or stop might trespass onto private property—common complaints include the trampling of gardens or blockading of driveways.¹⁵ But even when players manage to limit their pursuit of the creatures to public areas, the hunt can lead swarms of players to converge onto specific locations, creating “safety concerns,” and “horrible” living conditions for those housed adjacent to the beckoning GPS coordinates.¹⁶ Such effects have ultimately led multiple parties to file lawsuits against Niantic for monetary and injunctive relief.¹⁷ One plaintiff who brought suit after the game transformed her “once-quiet” street into a “nightmare” summarized the effects in particularly dramatic fashion:

We don’t feel safe having people on our property looking into our home. Nor do we feel safe with random vehicles parking, driving

11. Rebecca Hersher, *Holocaust Museum, Arlington National Cemetery Plead: No Pokémon*, NPR (July 12, 2016, 6:47 PM), <http://www.npr.org/sections/thetwo-way/2016/07/12/485759308/holocaust-museum-arlington-national-cemetery-plead-no-pokemon>.

12. Erwan Lucas, *Pokémon No: Can a Place Declare the Game Off- Limits?*, ART DAILY, <http://artdaily.com/news/89560/Pokemon-No—Can-a-place-declare-the-game-off-limits-#.V7yzZJMrLdc> (last visited Sept. 17, 2017).

13. *Request Removal of a PokéStop or Gym*, NIAN TIC, https://support.pokemongo.nianticlabs.com/hc/en-us/requests/new?ticket_form_id=341148 (last visited Sept. 19, 2017); Paul Tassi, *Pokémon Go’s Latest Plagues: Disappearing PokeStops and Hacker Gym Leaders*, FORBES (Aug. 6, 2016, 1:53 PM), <http://www.forbes.com/sites/insertcoin/2016/08/06/pokemon-gos-latest-plagues-disappearing-pokestops-and-hacker-gym-leaders/#3efc32f6373f>.

14. Lucas, *supra* note 12 (noting that to do so would require a “modification of the game’s algorithm, a complex process that presents a headache for the developers”).

15. *E.g.*, Clara Lindh, *What Pokémon Go Has to Do with Armed Robbery and a Dead Body*, CNN (July 11, 2016, 12:12 PM), <http://www.cnn.com/2016/07/11/tech/pokemon-go-crazy-events/>.

16. Perry Stein, *Pokémon Go’s Augmented Reality is Augmenting the Reality of This Small Town*, WASH. POST (Aug. 13, 2016), https://www.washingtonpost.com/local/pokemon-gos-augmented-reality-is-augmenting-the-reality-of-this-small-town/2016/08/13/b39cd6f2-5e1d-11e6-8e45-477372e89d78_story.html?hpidHP_no-name_hp-in-the-news%3Apage%2Fin-the-news&tid=sm_tw; *see also* Alex Hern, *Pokémon Go: Who Owns the Virtual Space Around Your Home?*, THE GUARDIAN (July 13, 2016, 9:46 AM), <https://www.theguardian.com/technology/2016/jul/13/pokemon-virtual-space-home> (describing how Pokémon Go led to “massive levels of noise after midnight, uncontrollable traffic, [and] excessive rubbish” in a small Sydney suburb).

17. *E.g.*, Cass Action Complaint, *Marder v. Niantic, Inc.*, No. 3:16-cv-04300 (N.D. Cal. July 29, 2016), 2016 WL 4073537, https://www.scribd.com/document/319964590/Pokemon-Go-lawsuit#from_embed; Tresa Baldas, *‘We Don’t Feel Safe’: Metro Detroit Couple Sues Pokémon Go*, DETROIT FREE PRESS (Aug. 16, 2016, 11:50 AM), <http://www.freep.com/story/news/local/michigan/macomb/2016/08/15/metro-detroit-couple-suing-pokmon-go/88756410/>.

slow, and hanging out on our street. We don't know who is playing the game, who is looking at our homes to break in or steal, who is a pedophile or rapist. I don't feel safe sitting on our porch, something we love to do. We have gotten heckled and yelled at for calling the police and we didn't ever do so. I have been threatened because I asked someone to leave, he said [“]shut up b**** or else.[“] What does [“]or else[“] mean?¹⁸

Unfortunately for such property owners, the imposition of these social costs by AR applications is unlikely to die with the Pokémon Go craze. For one, Pokémon Go's immense¹⁹ and unprecedented²⁰ popularity managed to add \$7.5 billion to Niantic's partner Nintendo's market value in just two days,²¹ attracting widespread investor attention in what was labeled a “milestone” for AR.²² While this will surely lead to the proliferation of many more AR games,²³ a number of such games already exist. For instance, “Real Strike” promises to turn the “forest, street, office, or whatever . . . into a military simulation field,”²⁴ “Zombies Everywhere!” invites users to “survive the augmented reality apocalypse” by “fighting zombies,”²⁵ and “Spec Trek” distributes “virtual ghosts” into the world for users to find and catch.²⁶ Thus, property owners currently beset by Pokémon trainers combing through their gardens and patios may soon be forced to confront marauding commandos looking for ammo caches or would-be Ghostbusters pursuing poltergeists.

Yet physical invasions and disruptions linked to virtual projections are not be the only thing property owners have to fear from the future of AR.

18. Class Action Complaint at 13, *Dodich v. Niantic, Inc.*, No. 3:16-cv-04556 (N.D. Cal. Aug. 10, 2016), https://www.scribd.com/document/321245304/Local-couple-files-law-suit-against-Pokemon-Go#download&from_embed.

19. Pokémon Go notably captured over 20 million active users in two weeks and surpassed Twitter with respect to daily active users. Yu, *supra* note 4.

20. It was additionally the “most active mobile game ever” and “smashed the Apple App Store downloads record.” Rossi, *supra* note 5.

21. Vella, *supra* note 3.

22. *Id.* The augmented reality industry is expected to be worth \$90 billion by 2020. Rossi, *supra* note 5.

23. Indeed, Niantic recently raised \$200 million in funding for a new AR game based off the world of Harry Potter. See Darrell Etherington, *Pokémon Go Creator Raises \$200 Million Ahead of Harry Potter Game Launch*, TECHCRUNCH, (Nov. 24, 2017), <https://techcrunch.com/2017/11/24/pokemon-go-creator-raises-200-million-ahead-of-harry-potter-game-launch/>.

24. Yii Universal Elite Ltd., *Real Strike - The Original 3D Augmented Reality FPS Gun App*, iTUNES PREVIEW, <https://itunes.apple.com/us/app/real-strike-original-3d-augmented/id507884100?mt=8> [https://web.archive.org/web/20160823012501/https://itunes.apple.com/us/app/real-strike-original-3d-augmented/id507884100?mt=8].

25. Useless Creations Pty Ltd., *Zombies Everywhere! Augmented Reality Apocalypse*, iTUNES PREVIEW, <https://itunes.apple.com/us/app/zombies-everywhere!-augmented/id530292213?mt=8>.

26. Games4All, *SpecTrek*, GOOGLE PLAY, <https://play.google.com/store/apps/details?id=com.spectrekking.full&hl=en>.

One possibility is the prospect of companies overlaying digital advertisements onto specific GPS coordinates. While AR advertising today is “still in its infancy,”²⁷ many believe that such advertising will become commonplace in the near future.²⁸ In that future, GPS-aware AR advertising might present property owners with the problem of images, slogans, and videos with which they disagree being digitally plastered onto all sides of their homes or properties.²⁹ Indeed, this can already be achieved using an application called “WallaMe,” which allows users to augment reality by writing messages on walls “in a real space” that can then be seen by “everyone passing by the physical location” using the WallaMe app.³⁰ A homeowner today might therefore have multiple offensive or racist messages pinned to his GPS location without his consent or knowledge, a possibility that will only become more likely as AR technology continues to gain in popularity and uses.

To date, the limited legal efforts to remedy AR incursions or offenses have largely focused on seeking recovery and relief for the physical side effects of actions taken in AR.³¹ However, a more direct and effective way of protecting the real property owners’ rights would be for courts to recognize these owners’ rights over their GPS coordinates, specifically the right to exclude unwanted AR projections on their land. The following section elaborates on this right and details how existing property theories, beyond merely endorsing the right’s recognition, actively compel such a conclusion.

II. PROPERTY RIGHTS IN AUGMENTED REALITY—THEORETICAL BASIS

Given the technology’s short history, little has been written—let alone adjudicated—on whether site-specific AR should constitute divisible property. However, the few that have been inspired to comment on the subject in the wake of the Pokémon Go craze have almost uniformly assumed that no such rights exist and that real property holders have no claims against digital

27. *Augmented Reality: The Future of Advertising?*, EURONEWS (May 5, 2015), <http://www.euronews.com/2015/05/05/augmented-reality-the-future-of-advertisement>; *but see, e.g.*, Eric Brackett, *Snapchat and BMW Team Up to Bring Augmented Reality Ads to Life*, DIGITAL TRENDS (Nov. 25, 2017), <https://www.digitaltrends.com/mobile/bmw-snapchat-create-ar-ads/>.

28. *See, e.g.*, EURONEWS, *supra* note 27, (declaring that AR advertising has a “promising future”); *see also* Mallory Russell, *11 Amazing Augmented Reality Ads*, BUS. INSIDER (Jan. 28, 2012), <http://www.businessinsider.com/11-amazing-augmented-reality-ads-2012-1?op=1&IR=T> (heralding AR as “one of the hottest new advertising trends”).

29. For one—albeit creative—vision of what such GPS-aware AR advertising might look like, *see* Richard Fisher, *This ‘Augmented Reality Film is Incredible. . . and Terrifying*, BBC (May 20, 2016), <http://www.bbc.com/future/story/20160519-this-augmented-reality-film-is-incredible-and-terrifying>.

30. Wallame Ltd., *WallaMe - Hide Augmented Reality Messages*, iTUNES PREVIEW, <https://itunes.apple.com/us/app/wallame-hide-messages-in-real/id963058537?mt=8>.

31. The Pokémon Go class actions, for example, focus on the “foreseeabl[ility of] incursions by Pokémon Go players onto [physical] property” as the basis of their allegations of nuisance and unjust enrichment. Class Action Complaint, *supra* note 17, at 14.

intrusions on their land.³² Such conclusions largely spring from the belief that the projections from Pokémon Go and other AR apps are “not there on the property . . . [but] only on [one’s] phone.”³³ Yet such reasoning both begins and ends with physicality: because real property owners can only have rights to physical space, they have no rights against digital projections on their land. Not only does this static understanding of property discount the evolving nature of the common law, it wholly overlooks courts’ well-established practice of recognizing rights to intangible property.³⁴ Indeed, once one successfully resists the false urge to make property rights turn on the tangible, there emerges a compelling case for embracing property rights in site-specific AR and identifying the relevant real property owners as the holders of those rights.

Nevertheless, in order to determine whether particular zones of site-specific AR ought to be governed by property laws, it is first necessary to define property. This question is unfortunately exceedingly complex and has bedeviled scholars and judges alike for countless years.³⁵ Perhaps the easiest definition—and the one most efficient for the purposes of this Essay—is that property is “simply a label for whatever ‘bundle of sticks’ the individual has been granted.”³⁶ This “disintegrated” vision of property essentially leaves courts and legislatures free to anoint whatever rights they please as property, as it denies the existence of any deeper, inherent meaning behind the broader concept of “property.”³⁷ Yet though such an approach empowers courts to add the right to control corresponding sections of AR to a real property owner’s bundle of rights—thereby accomplishing this Essay’s goal—this solution is neither satisfying nor convincing. The remainder of this section thus focuses on slightly more substantive property theories.³⁸

32. See, e.g., Ryan Nakashima & Mae Anderson, *Property Owners: Get Off My Lawn, Pokémon!*, ASSOC. PRESS (July 14, 2016), <http://www.bigstory.ap.org/article/907bac533d66441c9cb48b78f0a3b7fb/irked-owners-trying-pry-pokemon-go-clutch-property>; Hern, *supra* note 16. *But see Is Pokémon Go Illegal?*, ASSOCIATE’S MIND (July 11, 2017), <http://associatesmind.com/2016/07/11/is-pokemongo-illegal/> (questioning whether “exclusive rights to property extend to cyberspace”).

33. Nakashima & Anderson, *supra* note 32.

34. See *infra* notes 121–44 and accompanying text.

35. See, e.g., *Banks v. Block*, 700 F.2d 292, 295 (6th Cir. 1983) (conceding that there can be “no precise definition of a property interest”); Abraham Bell & Gideon Parchomovsky, *A Theory of Property*, 90 CORNELL L. REV. 531, 534 (2005) (describing the field of property law as being in “insoluble theoretical disarray”).

36. Edward L. Rubin, *Due Process and the Administrative State*, 72 CAL. L. REV. 1044, 1086 (1984); *Cf.* *Board of Regents of State Colleges v. Roth*, 408 U.S. 564, 576 (1972).

37. *Cf.*, Thomas C. Grey, *The Disintegration of Property*, in *NOMOS XXII: PROPERTY* 69, 70 (J. Roland Pennock & John W. Chapman eds., 1980) (asserting that the understanding that property rights are distinct from other legal rights “cannot withstand analysis”).

38. In addition to the “bundle of rights” theory, Professors Bell and Parchomovsky, *supra* note 35, at 541–50, all of which are analyzed to some degree below: natural rights, utilitarianism, and neo-conceptualism.

A. *The Personality Theory of Property*

One way to understand interests in site-specific AR as amounting to property rights is through the personality theory of property. Outlined in depth by Professor Margaret Radin,³⁹ the personality theory is premised on the notion that “to achieve proper self-development—to be a person—an individual needs some control over resources in the external environment.”⁴⁰ The connection between personhood and external objects in turn suggests that “the person should be accorded broad liberty with respect to control over th[e] thing[s]” that define her or, in other words, property rights over those things.⁴¹ Professor Radin additionally proposed that the strength of property rights should vary with the extent to which the relevant thing is bound up with one’s identity: “those rights near one end of the spectrum—fungible property rights—can be overridden in some cases in which those near the other—personal property rights—cannot be. . . . The more closely connected with personhood, the stronger the entitlement.”⁴²

At first blush, the personality theory does not seem to support rights in AR—how could intangible spaces become so intertwined with personality so as to warrant property right protection? Nevertheless, there is ample evidence to support the fact that individuals are increasingly electing to develop connections and elaborate an identity through abstract avenues, seeking self-creation in the virtual world rather than the physical world. Indeed, “more than one-sixteenth of the average [Facebook] user’s waking time is spent on Facebook,”⁴³ and one-fifth of Americans report going online “almost constantly.”⁴⁴ Courts have not failed to take heed of this development and adjust legal protections accordingly. For instance, in the process of unanimously holding that a warrantless search and seizure of a phone is unconstitutional, the Supreme Court in *Riley v. California*⁴⁵ observed that cell phones are a “pervasive and insistent part of daily life,”⁴⁶ and harbor “for many Americans ‘the privacies of life.’”⁴⁷ More revealingly still, that Court likened a search of files contained in the cloud—a wholly abstract and intangible me-

39. Margaret Jane Radin, *Property and Personhood*, 34 STAN. L. REV. 957, 957–58 (1982).

40. *Id.* at 957–58. (This foundational point in turn flows in large part from the work of Georg Wilhelm Friedrich Hegel, in particular *Philosophy of Right* (T. M. Knox trans., 1967) (1821)).

41. *Id.* at 960.

42. *Id.* at 986.

43. James B. Stewart, *Facebook Has 50 Minutes of Your Time Each Day. It Wants More.*, N.Y. TIMES (May 5, 2015), <http://www.nytimes.com/2016/05/06/business/facebook-bends-the-rules-of-audience-engagement-to-its-advantage.html>.

44. Andrew Perrin, *One-Fifth of Americans Report Going Online ‘Almost Constantly’*, PEW RESEARCH CENTER (Dec. 8, 2015), <http://www.pewresearch.org/fact-tank/2015/12/08/one-fifth-of-americans-report-going-online-almost-constantly/>.

45. *Riley v. California*, 134 S. Ct. 2473 (2014).

46. *Id.* at 2484.

47. *Id.* at 2495 (quoting *Boyd v. United States*, 116 U.S. 616, 630 (1886)).

dium—to a thorough raid of a house,⁴⁸ the most sanctified space in Fourth Amendment jurisprudence.⁴⁹ Such acknowledgements of the value and importance of intangible rights have by no means been limited to rights against searches and seizures; they have repeatedly materialized in recent cases concerning property rights.⁵⁰

In this context, not only does the right to control intangible site-specific features appearing over an individual's real property seem deserving of protection, it arguably falls into the category of intangible rights *most* deserving of property protection. Rights over projections on one's GPS coordinates, unlike other intangible rights, are notably tied to the most foundational property right, the right to real property. Indeed, the Supreme Court in this context has affirmed that the right to control what is communicated from one's private property is "unique and important,"⁵¹ and that efforts to circumscribe or eliminate that right are unconstitutional.⁵² This logic applies with similar force in AR. For instance, it seems elementary to state that a property owner who supports the freedom to marry ought to be able to prevent a billboard condemning homosexuals to eternal damnation from being erected on her property, regardless of whether that billboard is real or digital;⁵³ even if a smartphone is required to see the message, its appearance on one's private property will inevitably affect how viewers perceive and relate to the property and its owner. Far from a thought exercise in a type of advertising that does not yet exist, this very type of scenario is already presenting problems for property owners. For instance, the Holocaust Museum expressed concern about reports that a "poison-gas type Pokémon" was appearing within the museum via the Pokémon Go app.⁵⁴ Whereas finding such a projection in a public park or suburban backyard might not give one pause, its manifestation in the Holocaust Museum risks trivializing the plight of millions of people and undermining the Museum's ability to solemnize and honor history. Site-specific AR's ability to change the meaning of that which surrounds it emphatically underscores how the right to control the self-defining messages conveyed by real property needs to extend into AR.

Unsurprisingly, the intimate connection between real property and self-definition did not escape Professor Radin. In her article, she noted how one "embodies or constitutes oneself" in one's home, which is "affirmatively

48. See *Riley*, 134 S. Ct. at 2491.

49. Cf. *Kyllo v. United States*, 533 U.S. 27, 34 (2001) (labeling the interior of a home "the prototypical. . . area of protected privacy").

50. See *infra* notes 121–44 and accompanying text.

51. *City of Ladue v. Gileo*, 512 U.S. 43, 54 (1994).

52. See *id.* at 58.

53. Cf. *W. Virginia State Board of Ed. v. Barnette*, 319 U.S. 624, 645 (1943) (recognizing "the right to refrain from speaking at all" as constitutionally protected activity).

54. Toby Meyjes, *Koffing the Poison Gas Pokémon Found at Holocaust Museum*, METRO (July 12, 2016), <http://metro.co.uk/2016/07/12/koffing-the-poison-gas-pokemon-found-at-holocaust-museum-6002503/>.

part of oneself.”⁵⁵ Indeed, Professor Radin ultimately recognized that the “basis of individuality” in our culture flows from one’s rights over her home.⁵⁶ This same logic applies to rights of commercial entities or corporate bodies over non-residential real property, such as the United States Holocaust Memorial Council’s rights over the Holocaust Museum. Accordingly, as a direct offshoot of the foundational right to real property, interests in site-specific AR— by Professor Radin’s own logic—fall squarely on the “property” end of her theory’s spectrum. Nevertheless, while Professor Radin’s theory seems to strongly endorse property rights over location-specific AR, her theory is far from universally embraced.⁵⁷ A truly robust defense of such rights therefore requires the endorsement of other theories.

B. *The Utilitarian Vision of Property*

A completely different approach to property is to view it from a utilitarian perspective and to define rights with reference to their level of social utility. While such theories certainly have a flavor of the property-is-any-bundle-society-decides vision of the law, they notably contain a bit more underlying substance. For instance, Jeremy Bentham—whose work on property is generally regarded as the first in the utilitarian vein⁵⁸—opined that property should essentially encompass those objects from which people, by established expectations, expect to draw advantages.⁵⁹ Though malleable, the dimensions of this theory’s definition of property are not entrusted to the sole discretion of judges and legislators, but instead must be ascertained with reference to outside, objective criteria.

If Bentham’s work marked the “flowering” of a particular strand of utilitarianism,⁶⁰ the law and economics movement amounted to an extended and active spring for the entirety of the species.⁶¹ Yet though works like Guido Calabresi and Douglas Melamed’s *Property Rules, Liability Rules, and Ina-*

55. Radin, *supra* note 39, at 992.

56. *Id.* at 996.

57. See Bell and Parchomovsky, *supra* note 35, at 542 (describing such natural rights theories as having “[fallen] into eclipse”).

58. See, e.g., Frank Michelman, *Property, Utility, and Fairness: Comments on the Ethical Foundations of “Just Compensation” Law*, 80 HARV. L. REV. 1165, 1211 (1967) (distinguishing Bentham’s work on property from the “pre-utilitarian property theories”).

59. Jeremy Bentham, *Theory of Legislation* 137 (R. Hildreth trans., Weeks, Jordan, & Co. 1840) (1802).

60. Michelman, *supra* note 58, at 1211.

61. *But Cf.* John J. Donohue III, *The Law and Economics of Tort Law: The Profound Revolution*, 102 HARV. L. REV. 1047 (1989) (showing that the incorporation of economic analysis, presently in tort, has opened new avenues of inquiry to further legal theory).

*lienability*⁶² proved enormously influential,⁶³ as Professors Bell and Parchomovsky note, these works were oftentimes more concerned with how to best *protect* property rather than how to *define* it.⁶⁴ Thankfully, Bell and Parchomovsky offered to fill this gap by further developing Bentham's utilitarian understanding of what constitutes property in what they called the "value-oriented theory of property."⁶⁵ Galvanized by the intuition that "property law is a legal institution organized around creating and defending the value inherent in stable ownership,"⁶⁶ the value-oriented theory defines property as "assets for which protection of stable ownership will enhance social welfare."⁶⁷ Accordingly, while property under this theory is in an eternally evolving state, at any given moment its parameters can be identified by reference to the value that can be derived from protecting particular interests.⁶⁸

Utilitarian theories broadly support recognizing rights to site-specific AR as property. Just as people do—or soon will—expect to draw advantages from such spaces, so too does their protection enhance social welfare. For one, as mentioned above, in the absence of such protection anybody would be able to project hateful, controversial, or inappropriate messages or advertisements onto private property, thus leaving the owner perpetually at risk of being tied to statements or causes they reject. Yet apart from the costs to the individual—be it the derailment of the self-development process described by Professor Radin or an assault on one's right to free speech⁶⁹—failing to recognize rights to AR would lead to larger social and economic inefficiencies. In the absence of such rights, real property owners would be forced to constantly monitor the AR space connected to their property to ensure that no objectionable messages or trespass-encouraging digital creatures were invading their space. When such encroachments did inevitably take place in this rights-deprived universe, those who hoped to protect their domains

62. See generally Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089 (1972).

63. Fred Shapiro & Michelle Pearse, *The Most-Cited Law Review Articles of All Time*, 110 MICH. L. REV. 1483, 1489 (2012) (ranking the article sixth in a 2012 study of the most-cited law review articles of all time).

64. See Bell and Parchomovsky, *supra* note 35, at 588.

65. See *id.* at 539, 643-47.

66. *Id.* at 538.

67. *Id.* at 563.

68. See *id.* It is worth noting, however, that—as the authors willingly concede—this theory does not fully track existing property law. See *id.* at 602–08 (suggesting reforms to nuisance and takings law so that they better track the value-oriented theory).

69. The merits of First Amendment claims in this context would likely center on whether the right to refrain from speaking includes the right to be free from messages projected onto one's property. Cf. *Wooley v. Maynard*, 430 U.S. 705, 715–17 (1977) (finding that private property can serve as a "billboard" and that—at least in the case of license plates—the government cannot compel individuals to display specific messages on those billboards).

would be forced to react by investing time and money into a legal action,⁷⁰ or hope that some extra-legal endeavor might yield results. This extreme inefficiency, moreover, would only be compounded by the reality that any success real property owners might have against unwanted AR advances would not create any deeper sense of security or stability; while one server's projections might be removed, there would remain a near infinite number of other servers still free to project onto the property until told otherwise. As a means of preventing this unpredictable and utterly undesirable state of affairs, recognizing property rights in AR clearly presents itself as a way to both stabilize existing ownership interests and enhance social welfare more broadly.

Admittedly, not recognizing property rights in site-specific AR also has social benefits. Freeing software developers from the concern that their projections might invade private property could encourage and facilitate wide-ranging and innovative uses of AR, which might lead to a larger and more expansive augmented universe for society to explore. Yet the fact that social benefits could flow from the non-recognition of a property right is not sufficient to justify such non-recognition under the utilitarian theory; such benefits would need to affirmatively outweigh those tied to recognizing the right. In this respect non-recognition falls short, a fact underscored by the danger that a lack of rights in AR could result in a tragedy of the commons.⁷¹ Without a restraining force, a developer would be incentivized in the short run to overwhelm certain attractive locations—such as properties located in very dense parts of the world—with AR features. Other developers would be similarly motivated to populate these AR coordinates, resulting in a massive concentration of projections. This, in turn, could result in the degradation of that resource. While such features would still exist on their respective servers, they would prove inaccessible in real life as crowds attempting to interact with the AR feature prevented others from so doing;⁷² this would mean that some of the most compelling augmentations of reality would be effectively nonexistent.⁷³ Weighed against the larger gains in social welfare to be

70. Here, property owners might seek relief for free speech issues in a compelled speech claim or vindication of their property rights in a nuisance or trespass suit. However, in a world where site-specific property rights in AR did not exist, the ability of owners to prevail on these claims based solely on incursions in AR seems improbable. This therefore means that there would be no legal recourse for those with free speech concerns, and that those eager to defend against a nuisance or trespass would need to helplessly wait until the predestined nuisance or trespass occurred before taking action.

71. See generally Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1232 (1968).

72. As previously mentioned, such a scenario, far from science fiction, has already played out in numerous locations around the globe. See Stein, *supra* note 16. That such concentrations of people have also led to unwanted noise, pollution, and general chaos serves as a further testament to the sizable social costs of not recognizing property rights in AR. *Id.*

73. This is concededly also a risk under a private property AR regime, as property owners of attractive AR locations could enforce their right to exclude. The situation is thus

had from recognizing property interests in site-specific AR, this laissez-faire approach to rights over AR thus reveals itself as both unattractive and inefficient.

An important analogue to the argument that recognizing property rights in site-specific AR is more efficient than not doing so is the implication that efficiency would be maximized by granting those property rights to the owners of the real property linked to the specific GPS coordinates. Indeed, many of the costs associated with a non-recognition regime could only be avoided by granting property rights to the relevant real property owners, as other owners would likely be less incentivized to appropriately balance digital enhancements against their physical costs. What is more, any other regime would substantially raise information costs, as those attempting to project objects onto certain coordinates would have no easy way of ascertaining the owner of those coordinates.⁷⁴ There also exists the risk of the creation of a sort of anticommons, “a type of property regime that may result when initial endowments are created as disaggregated rights rather than as coherent bundles of rights”;⁷⁵ for instance, if rights were awarded to the first to occupy a particular coordinate but extinguished after a certain period of nonuse, there might easily emerge a “world-class tangle” of claims over the coordinates corresponding with real property and a resultant inability to put those coordinates to a unified use.⁷⁶ In light of these and related issues, the utilitarian theory ultimately points toward recognizing real property owners’ property rights to AR over their GPS coordinates as a means of maximizing overall social utility.

C. “Property as the Law of Things”

A third and final starting point for understanding property and why rights to site-specific AR are worthy of being included in that category is the

different than one in which non-recognition of the right inherently leaves “every member worse off than he would have been. . . [with] some restriction.” Richard Epstein, *Why Restrain Alienation?*, 85 COLUM. L. REV. 970, 978–88 (1985) (compiling such situations). However, owners of attractive AR locations would likely be incentivized to efficiently balance income to be derived by “leasing” their GPS coordinates against a desire to not flood their property with an overwhelming number of visitors, which would yield a more desirable outcome than the elimination of accessibility threatened by a common rights regime.

74. See Thomas Merrill & Henry Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1, 8 (2000) (“The existence of unusual property rights increases the cost of processing information about all property rights. Those creating or transferring idiosyncratic property rights cannot always be expected to take these increases in measurement costs fully into account, making them a true externality. Standardization of property rights reduces these measurement costs.”).

75. Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621, 623 (1998).

76. *Id.* at 684. See also Dan Hunter, *Cyberspace as Place and the Tragedy of the Digital Anticommons*, 91 CAL. L. REV. 438, 509–14 (2003) (detailing how the tragedy of the anticommons can occur in the digital realm).

idea, emphasized in recent years by Professors Thomas Merrill and Henry Smith, that property is a “distinctive type of right to a thing, good against the world.”⁷⁷ There are two important points in that seemingly simple definition worth emphasizing. First is the idea that property need be a “thing,” or a “chunk of the world.”⁷⁸ On its face, this might seem to demand some sort of physicality out of that to which one is claiming an entitlement. This notion is undercut, however, by the reality that property law recognizes rights to many “things” that have no tangible expression.⁷⁹ The galvanizing force behind this idea instead seems to be that property rights can only inhere in something capable of “precise definition.”⁸⁰ The second element worth emphasizing is the “in rem character of the right.” To qualify as a property right, an owner must be able to exclude the entire world from using the relevant thing. Thus, the right to exclude from something is a necessary and sufficient condition of property: “give someone the right to exclude others from a valued resource . . . and you give them property.”⁸¹

The Smith and Merrill theory points squarely toward the existence of a property right over AR spaces associated with particular parcels of land. Working off of the basic definition, the first question is whether there exists a “thing.” While “all augmented reality appearing on a particular set or sets of GPS coordinates” does not have the best ring to it, there certainly appears to be a “thing” there. For one, all AR over specific GPS coordinates is a concept capable of precise definition, and conforms quite literally to Professor Smith’s notion of a chunk of the world. While an admittedly infinite number of servers might have the ability to access and modify the relevant “thing,” this is inconsequential; countless people, animals, particles, and electromagnetic waves intrude every day onto real property, but that does not negate the existence of the underlying right. Despite the inherently abstract nature of the right, there accordingly seems sufficient reason to christen rights to AR over specific physical areas as a “thing.”⁸²

Satisfying the right to exclude prong proves slightly more challenging. There currently does not exist an easy way for real property owners to exclude software developers from configuring servers in a way that makes AR

77. Thomas Merrill and Henry Smith, *What Happened to Property in Law and Economics*, 111 *YALE L.J.* 357, 358 (2001).

78. See Henry Smith, *Property as the Law of Things*, 125 *HARV. L. REV.* 1691, 1702-03 (2012).

79. See *infra* notes 121–44 and accompanying text.

80. Cf. *G.S. Rasmussen & Assoc. v. Kalitta Flying Serv.*, 958 F.2d 896, 903 (9th Cir. 1992) (establishing “capable of precise definition” as the first requirement in the circuit’s test for recognizing a property right).

81. Thomas Merrill, *Property and the Right to Exclude*, 77 *NEB. L. REV.* 730, 730 (1998).

82. While Professor Merrill elsewhere speaks of the “thing” condition in terms of a “valued resource,” see *id.* at 730, this does not change the calculus, as space in site-specific AR also amounts to a valued resource. See *supra* notes 58–76 and accompanying text.

features appear over the property owners' GPS coordinates. This reality, however, is far from determinative. For one, technology might soon evolve that empowers real property owners to control what can and cannot appear over their GPS coordinates.⁸³ Moreover, the mere fact that developers can intrude onto a real property owner's GPS coordinates does not mean that such intrusions are necessarily legal. Trespassers can oftentimes easily enter onto private property, yet the possibility of such penetration does not negate the existence of the underlying property right. Thus, as with real property, though the right to exclude in AR will likely depend on the police power of the state and the owner's ability to "fence off" his property, this should not prevent courts and legislatures from recognizing the existence of the right.

Moreover, approached from a slightly different angle, there *is* a way to argue that real property owners already possess the right to exclude AR features from their properties' coordinates. In order for a projection designed to appear on a particular GPS coordinate to become a "thing" capable of value, the user must go to that particular GPS coordinate; a savage digital zombie designed to chase all those who happen onto Blackacre remains a mere abstraction unless the owner of Blackacre allows a person using the application to enter.⁸⁴ Yet there is no default right or license for those participating in AR applications to ignore underlying property laws and trespass in order to make AR features appear. Thus, to the extent that an AR feature can transcend existence as an abstraction and become a valued resource, the owner of the underlying GPS coordinate must grant consent to users seeking to observe the feature digitally pinned to her property. This means that the owner of the underlying property has the ultimate right to exclude: not only does she possess the ability to control who may observe and engage with the AR, she possesses the ability to effectively destroy the AR for the rest of the world by uniformly denying access to her property.

On the surface, this last argument might seem internally inconsistent: why deny the software developer who creates the AR features the right to features he places into AR but cannot access yet grant rights to the real property owner for equally abstract rights to augmented space over their property? The answer is that, whereas the former right has value only when allowed to "materialize" by visitors to the GPS coordinates, the latter right has inherent value. There is no value to the developer of an AR game in

83. To a certain extent, this technology is already a reality. For example, though banned in certain states, GPS jamming technology creates a disruption around the device that prevents devices from connecting to satellites. See e.g. Kate Allen, *How the Super-Rich are Making their Homes "Invisible"*, FINANCIAL TIMES (Aug. 27, 2016), <https://www.ft.com/content/7a707048-648d-11e6-8310-ecf0bddad227> (describing jamming devices that can block location trackers). Thus, if the owner of Blackacre configured the device to jam all GPS signals over Blackacre, she would effectively be able to exclude AR features from her property.

84. Cf. Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287, 295 (1988) ("[The] exclusivity [of intellectual property rights] touches only the concrete, tangible, or physical embodiments of an abstraction.").

placing AR features on property that no user can access. Here, property law should function as it does in the copyright or patent domain, where it disfavors claims to nebulous, unrealizable ideas and designs; copyright law only gives ownership in “works of authorship which are fixed in a tangible medium of expression,”⁸⁵ while patent protection “will not obtain in the absence of some tangible evidence of the idea.”⁸⁶ By contrast, because a real property owner’s AR rights have independent value,⁸⁷ they are more akin to “cyberproperty” like domain names or websites;⁸⁸ unlike patents or copyrights, the value of these rights is not dependent on some additional act of elaboration. Accordingly, not only is a distinction between AR rights claimed by developers versus AR rights owed to real property owners sensible, it is a distinction already recognized in parallel areas of property law.

Nevertheless, those crusading for the rights of developers in GPS-sensitive AR might further counter that site-specific AR amounts to more of a “thing” when it is filled with projections; adopting a Lockean view of property, such proponents might maintain that it is wasteful to grant property rights to owners who simply leave the AR over their GPS coordinates unused.⁸⁹ Those who subscribe to such a view might further argue that property rights ought be awarded to those who labor to create value where there previously was none, such as developers adding projections into otherwise “vacant” space.⁹⁰ Yet while such an approach might have a compelling internal logic, it is ultimately an approach that the law has repeatedly refused to endorse. For instance, the traditional approach to improvements to land by trespassers holds that the trespasser is not entitled to the value of his labor.⁹¹ And on a broader level, the law recognizes real property owners’ right to unused airspace immediately above their property;⁹² just as the owner of a drone cannot fly his contraption over property and then claim ownership of

85. Wendy Gordon, *An Inquiry into the Merits of Copyright*, 41 *STAN L. REV.* 1343, 1380 (1989) (quoting 17 U.S.C. § 102(a) (1982)).

86. Bell and Parchomovsky, *supra* note 35, at 584 n.274 (citing *Pfaff v. Wells Electronics, Inc.*, 525 U.S. 55, 60–63 (1998)). See Hughes, *supra* note 84 (“[Intellectual property] rights invariably focus on physical manifestations of the res.”).

87. See *supra* notes 39–76 and accompanying text.

88. See generally Hunter, *supra* note 76.

89. See John Locke, *SECOND TREATISE OF GOVERNMENT*, § 42 (ed. C.B. Macpherson 1980) (1690) (“[L]and that is left wholly to nature, that hath no improvement or pasturage, tillage, or planting, is called, as indeed it is, waste . . .”).

90. Cf. *id.* at § 27 (“[F]or this labour being the unquestionable property of the labourer, no man but he can have a right to what that is once joined to, at least where there is enough, and as good, left in common for others.”).

91. See *RESTATEMENT (FIRST) OF RESTITUTION*, § 42 (AM. LAW INST. 1937). While the Third Restatement adopts a slightly more forgiving approach, it limits restitution to that necessary to prevent “unjust enrichment” and does not recognize any right to restitution for those cognizant of the trespass, a category that would likely encompass developers placing AR features on private property. See *RESTATEMENT (THIRD) OF RESTITUTION*, § 10DD (AM. LAW INST. 2000).

92. See *infra* notes 96–119 and accompanying text.

that airspace, so too should a developer not be able to claim ownership over AR on a particular GPS coordinate based off of mere occupation.

This point is further underscored by analogizing to the law surrounding site-specific art. While artists oftentimes challenge attempts by the relevant real property owner to remove work from its intended location, courts have generally sided with the real property owners in such conflicts. For instance, in *Serra v. U.S. General Services Administration*,⁹³ the Second Circuit held that the government could relocate Richard Serra's site-specific work "Tilted Arc" away from its "artistically inseparable" location without violating the artist's free expression and due process rights.⁹⁴ And even after the passage of the Visual Artists Rights Act of 1990,⁹⁵ which recognized an artist's general power to "prevent any intentional distortion, mutilation, or other modification" of her art,⁹⁶ courts have continued to side with real property owners in disputes over site-specific art.⁹⁷ This consistent position highlights the broad deference courts accord to holders of an underlying property right, even when refusing to recognize a dueling claim raises constitutional concerns. Applied in the context of rights over site-specific AR, these cases suggest that the interest of a real property owner in her AR space could, in some instances, prove so strong as to trump First Amendment arguments raised by software developers.

Of course, any attempt to "thingify" in the interest of crafting a property right is ultimately subject to the critique leveled over 80 years ago by Felix Cohen that such efforts veil the circular process of deriving rights from value, even though value would not exist without courts protecting the underlying right.⁹⁸ This, of course, is true: the right to control projections over a GPS coordinate is inherently abstract and would be devoid of meaning and value without the intervention of a court. Yet to parallel a response to Cohen forwarded in Professor Joshua Fairfield's defense of virtual property,⁹⁹ for reasons discussed above, rights of real property owners in AR ought to be protected not merely because they are property rights, but because recognizing such rights best preserves owner autonomy and best promotes efficient

93. *Serra v. U.S. Gen. Servs. Admin.*, 847 F.2d 1045, 1052 (2d Cir. 1988).

94. *Id.* at 1046–48.

95. Visual Artists Rights Act of 1990, 17 U.S.C.A. § 106A (West 2012).

96. *Id.* § 106A(a)(3)(A).

97. See, e.g., *Phillips v. Pembroke Real Estate, Inc.*, 459 F.3d 128, 143 (1st Cir. 2006) (holding that VARA does not apply to site-specific art "at all"); but see *Kelley v. Chicago Park Dist.*, 635 F.3d 290, 306–07 (7th Cir. 2011) (questioning *Phillips*'s interpretation of VARA).

98. See Felix Cohen, *Transcendental Nonsense and the Functional Approach*, 35 COLUM. L. REV. 809, 815 (1935) ("[T]he fact that courts did not protect [a right] would make the [right] valueless, and the fact that it was valueless would then be regarded as reason for not protecting it.").

99. See Joshua Fairfield, *Virtual Property*, 85 B.U. L. REV. 1047, 1093–94 (2005).

use. And even without such defenses, unlike with virtual property,¹⁰⁰ there is ultimately less to “thingify” when it comes to rights in site-specific AR; they directly track the most elemental right in the property canon, the right to real property. Perhaps for this very reason, therefore, recognizing real property owners’ rights in digital spaces overlaid over their land as property accords with the theoretical underpinnings offered for the law.¹⁰¹

III. PROPERTY RIGHTS IN AUGMENTED REALITY—CASE LAW

While abstract property theories’ alignment with the move to recognize rights in site-specific AR is relevant from a theoretical standpoint, it would ultimately be meaningless from a practical standpoint if such recognition ran contrary to established precedent. Thankfully, however, embracing property rights in AR also aligns with multiple distinct threads of property case law. Indeed, just as courts have historically accepted the legal right of real property owners to claim ownership over associated areas and objects, so too have they more recently come to embrace the recognition of rights in cyber-property. These two threads together serve as a formidable bedrock on which courts can begin to construct a regime of property rights in AR.

A. *The Ad Coelum Rule and Airplane Overflight Cases*

According to William Blackstone’s famous articulation, land has an “indefinite extent, upwards as well as downward”; it includes “not only the face of the earth, but everything under it, or over it.”¹⁰² This vision, known as the *ad coelum* rule,¹⁰³ held that even owners of the smallest parcel of real property had associated property rights that were infinite in scope, encompassing ownership that extended further into the galaxy’s outer reaches or Earth’s core than any human could ever hope to go.¹⁰⁴ Far from isolated musings, Blackstone’s understanding of property had a sweeping effect on property

100. *Cf. id.* at 1089 (acknowledging the primacy of the critique of virtual property that argues “there is no ‘there’ there”).

101. An additional, less widely cited property theory explicitly draws from underlying entitlements as a means of recognizing new forms of property; it favors original possession as the “source of ownership.” See Richard Epstein, *Possession as the Root of Title*, 13 GA. L. REV. 1221, 1222 (1979). This encourages further organization of property to flow from preexisting property interests. See *id.* at 1241. This theory also supports recognizing rights in site-specific AR as an extension of current rights to real property. *Id.*

102. 2 WILLIAM BLACKSTONE, COMMENTARIES *18.

103. This is short for “Cujus est solum ejus est usque ad coelum,” or “Whose is the soil, his it is up to the sky.”

104. *Cf. Bell and Parchomovsky, supra* note 35, at 544 (“The Blackstonian bundle presupposes impeccably demarcated parcels whose boundaries extend upwards to the heavens and downwards to the depths of the earth, and bestows upon owners unbridled powers and privileges to use, transfer, and even abuse land.”).

theory,¹⁰⁵ and was eventually fully incorporated into the common law.¹⁰⁶ This notably meant that the common law rejected an approach whereby rights to property were only available to those who possessed the relevant space.¹⁰⁷ Instead, the default approach was to recognize the inherent right of property owners to claim and control certain “derivative” spaces linked to their property, regardless of the accessibility of those spaces or the enforceability of those rights.¹⁰⁸

The common law’s embrace of Blackstone’s *ad coelum* rule has obvious implications for rights in AR. Just as the owner of real property cannot exercise dominion over areas far above or below her land, so too would it prove challenging for her to establish concrete control over AR linked to the property’s GPS coordinates.¹⁰⁹ Yet in the same way that numerous property theories are willing to impute ownership over things and spaces associated with certain pieces of property to the owner of the underlying right, so too does the common law adopt this same intuition by ascribing ownership of the heavens and depths to the surface owner. Applied to site-specific AR, the logic of the common law points to the existence of rights that inhere in the owner of the underlying land. Cases adopting and applying the *ad coelum* rule thus serve as a powerful tool for courts and litigants keen on recognizing rights for real property owners in AR.

Of course, the *ad coelum* rule is no longer good law; owners of real property cannot initiate a trespass action against any satellite, space shuttle, or high-altitude 747 that briefly overshadows their property.¹¹⁰ Yet while courts and commentators have been quick to label the displacement of this rule as a natural evolution of the common law or as an affirmative act of the Supreme Court,¹¹¹ such characterizations are inaccurate. In *United States v.*

105. See, e.g., *id.* at 543 (“William Blackstone provided the dominant understanding of property rights.”).

106. See, e.g., *United States v. Causby*, 328 U.S. 256, 260 (1946) (citing 2 WILLIAM BLACKSTONE, COMMENTARIES *18 (“It is ancient doctrine that at common law ownership of the land extended to the periphery of the universe.”)).

107. Cf. Thomas Merrill, *Trespass, Nuisance, and the Costs of Determining Property Rights*, 14 J. LEGAL STUD. 13, 36 (1985) (discussing a “possessor” approach to ownership of columns of space over real property that “the common law did not tend to adopt”).

108. See, e.g., *Smith v. New England Aircraft Co.*, 170 N.E. 385, 393 (Mass. 1930) (quoting FREDERICK POLLOCK, THE LAW OF TORTS 362 (13th ed. 1929)) (“It does not seem possible on the principles of the common law to assign any reason why an entry above the surface should not also be a trespass . . .”).

109. But see Allen, *supra* note 83.

110. See *Brown v. United States*, 73 F.3d 1100, 1104 (Fed. Cir. 1996) (“With the advent of human flight, and now world-wide aviation, a high altitude intrusion into an owner’s theoretical airspace that had no impact whatsoever on the surface property could not be actionable.”).

111. See, e.g., *Branning v. U.S.*, 654 F.2d 88, 97 (Ct. Cl. 1981) (“The Supreme Court long ago put to rest the ancient common law doctrine that ownership of the land extends to the periphery of the universe.”); Merrill, *supra* note 107, at 36 (“[T]he common law. . . instead [adopted] an ad hoc exception for overflights.”).

Causby,¹¹²—the case universally cited as sounding the death knell for the *ad coelum* rule,¹¹³ the Court—far from eliminating landowners’ rights to air-space *sua sponte*—avoided responsibility for its holding and stressed that its actions were compelled by Congress. The opinion notably began by citing not to common law doctrines but to the Air Commerce Act of 1926,¹¹⁴ which the Court observed granted the United States “complete and exclusive national sovereignty in the air space over this country.”¹¹⁵ Only after so establishing that Congress had already divested property owners of their air rights did the Court proceed to find that the *ad coelum* rule “has no place in the modern world.”¹¹⁶ Yet evidently not satisfied that its opening references to Congress were sufficient, the Court immediately reemphasized in the following sentence that it was “Congress [that] declared” the air to be a “public highway.”¹¹⁷ Given the Court’s extreme reluctance to take ownership over the *ad coelum* rule’s demise and its insistence that lawmakers had forced its hand, it is more than conceivable that, absent congressional action, the *Causby* Court might not have extinguished property owners’ rights to overhead airspace.

The reasoning in *Causby* illustrates how courts today could find that, absent legislation to the contrary, real property owners are broadly entitled to rights over spaces associated with their property. What is more, the inconsistent legacy of *Causby* evinces how, even when Congress seeks to limit or appropriate ownership over these related areas, the relevant real property owners still retain certain fundamental rights. For instance, in *Griggs v. Allegheny County*,¹¹⁸ the Supreme Court found that flight routes that fully complied with the Civil Aeronautics Administration’s regulations could still infringe on subjacent property owners’ rights to such an extreme extent as to be considered takings.¹¹⁹ The *Griggs* Court’s ruling was later extended beyond that case’s somewhat atypical fact pattern—the relevant parcel of property neighbored an active runway—by the Court of Claims in *Branning v. United States*.¹²⁰ There, the actions of the government were once again found to have effected a taking of the plaintiff’s property, notwithstanding the fact that these actions took place above the 500-foot level at which the federal government’s sovereignty purportedly began.¹²¹ What is more, the

112. *Causby*, 328 U.S. 256.

113. *See, e.g.*, *Cheskov v. Port of Seattle*, 348 P.2d 673, 676 (Wash. 1960) (en banc) (branding *Causby* the “leading case” relating to the *ad coelum* rule).

114. Air Commerce Act of 1926, 49 U.S.C. § 171 (1926).

115. *Causby*, 328 U.S. at 260 (quoting 49 U.S.C. § 171 (1926)).

116. *Id.* at 261.

117. *Id.*

118. *Griggs v. Allegheny Cty.*, 369 U.S. 84, 84 (1962).

119. *See id.* at 89.

120. *Branning v. U.S.*, 654 F.2d 88, 88 (Ct. Cl. 1981).

121. *See id.* at 101–02.

court was so firm in its conviction that it volunteered that the fact pattern before it amounted to a “*classic* statement of a taking situation.”¹²²

Collectively, these cases indicate that Congress can never fully divest real property owners of all rights to affiliated property such as overhead airspace. The special nature of “*ad coelum* areas” is only further confirmed with reference to the test used in these cases; instead of requiring the denial of “all economically beneficial or productive uses of the land” as demanded in takings cases that do not feature a physical invasion,¹²³ *Causby* and its progeny merely require a “diminution of the value of the [real] property” caused by activity in the associated but appropriated space.¹²⁴ This markedly different test hints at an understanding in the law that associated or derivative property is special, and that owners of the underlying property possess certain inalienable rights. Moreover, nothing in these opinions suggest that private actors would not be similarly constrained in their ability to use and occupy this otherwise public property; just as a real property owner can prevail on a takings claim based on flights in overhead but public airspace, so too would such an owner seem to have a viable case for an injunction to abate intrusions by private actors.

The *ad coelum* line of cases therefore demonstrates the law’s acceptance of real property owners’ rights to spaces affiliated with their property. Together, they reveal how the common law is amenable to a default state in which property owners hold the right to control spaces in site-specific AR connected to their property. And on a more foundational level, they suggest that, even were Congress to affirmatively declare that such rights do not exist, actors in such spaces are not free to operate without constraint, but instead must respect the residuum rights of the real property owner or face possible liability.¹²⁵

B. Cyberproperty Cases

The law’s willingness to recognize real property owners’ rights to associated or derivative spaces would be of little consequence to AR if the law foreclosed one’s ability to possess wholly intangible interests in cyberspace. Yet as the “cyberproperty” line of cases reveals, the opposite is true. Indeed, not only has the law proven willing to recognize these rights, in the process

122. *Id.* at 90 (emphasis added).

123. *See* *Lucas v. S. Carolina Coastal Council*, 505 U.S. 1003, 1015 (1992).

124. *Branning*, 654 F.2d at 102. *See also* *United States v. Causby*, 328 U.S. 256, 266 (1946) (“[I]t is the character of the invasion, not the amount of damage resulting from it, so long as the damage is substantial, that determines the question whether it is a taking.” (quoting *United States v. Cress*, 243 U.S. 316, 328 (1917)) (internal quotation mark omitted)).

125. This conclusion notably lends support to the litigants currently seeking to enjoin the presence of projections they allege encourage nuisances on their GPS coordinates. *See* Class Action Complaint, *supra* note 17, at 15; Baldas *supra* note 17.

of so doing it has endorsed theories and rights that strongly support establishing robust property interests in AR.

Any accounting of cyberproperty likely needs to begin with *Thrifty-Tel v. Bezenek*.¹²⁶ A California Court of Appeals in that case was confronted with two teenagers who had gained access to a long distance telephone carrier's network and subsequently overwhelmed it with a computer program that generated over a thousand calls in the hopes of identifying an authorization code for free long distance calls.¹²⁷ In ruling that Thrifty-Tel was entitled to recovery, the court relied on a trespass to chattels theory, which holds that recovery is appropriate where "an intentional interference with the possession of personal property has proximately caused injury."¹²⁸ Importantly, for such a theory to apply in the first place, the court needed to find that there existed a property interest in Thrifty-Tel's "computerized switching network."¹²⁹ The court was persuaded that such an interest indeed existed,¹³⁰ and in so finding effectively opened the floodgates for related property claims in cyberspace. Litigants quickly seized on this development, and within a few years courts began accepting that accessing a website could infringe on property rights.¹³¹

While the extent to which the cyberproperty at issue in these early cases was truly intangible is admittedly unclear—the courts made frequent references to the corresponding "servers" and "computer systems"¹³²—later developments eschewed the suggestion that digital property rights might hinge on the existence of a server or system. For instance, while a federal court in Utah that directly addressed the issue of property rights in websites characterized websites as tangible property, it tied this conclusion not to the existence of a host server that is itself property, but rather to websites' "physical presence on [a] computer drive," the fact that they "cause tangible effects on computers," and their ability to be "perceived by the senses."¹³³ This trend has been put on further display in the context of domain names. Despite domain names' wholly intangible nature, not only have courts held that they are a form of property,¹³⁴ they have further found that domain names are

126. 54 Cal. Rptr. 2d 468 (Cal. Ct. App. 1996). See Greg Lastowka, *Decoding Cyberproperty*, 40 IND. L. REV. 23, 25 (2007) ("The first cyberproperty case is usually said to be *Thrifty-Tel, Inc. v. Bezenek*.").

127. *Thrifty-Tel*, 54 Cal. Rptr. 2d at 471.

128. *Id.* at 473.

129. *Id.* at 471.

130. *Id.* at 473 ("Thrifty-Tel pleaded and proved a claim for trespass to personal property, and the defendants are properly liable under that label.").

131. See, e.g., *Oyster Software v. Forms Processing*, 2011 WL 17366382 (N.D. Cal. 2001); *eBay v. Bidder's Edge*, 100 F.Supp. 2d 1058 (N.D. Cal. 2000).

132. See, e.g., *eBay*, 100 F.Supp. 2d at 1064; *Oyster Software*, 2011 WL 17366382 at *12.

133. *Margae v. Clear Link Technologies*, 620 F.Supp. 2d 1284, 1288 (D. Utah 2009).

134. See, e.g., *Kremen v. Cohen*, 337 F.3d 1024, 1030 (9th Cir. 2003).

subject to *quasi in rem* jurisdiction.¹³⁵ Indeed, in the process of so holding, the Ninth Circuit likened domain names to the most elemental form of property, real property, analogizing the registration of a domain name with “staking a claim to a plot of land at the title office.”¹³⁶

Such precedents and the reasoning supporting them point heavily in favor of finding property rights in site-specific AR. Indeed, if anything, the case for extending cyberproperty to encompass rights in AR is stronger than the arguments used to support now-enshrined forms of cyberproperty. Perhaps the most salient and ubiquitous critique of the cyberproperty cases is that courts’ reflexive application of terms and concepts used in the real property context to interests that have no physical expression is inappropriate and dangerous.¹³⁷ Those who subscribe to this belief assert that, in the process of applying trespass laws to computer systems or equating one’s use of a website to presence in a physical store, courts “apply physical assumptions about property in this new, abstract space,” and thereby risk creating “undesirable private control of the previous commons-like Internet.”¹³⁸ Yet such concerns apply with much less force—if they apply at all—to site-specific AR, which directly correlates to physical spaces. Thus, not only are property interests in this area capable of precise definition, but their finite nature neutralizes the danger that privatizing this realm might lead more broadly to “the gradual whittling away of the public domain within intellectual property.”¹³⁹ It should therefore come as little surprise that interests in site-specific AR can fit neatly into the test used by the Ninth Circuit to define new types of cyberproperty: they are “capable of precise definition. . . capable of exclusive possession or control,” and putative owners possess the ability to “establish a legitimate claim to exclusivity.”¹⁴⁰

In addition to the broader support advocates for property rights in site-specific AR can derive from cyberproperty precedent in general, two specific trends in that area of the law apply with particular force to AR. The first is cyberproperty’s acceptance that ownership of more traditional property can generate rights in cyberspace. This feature of the law found its clearest expression in cases concerning “cyber-squatters,” the “early profiteers who bought up the Web addresses, or domain names, of well-known trademarked brands.”¹⁴¹ In adjudicating claims over “the ownership

135. See, e.g., *Office Depot v. Zuccarini*, 596 F.3d 696, 703 (9th Cir. 2010).

136. *Kremen*, 337 F.3d at 1030.

137. See generally Hunter, *supra* note 76, at 511–14.

138. *Id.* at 443, 446.

139. *Id.* at 446.

140. *Kremen*, 337 F.3d at 1030 (quoting *G.S. Rasmussen & Assoc. v. Kalitta Flying Serv.*, 958 F.2d 896, 903 (9th Cir. 1992)).

141. Steve Lohr, *A New Battle is Beginning in Branding for the Web*, N.Y. TIMES (Aug. 31, 2008), http://www.nytimes.com/2008/09/01/technology/01copyright.html?_r=1&adxnnl=1&oref=slogin&ref=business&adxnnlx=1220321046-Lj44cXocy6crTcdH7Z7q8Q.

of . . . highly prized Internet address[es],”¹⁴² courts consistently held for the trademark holders, finding that their rights translated to and applied in cyberspace.¹⁴³ Among the arguments buttressing these conclusions was a fundamental concern with the very real effects refusing to extend the right to company names into cyberspace could work on a company’s ability to define itself. In the words of the Ninth Circuit, any other holding would put companies’ “name[s] and reputation at [the] mercy [of cybersquatters].”¹⁴⁴

The cybersquatting cases effectively parallel the *ad coelum* cases, but in cyberspace; the courts in both lines of cases accepted that an underlying property right included rights over special, related areas. Thus, in recognizing rights over site-specific AR that derive from underlying rights over real property, courts would merely be following existing precedent related to derivative rights in cyberspace. One central difference, of course, is that the cybersquatting cases involved trademark claims, which are dictated by statute as opposed to common law.¹⁴⁵ Yet the reasoning behind those cases—paralleling the personality theory—is fully applicable to site-specific AR.¹⁴⁶ Accordingly, just as property protection for trademark is needed in cyberspace as a bulwark against the dilution or distortion of a company’s image, so too is property protection for site-specific AR necessary to protect individuals’ ability to control, develop, and define their land and, by extension, themselves.

Finally, the second specific trend in cyberproperty that supports extending rights over site-specific AR to real property owners is the developing movement to establish property rights in the virtual worlds of video games. While certain games allow users to “own anything they create in the game world,” they are under no legal obligation to do so and most actively refuse to recognize such rights.¹⁴⁷ Nevertheless, commentators are increasingly vocalizing arguments in favor of property rights in virtual worlds,¹⁴⁸

142. *Intermatic v. Toeppen*, 947 F.Supp. 1227, 1233 (N.D. Ill. 1996).

143. *See, e.g., id.* at 1241; *Panavision International v. Toeppen*, 141 F.3d 1316, 1327 (9th Cir. 1998).

144. *See Panavision*, 141 F.3d at 1327; *see also Intermatic*, 947 F.Supp. at 1240 (“[T]he most corrosive and irreparable harm attributable to trademark infringement is the inability of the victim to control the nature and quality of the defendant’s goods.”) (quoting *Ideal Industries, Inc. v. Gardner Bender, Inc.*, 612 F.2d 1018, 1026 (7th Cir.1979)).

145. *See* 15 U.S.C. § 1125 (1995).

146. *See supra* notes 39–76 and accompanying text.

147. *See James Bonar-Bridges, Regulating Virtual Property with EULAS*, 2016 Wis. L. REV. FORWARD 79, 80–86 (2016).

148. *See generally id.* at 88–89; Brett Burns, *Level 85 Rogue: When Virtual Theft Merits Criminal Penalties*, 80 UMKC L. REV. 831 (2012). *But see* Christopher 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, 237 (2014).

and at least one court has entertained the idea of their existence.¹⁴⁹ What is more, numerous foreign jurisdictions have been actively expanding their definitions of property to encompass these virtual interests. Thus, Great Britain, the Netherlands, South Korea, and China all currently regard the theft of virtual property to be equivalent to the theft of real property.¹⁵⁰

These developments clearly remain very far removed from crystallizing into a stable property regime for virtual worlds. Nevertheless, the mere existence of a slowly building movement for property rights in worlds that are entirely virtual innately strengthens the claim for property rights in site-specific AR, which—unlike virtual reality—can be naturally divided into defined and finite parcels. And whereas those seeking to defend property rights in virtual worlds must endeavor around the unalterable fact that such worlds can vanish at the will of the relevant server operator,¹⁵¹ rights in site-specific AR suffer from no such instability; real property owners' rights to AR transcend servers, existing whether the AR over their property is wholly empty or filled with projections generated by an endless array of discrete servers worldwide. In this way, the trend favoring property rights in virtual worlds—like the larger body of cyberproperty law and the more dated *ad coelum* doctrine—adds ultimately unignorable weight to the intuition that real property owners' rights ought to extend into AR.

IV. CONCLUSION

As AR technology inevitably continues to develop, proliferate, and expand in its applications, any corner of the world covered by the ever-expanding cellular network might soon find its features overrun with digital projections. While this technology can undoubtedly enhance our environments for the better and inspire people to connect with the world in entirely new ways, the antipodal potential for such technology to digitally vandalize locations or instigate trespassory conduct poses a legitimate threat to owners of real property. However, due in large part to this technology's intimate connection to the physical world, crafting a regime of property rights in site-specific AR would ultimately be a simple and straightforward exercise. And as this Essay has emphasized, not only would such a regime help protect the interests of real property holders and enhance social welfare, it would fit comfortably within existing property law theory and precedent.

149. See *Bragg v. Linden Research*, 487 F.Supp. 2d 593, 612 (E.D. Penn. 2007) (denying defendant's motion to dismiss a claim arising from the allegedly unlawful confiscation of virtual property in the virtual world known as "Second Life").

150. See *Burns*, *supra* note 148, at 845–50.

151. See *Fairfield*, *supra* note 99, at 1098 (arguing that, while "[p]ulling the plug on a virtual world certainly deprives the inhabitants of the value of their holdings," it does so in no greater fashion than bankruptcy deprives equity holders of the value of their stock, a universally accepted property right).

That said, recognizing property rights in site-specific AR is merely the first step in a larger process. As Professors Bell and Parchomovsky have highlighted, a comprehensive property theory involves multiple related yet distinct questions;¹⁵² while this Essay has sought to comprehensively argue that real property owners ought to have default legal rights in AR that are good against the world, the exact dimensions of those rights and how they ought to be enforced are beyond its scope. Nevertheless, it is worth noting that such property rights would be relatively meaningless if courts proved unwilling to hold that intangible affronts to those rights were actionable without proof of physical damage. While this was the conclusion drawn with respect to a trespass to chattels cyberproperty action before the California Supreme Court in *Intel Corp. v. Hamidi*,¹⁵³ extending such a rule to AR would eviscerate the underlying property right. Specifically, such a limitation would deprive real property owners of the ability to remove offensive yet intangible messages from their property and limit their remedies against nuisance- or trespass-producing projections to piecemeal litigation aimed at the physical fallout instead of the unwanted projection itself. Yet unlike the property rights crusaders in cyberproperty cases like *Hamidi*—which notably produced two strong dissents calling for the expansion of California’s common law¹⁵⁴—those endeavoring for property rights in AR need not struggle to craft creative and convincing analogies to physical situations or invent new property rules to make their case; these parties can take solace in the knowledge that their interests remain anchored to tangible spaces and that their cause finds broad support in existing bodies of law.¹⁵⁵

Finally, as has been alluded to above, while such a regime would privatize certain spaces that might otherwise be used for creative expression, this is no reason to reflexively reject it. Apart from the already documented benefits such a system would provide to owners of real property, it is worth emphasizing that society has already struck a certain balance between public and private spaces; the property rights described in this Essay would merely extend that same balance into the zone of AR. If that balance proves inap-

152. Bell and Parchomovsky, *supra* note 35, at 538 (“[C]ontemporary scholarship clusters around four questions: (1) which legal entitlements qualify for legal recognition as property rights?; (2) against whom do the rights apply?; (3) what is the content of property rights . . . ?; and (4) what should be the remedies for property right infringement?”).

153. *See* 71 P.3d 296, 309 (Cal. 2003) (“[U]nder California law, intangible intrusions on land, including electromagnetic transmissions, are not actionable as trespasses. . . unless they cause physical damage to real property.”).

154. *See id.* at 325 (Brown, J., dissenting) (opposing the opinion’s effective “den[ial] of the ‘right to exclude’ to property holders); *id.* at 326 (Mosk, J., dissenting) (distinguishing “unauthorized intermeddling on a private, proprietary intranet” from “communicating in the public ‘commons’ of the Internet”).

155. Indeed, given how closely tied AR is to physical spaces, the law here might borrow from the law of nuisance, which readily recognizes intangible intrusions as forming a basis for recovery.

propriate or unworkable, Congress could choose to restructure the rights through legislation, or society as a whole could reject such rights on a more fundamental level.¹⁵⁶ Yet until Congress, broader society, or some other vital force so intervenes, the most prudent and legally consistent approach to AR is to recognize and protect the rights of real property owners, ensuring that they possess the ability to exclude from, control, and ultimately define their digital spaces.

156. Cf. Joseph Singer, *Property as the Law of Democracy*, 63 DUKE L.J. 1287, 1304 (2014) (“Property law. . . also entails substantive choices about the type and scope of property rights that a free and democratic society can recognize without violating its deepest values.”).