ARTICLE

ON THE ECONOMY OF CONCEPTS IN PROPERTY

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Concepts help economize on information. Conventional wisdom correctly associates conceptualism with formalism but misunderstands the role concepts play in law. Commentators from the Legal Realists onward have paid insufficient attention to the distinction between concepts and the categories they pick out (or, to borrow from philosophical semantics, the intension and extension of legal relations). Even though two concepts may identify the same category, they can differ greatly in terms of information costs. This Article applies tools of cognitive science to explore the economics of legal concepts. Both the mind and the law are information-processing devices that manage complexity and economize on information by employing concepts and rules, the specific-over-general principle, modularity, and recursion. These devices work in tandem to produce the economizing architecture of property. As in cognitive science, we expect simplicity of description and generality of explanation to coincide. This Article then applies the cognitive theory of property to longstanding puzzles like the role of baselines—such as nemo dat *("one cannot give that which one does not have") and* ad coelum *("one who owns the soil owns to the heavens above and the depths below")—the notion of title, and the function of equity as a safety valve for the law. The theory developed here provides a more elegant description of the law, better generalizes to new situations, and therefore helps to explain and justify the robustness of traditional baselines in property law. The cognitive theory also allows one to reconcile reductionism and holism in property theory, as well as static and process descriptions of the contours of property.*

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INTRODUCTION

Legal conceptualism has long been in bad odor, and nowhere more so than in property. Yet, outside of law, concepts are part of the basic furniture of our mental life. Accordingly, concepts—including the concept of a concept—have been analyzed by disciplines like philosophy and cognitive science.

This Article will reevaluate the role of concepts in property using the tools of cognitive science. These tools help explain how the mind is shaped by its limits, which limit the use of context. I will present parallels between cognitive science and the information-cost theory of property.

For our purposes, general concepts economize on information cost, because they pick out large classes of entities or situations at once. The related notion of general ideas, or "abstraction," has been important in political and economic thought. For example, de Tocqueville recognized that despite being imperfect, general ideas are useful in a complex society:

> The Deity does not view the human race collectively. With one glance He sees every human being separately and sees in each the resemblances that makes him like his fellows and the differences which isolate him from them.
>
> It follows that God has no need of general ideas, that is to say, He never feels the necessity of giving the same label to a considerable number of analogous objects in order to think about them more conveniently . . . .

> General ideas do not bear witness to the power of human intelligence but rather to its inadequacy . . . .
>
> General ideas have this excellent quality, that they permit human minds to pass judgment quickly on a great number of things; but the conceptions they convey are always incomplete, and what is gained in extent is always lost in exactitude.[1]

Hayek put great weight on abstractness as necessary for spontaneous order, including the one he saw arising in the common law.[2] Hayek believed that the common law was based largely on earlier custom that had proven itself and evolved in practice.[3] Through the common law, dispersed knowledge could produce results that no single mind could achieve on its own. Although Hayek overestimated the evolved nature of the common law and the role that rules, as opposed to standards, play in legal regimes,[4] I argue that in the hybrid systems we do see, the basic setup of law relies on general, abstract—and formal—rules for the reasons recognized by de Tocqueville and Hayek. This recognition of the limits of the mind and the law suggests a theory of when formalism makes sense.

By drawing on philosophy and cognitive science, this Article shows how law and economics can help explain legal concepts. Concepts both in law and outside it respond to the same kinds of costs and benefits and a similar need to manage complexity. Property law helps organize the activity of many minds by furnishing a platform through which people navigate relations with others with respect to things. Concepts within property law manage the complexity of those interactions and economize on information costs.

The Article offers a sketch of how a cognitive theory of property might work. Part I shows how legal concepts can be analyzed with the tools of philosophy and psychology. Like concepts generally, legal concepts can be regarded as ways of presenting things in the world.

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[1] ALEXIS DE TOCQUEVILLE, DEMOCRACY IN AMERICA 402 (J.P. Mayer & Max Lerner eds., George Lawrence trans., Harper & Row 1966) (1835).

[2] *See, e.g.*, 1 FRIEDRICH A. HAYEK, LAW, LEGISLATION AND LIBERTY: RULES AND ORDER 44 (1973) [hereinafter HAYEK, RULES AND ORDER] (arguing that the abstraction of general rules leads "individuals to behave in a manner which makes social life possible"); FRIEDRICH A. HAYEK, THE CONSTITUTION OF LIBERTY 149 (1960) (explaining that unconsciously abstracted rules guide individual interactions and avoid a "trial of strength").

[3] HAYEK, RULES AND ORDER, *supra* note 2, at 84-88, 94-95, 104-05, 118.

[4] *See generally* Ronald Hamowy, *F.A. Hayek and the Common Law*, 23 CATO J. 241, 252 (2003) (arguing that even in its early history, the common law would not have survived if not supplemented with equitable standards); John Hasnas, *Hayek, the Common Law, and Fluid Drive*, 1 N.Y.U. J.L. & LIBERTY 79, 104 (2005) (arguing that the common law, as opposed to customary law, requires judges to "consciously creat[e] rules").

Part II presents some tools from cognitive science that have been useful in modeling the mind's methods of economizing on information. These include, in addition to concepts and rules, the specific-over-general principle, modularity, and recursion. Concepts and other formal devices of property law suppress some context for a reason: they manage complexity by organizing the world into components whose internal workings are only partially visible to the rest of the system. Partial information hiding allows such components to be selective "black boxes." The most obvious, though not exclusive, set of such components are the "things" that property defines.

Part III applies the cognitive theory developed here to several puzzling issues of baselines in property, including the *nemo dat* principle ("one cannot give that which one does not have"), the *ad coelum* rule (that a landowner owns "to the heavens above and the depths below"), the notion of title, and the role of equity as a modification of the law. These baselines receive a more elegant and more generalizable description, which helps explain and justify their robustness in the law. This analysis also illustrates how the cognitive theory reconciles in-principle reductionism in property theory with "pragmatic holism." The Article concludes with observations about the role of formalism in property and how that role is illuminated by the cognitive analysis of concepts.

I. WHAT IS A LEGAL CONCEPT?

In philosophy and psychology, concepts are far from an obstacle to thought: they allow for prediction, communication, and abstract thought, when a mass of particulars is not useful. Concepts organize particulars into useful sets—or, to borrow the terminology of psychology, concepts pick out categories. Although it is sometimes easy to forget—and the Legal Realists appear sometimes indeed to have forgotten—concepts are not the same as the things those concepts pick out.

What is the relationship of concepts to categories? Some philosophers regard concepts as functions from states of the world to sets of objects. Such a function is called an "intension." The set of things denoted is sometimes called an "extension." The meaning of a word can be associated with intensions or extensions, and either choice has many implications.[5] For our purposes, it is enough to note the differ-

[5] For examples of sources in linguistics discussing intensionality, see GENNARO CHIERCHIA & SALLY MCCONNELL-GINET, MEANING AND GRAMMAR: AN INTRODUCTION TO SEMANTICS 257-328 (2d ed. 2000), DAVID R. DOWTY ET AL., INTRODUCTION TO MONTAGUE SEMANTICS 141-78 (1981), Richard Montague, *The Proper Treatment of Quantifica-*

ent roles played by intensions and extensions. An intension, roughly like a concept, mediates between the world (or possible worlds) and sets of objects in the world or worlds. An intension is modeled as a function from worlds to referents; it is a way of picking out referents.

Returning to word meaning, a word is associated both with functions from worlds to referents and with those referents themselves—intensions and extensions. Consider a famous example. The expressions "morning star" and "evening star" both refer to the planet Venus—they have the same extension—but they have two different intensions.[6] Both phrases have an intension that takes us from states of the world to the planet Venus—the same extension. But the *way* of getting there is different.[7]

The distinction between different intensions that have the same referent emerges in epistemic contexts—sentences that describe mental states like belief. "John believes that the morning star is a planet" does not entail "John believes that the evening star is a planet" (nor vice versa). Further, the sentence "the morning star is the same object as the evening star" is informative. Thus, concepts are not the same as the categories they pick out.

In short, concepts matter in epistemic contexts. This is significant for legal scholars because legal relations have their form based in part on people's cognitive limitations. With full knowledge (as in the zero-transaction-cost world or de Tocqueville's divine perspective), we would have less need to distinguish intensions from extensions. Beliefs about the morning star and the evening star would coincide, and it would be less important to distinguish each idea from the object Venus. Similarly, in the legal realm, there would be no need to distinguish actual legal relations from sets of legal consequences holding between individuals. Legal relations could be as articulated as one wished and their consequences could be achieved by any route that would get there. Legal concepts as intensions (which, I argue, is at least a good analogy if not

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tion in Ordinary English, *in* APPROACHES TO NATURAL LANGUAGE: PROCEEDINGS OF THE 1970 STANFORD WORKSHOP ON GRAMMAR AND SEMANTICS 221, 228-32 (K.J.J. Hintikka et al. eds., 1973), and Robert Stalnaker, *Propositions*, *in* ISSUES IN THE PHILOSOPHY OF LANGUAGE: PROCEEDINGS OF THE 1972 OBERLIN COLLOQUIUM IN PHILOSOPHY 79 (Alfred F. MacKay & Daniel D. Merrill eds., 1976).

[6] In epistemic contexts the referent of the noun phrase in question is its intension.

[7] This example goes back to Frege, who provided the philosophical roots of intensional logic. *See* Gottlob Frege, *On* Sinn *and* Bedeutung (Max Black trans.) (translating Gottlob Frege, *Über Sinn und Bedeutung*, 100 ZEITSCHRIFT FÜR PHILOSOPHIE UND PHILOSOPHISCHE KRITIK 25 (1892)), *in* THE FREGE READER 151, 156 (Michael Beaney ed., 1997).

the correct analysis) would coincide completely with these legal extensions. Concepts, intensions, and delineation within the law are all mental shortcuts, as are concepts in our mental life more generally.

The distinction between intension and extension illuminates the nature of Hohfeldian analysis and its contribution to the bundle of rights theory of property. Hohfeldian analysis basically asks for the bottom line: who gets to do what to whom with respect to what. Hohfeld pursued this approach by seeking the smallest units of analysis—the "lowest common denominators" of the law—and then building up larger aggregates, such as the packages of entitlements we call "property" from these smaller pieces.[8] Hohfeld defined two types of basic pieces. First, he developed his system of jural correlatives and opposites: rights correlate to duties, privileges to no-rights, powers to liabilities, and immunities to disabilities.[9] Very elegantly, rights were also the opposite of no-rights, privileges of duties, powers of disabilities, and liabilities of immunities.[10] Second, he tried to break down the notion of in rem relations to collections of smaller relations holding individually between pairs of people.[11]

Controversy over Hohfeld's scheme reflected how commentators emphasized intension or extension differently. Albert Kocourek criticized Hohfeld's scheme for failing to capture the distinctive nature of in rem rights.[12] He argued both that numerosity of duty bearers was not the only characteristic that defined an in rem right and that some indefiniteness of the class of duty bearers was also important.[13] To demonstrate, he hypothesized that, for an owner who granted an easement to everyone in the world except *A*, the duty bearer is singular but bears an in rem duty.[14] Kocourek proposed that an in rem right was one in which the facts used to delineate the right do not directly identify the duty holder.[15] In response, Arthur Corbin defended Hohfeld's

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[8] Wesley Newcomb Hohfeld, *Some Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 23 YALE L.J. 16, 58 (1913) (internal quotation marks omitted).

[9] *Id.* at 30.

[10] *Id.*

[11] *See* Wesley Newcomb Hohfeld, *Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 26 YALE L.J. 710, 718-23 (1917) (reducing "in rem–ness" to the numerosity of the duty holders).

[12] *See* Albert Kocourek, *Rights in Rem*, 68 U. PA. L. REV. 322, 335 (1920) (arguing that a definition of in rem should not be "based on" the characteristic of the large "number of persons who owe duties corresponding to rights *in rem*" because such a requirement is "not essential").

[13] *Id.* at 332-33.

[14] *Id.*

[15] *Id.* at 325-29.

quantitative approach to "in rem–ness" by stressing exclusively the extensional aspect of legal relations:

> [Hohfeld's eight terms] are fundamental because they are the conceptions out of which in various combinations we construct our conceptions of property, ownership, trust, easement, license, right of entry, patent, franchise, chose in action, contract, debt, quasi-contract, and other important complexities. They are fundamental because they are constant elements, into which all of our variable combinations can be analyzed, common denominators to which the superficially dissimilar, like law and equity, property and contract, can be reduced. . . . [I]t is a great service if they enable us to see similarities and distinctions otherwise concealed and help us toward a consistent legal system. To adopt and use them does not mean that we must abandon our former language and our former more complex conceptions of variable content. We shall still talk of property and contracts and trusts; but we shall also have at our command the machinery of a more exact analysis when the case requires it.[16]

What Corbin describes as a concept is a set of legal consequences, or concepts very closely tied to a narrow set of concrete legal consequences. He is interested solely in predicting how legal decisionmakers will behave: from the behavioral point of view, the bottom line in terms of lowest common denominators is all we need.[17] In his view, while it is permissible to speak of notions like "property," those notions do no independent work.[18] By contrast, Kocourek's emphasis on "investitive" facts can be interpreted as providing some room in the theory for alternative methods of delineation.[19]

Corbin, like the later Realists, (wrongly) believed that merely recognizing that legal relations hold between persons makes clear that the delineation of relations by means of artificial entities is mystical nonsense.[20] However, defining an in rem right in *A* against "others generally" is very different from specifying the pairwise right-duty relations holding between *A* and each of *B*, *C*, *D*, etc. in society. They are

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[16] Arthur L. Corbin, *Jural Relations and Their Classification*, 30 YALE L.J. 226, 228-30 (1921).

[17] *See id.* at 226 ("In determining what is the law in any given case, we are invariably interested in finding the answer to one question: what will our organized society, acting through its appointed agents, do?").

[18] *See id.* at 229 ("One may well have not the slightest interest in [those notions] except so far as they are useful in actual life . . . .").

[19] Kocourek, *supra* note 12, at 327.

[20] Corbin associated this view regarding artificial entities with sinister formalism. *See* Cortbin, *supra* note 16, at 227 n.2 (arguing that recognizing that jural relations are ultimately about individuals "sends to the scrap heap a deal of juristic nonsense about corporate 'entities' and rights of 'the state' and 'social interests' and other cherished fictions—cherished among ourselves as well as among our quondam friends in Prussia").

extensionally equivalent but intensionally very different—something not captured in either the Hohfeld-Corbin approach or in later versions of Realism. The intension–extension distinction is particularly important for property because property characteristically holds between people in general and covers uses of resources. Property is a shortcut for the more complete set of pairwise relations among micro-users that could be achieved in a Hohfeldian analysis. Indeed, Austin's declaration that the essence of property is its indefiniteness captures this point[21]: the shortcuts property uses in delineating in rem rights save on transaction costs precisely because they are indefinite. They are an example of de Tocqueville's general ideas, suited to those lacking the divine perspective.

In terms of both breaking the basic legal relations down into their smallest relational pieces and seeing in rem rights as a collection of individual rights, the synthetic Hohfeldian and Realist approach may be extensionally equivalent to a right to a thing good against the world, but it is intensionally very different. A right to a thing good against the world need not be explicitly defined along a number of dimensions. By defining a thing and using trespass as a basic mode of protection, many of the protected privileges of use can remain implicit. The very ambiguity that Hohfeld decried in using the term "right" to cover both true claims and privileges (liberties) may be seen as a by-product of costly delineation. Property involves innumerable privileges of use; one can always specify the use more narrowly, as in use for parking cars, use for parking cars on Mondays, use for parking cars on Mondays between 2 and 3 p.m., use for parking Chevrolets on Mondays between 2 and 3 p.m., etc. But generally, leaving the use privileges implicit is sufficient. When a resource conflict becomes severe enough, the law will pick out a use and may regard that use as a subject of a right rather than a privilege. This tendency is most explicit in the case of easements, but it also occurs with nuisance. The "Hohfeldian" intensions—functions from states of the world to packages of entitlements—are usually more elaborate than the delineation of actual property interests. Relatedly, consider the residual claim: it too could be formed synthetically out of all the small pieces or sticks. Or we can define it as the right to an asset after all the other more specific claims have been carved out. Same extension, different intensions.

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[21] *See, e.g.*, 2 JOHN AUSTIN, LECTURES ON JURISPRUDENCE OR THE PHILOSOPHY OF POSITIVE LAW 799 (Robert Campbell ed., 5th ed. London, John Murray 1885) ("[I]ndefiniteness is of the very essence of the right; and implies that the right . . . cannot be determined by exact and positive circumscription.").

Intensions and concepts partially capture reality by focusing on only some aspects. This selectivity makes the use of concepts and categories somewhat formal, in the sense that they are less than fully responsive to contextual information. Not coincidentally, formalism has been as controversial as conceptualism in property, and for similar reasons. Academics identified the two with each other in the Realist era.[22] Conceptualism has continued to be associated with "formalism." Although formalism has come to mean many things (mainly negative),[23] I argue that the Realists were right to identify conceptualism with formalism but wrong in dismissing concepts for that reason.

The most useful notion of formalism (with roots in both cognitive science and economics) is relative indifference to context (the extent to which interpretation is invariant to context).[24] A language or rule system (as well as instances, like sentences or individual rules) is more formal the less its interpretation or application depends on context. By picking out certain facts as the basis for a function from possible worlds to sets of things, concepts employ formalism. To be useful, the concept has to pick out enough facts to serve the purpose in question but not so many that it entails too much complexity. Optimal concepts thus have a medium level of generality.[25]

Notions like the right to exclude and seeing the owner as a gatekeeper to an asset are sometimes considered too formal because they are not responsive enough to societal needs in a variety of contexts.[26] The law provides doctrines for overriding both rights to exclude and

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[22] *See, e.g.*, Felix S. Cohen, *Transcendental Nonsense and the Functional Approach*, 35 COLUM. L. REV. 809, 820 (1935) ("In every field of law we should find peculiar concepts which are not defined either in terms of empirical fact or in terms of ethics but which are used to answer empirical and ethical questions alike, and thus bar the way to intelligent investigation of social fact and social policy.").

[23] *Compare* MORTON WHITE, SOCIAL THOUGHT IN AMERICA: THE REVOLT AGAINST FORMALISM 12-13 (Beacon Press 1957) (1947) (tracing the various attacks historically levied against formalism), *with* Hanoch Dagan, *The Realist Conception of Law*, 57 U. TORONTO L.J. 607, 611-12 (2007) (characterizing classical formalism as viewing law as "composed of concepts and rules").

[24] Francis Heylighen, *Advantages and Limitations of Formal Expression*, 4 FOUND. SCI. 25, 26-27 (1999).

[25] *Cf.* Douglas Glen Whitman, *The Rules of Abstraction*, 22 REV. AUSTRIAN ECON. 21, 23-28 (2009) (explaining that we rely upon intermediate abstraction, particularly in the law, to "deal with . . . complexity by filtering it, deeming some features relevant while ignoring others"). One can regard concepts as components of modular systems: the concept suppresses some information in order to manage complexity. *See infra* Section II.C.

[26] Much of this debate is couched in terms of whether there is a "core" to property and, if so, whether it has anything to do with exclusion. *See infra* note 28.

the owner-gatekeeper's wishes,[27] but much commentary rejects exclusionary conceptions of rights to things as any baseline or starting point at all.[28]

The controversies over exclusion stem in part from a failure to distinguish intensions and extensions, or concepts versus consequences. Commentators subscribing to the gatekeeper view focus on the concept of property whereas the Realists and their progeny are primarily concerned with the consequences of property. Both are important. There is a difference between a concept and an object in the world, as the Realists never tired of pointing out.[29] But it is a fallacy then to conclude that all functions from the world to sets of things—that all modes of presenting results—are equivalent. Even with extensional equivalence, one set of concepts can lower information costs more than another.

Although rights can be analyzed into their smallest constituents, it is not cost-effective to *create* them this way, largely because of information costs. The set of concepts in use is a small subset of the set of possible concepts. The same is true of language: we tend to have words for the most useful concepts and rely on paraphrases for others, to the extent we bother thinking about them at all. Despite how conceptualism has, like formalism, acquired a bad name for itself among many legal commentators,[30] concepts serve an economizing function, even though not all concepts serve this function equally well.

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[27] *See, e.g.*, Holbrook v. Taylor, 532 S.W.2d. 763, 766 (Ky. 1976) (relying on the doctrine of easement by estoppel to allow the use of a roadway, despite the owner's right to exclude). These exceptions generally arise in the context of more specific facts, so they are closer to the governance end of the spectrum of strategies for delineating property rights. *See* Henry E. Smith, *Exclusion Versus Governance: Two Strategies for Delineating Property Rights*, 31 J. LEGAL STUD. S453, S467-70 (2002) (discussing the spectrum of property rules with exclusion on one end and governance on the other).

[28] *See, e.g.*, HANOCH DAGAN, PROPERTY: VALUES AND INSTITUTIONS 38-42 (2011) (critiquing the exclusionary conception of property for its failure to "bear[] any resemblance to the law of property as lawyers know it or, even more importantly, as citizens experience it in everyday life"); Gregory S. Alexander, *The Social-Obligation Norm in American Property Law*, 94 CORNELL L. REV. 745, 747, 774 (2009) (calling the exclusionist account misleading and advocating an alternative theory centered on social obligations); *see also* Jane B. Baron, *The Contested Commitments of Property*, 61 HASTINGS L.J. 917, 940 (2010) (contrasting information theorists' and progressive theorists' stances on the importance of exclusion to the notion of property).

[29] *See* Henry E. Smith, *Emergent Property*, *in* PHILOSOPHICAL FOUNDATIONS OF PROPERTY LAW (James Penner & Henry E. Smith eds., forthcoming 2013).

[30] *See id.*

II. A COGNITIVE THEORY OF PROPERTY

In this Part, I explore concepts and baselines in property, borrowing some tools from cognitive science. It may be no accident that the mind and the property system share these features. For one thing, the property system is the product of human minds. Further, I propose that the limits of the human mind and the property system both reflect a form of economizing in the face of complexity. Both cognitive science and New Institutional Economics[31] benefit from a very similar notion of economy and information cost. Devices like decontextualization, modularity, recursion, and the specific-over-general principle help the mind and the property system manage complexity.[32]

One overarching hypothesis in cognitive science and, I would argue, implicitly also in the law and economics of property is that reductions in the information costs of using the system are reflected in the economy of description of that system. Most types of (aspirationally) scientific theorizing place importance on shortness of description in some agreed upon metalanguage.[33] A better theory, the argument goes, will capture known facts in a shorter description that simultaneously exposes the theory to counterevidence; the shortness of the description will correspond to a generality that makes claims about new cases.

In this Part, I introduce a number of devices that have featured prominently in cognitive science and that can be applied to the architecture of property. These include formal concepts and rules, the specific-over-general principle, modularity, and recursion. Together they form part of an architecture of property law.

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[31] *See generally* Henry E. Smith, *Institutions and Indirectness in Intellectual Property*, 157 U. PA. L. REV. 2083, 2090-101 (2009).

[32] Although it goes well beyond what I can demonstrate here, a larger question this thesis raises is whether both the mind and property law are pushed toward economizing on information by evolutionary pressures—that is, success in the environment in which each operates. At least it would appear that many systems that manage complexity this way are well adapted to their environments. For examples in the field of economics, see THE ELGAR COMPANION TO INSTITUTIONAL AND EVOLUTIONARY ECONOMICS (Geoffrey M. Hodgson et al. eds., 1994) and Armen A. Alchian, *Uncertainty, Evolution, and Economic Theory*, 58 J. POL. ECON. 211 (1950).

[33] *See, e.g.*, BAS C. VAN FRAASSEN, THE SCIENTIFIC IMAGE 87 (1980) ("When a theory is advocated, it is praised for many features other than empirical adequacy and strength: it is said to be mathematically elegant, *simple*, of great scope, complete in certain respects: *also* of wonderful use in unifying our account of hitherto disparate phenomena, and most of all, explanatory." (first emphasis added)).

A. *Concepts and Rules*

We can now extend the discussion of the concepts and rules from the previous Part to a meta-level. We have seen that more formal (decontextualized) concepts can be useful in operation and can save on information costs. But concepts of law should not only generate the desired results but also reflect a general theory of the system. Cognitive science hypothesizes that shortness of description in an agreed upon meta-language corresponds to genuine generalizability.[34] This idea has been highly influential in generative linguistics from the beginning: the effort has been to align simplicity of description and explanatory power.[35] As Chomsky put it when launching his research program, "We are not interested in reduction of the length of grammars for its own sake. Our aim is rather to permit just those reductions in length which reflect real simplicity . . . ."[36]

Take a simple example from linguistics. A grammar should capture, among other things, all the actual words of English. But it also should capture accidental and systematic gaps. Thus, "brick" is a word of English, but "blick" and "bnick" are not. "Blick" is an accidental gap—it is well-formed according to the best theory of English as reflected in the shortest grammar that captures this part of English. By contrast, "bnick" should be systematically excluded.[37] Experimental data on

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[34] More technically, we are looking for the theory whose description can be generated by the shortest program in a binary language on a universal computer—the one with the least Kolmogorov complexity. MING LI & PAUL VITÁNYI, AN INTRODUCTION TO KOLMOGOROV COMPLEXITY AND ITS APPLICATIONS 319 (2d ed. 1997); *see also* JORMA RISSANEN, STOCHASTIC COMPLEXITY IN STATISTICAL INQUIRY 6-10, 79-92 (1989) (discussing Minimum Descriptive Length). Interestingly, something like this idea is implicit in the work of the great Indian grammarian of the fourth century B.C., Pāṇini. *See* Paul Kiparsky, *Economy and the Construction of the Śivasūtras* ("Economy requires making the list as short as possible, which means avoiding repetitions of sounds, and using as few markers as possible."), *in* PĀṆINIAN STUDIES: PROFESSOR S.D. JOSHI FELICITATION VOLUME 239, 240 (Madhav M. Deshpande & Saroja Bhate eds., 1991); Henry Smith, *Brevity in Pāṇini*, 20 J. INDIAN PHIL. 133, 136 (1992) (noting that, for Pāṇini, "[b]revity seems to take precedence" in the statement of grammatical rules); *see also* Paul Kiparsky, Stanford Univ., Pāṇini's Razor, Presentation at the Symposium on Sanskrit and Computational Linguistics 14 (Oct. 29, 2007), *available at* http://www.stanford.edu/~kiparsky/Papers/paris.pdf (linking the thoughts of Pāṇini to Kolmogorov complexity).

[35] *See, e.g.*, Morris Halle, *Phonology in Generative Grammar*, 18 WORD 54, 55-56 (1962) (applying a simplicity criterion to decide between expressions of a statement of generative grammar), *reprinted in* THE STRUCTURE OF LANGUAGE 334, 335 (Jerry A. Fodor & Jerrold J. Katz eds., 1964).

[36] NOAM CHOMSKY, THE LOGICAL STRUCTURE OF LINGUISTIC THEORY 118 (1975).

[37] This example is drawn from Noam Chomsky & Morris Halle, *Some Controversial Questions in Phonological Theory*, 1 J. LINGUISTICS 97, 101 (1965).

acceptability judgments back this up.[38] Now consider two fragments of grammar. In one, the rule makes consonants nonnasal (so no *m*'s or *n*'s) after consonants.[39] In the other, which can be called the "blick rule," the rule makes consonants nonlateral (not *l*) between *b* and *ik*.[40] The latter rule is not only longer[41] but it saves less space in the lexicon: the "*blick* rule" covers just one case, but the other rule consolidates the lexicon corresponding to the systematic lack of nasals (*m* and *n*) following consonants.

The cognitive theory of property views property law in a similar way. Later I show that the longstanding controversies over baselines and exceptions in property can be seen in a different light if we pay attention to the potential shortness of a description produced by various alternative sets of concepts and baselines in a meta-language.[42]

B. *The Specific-over-General Principle*

Closely related to the criterion of simplicity in theorizing is the specific-over-general principle. This principle allows for brevity to capture generalizations in a system of rules and is at the heart of cognitive architecture, especially the language faculty. Any set of categories characterized (at least in part) by features can be described more briefly if common features can be factored out and applied by rule. We can conceptualize this as a "feature architecture," in which specific categories, and ultimately individual types, inherit features from more general categories. For example, verbs can take the past tense. We need not note this for every verb's entry in the mental lexicon. Rather, all verbs inherit the *feature* "ability to take past tense."

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[38] The nature of the rules involved, if any, is a subtler question, because the reluctance to accept an isolated sequence like *bn-* could be a statistical generalization from the lexicon or be based on analogy. For discussion and some experimental evidence in favor of a version of structural rules, see Adam Albright & Bruce Hayes, *Rules vs. Analogy in English Past Tenses: A Computational/Experimental Study*, 90 COGNITION 119 (2003). Grammaticality judgments have their limits as data but can be supplemented by data of relative preference of one unattested sequence over another, such as *blick* over *bzick*. *See generally* CARSON T. SCHÜTZE, THE EMPIRICAL BASE OF LINGUISTICS: GRAMMATICALITY JUDGMENTS AND LINGUISTIC METHODOLOGY (1996); Adam Albright, Natural Classes Are Not Enough (Oct. 16, 2007) (unpublished manuscript), *available at* http://web.mit.edu/albright/www/papers/Albright-BiasedGeneralization.pdf.

[39] Or, in one common notation: $C \rightarrow$ [*-nasal*] / #*C*_.

[40] Or, $C \rightarrow$ [*-lateral*] / *b*_*ik*.

[41] That is, it is longer in terms of the length of the rule notation as shown *supra*, notes 39-40.

[42] *See infra* Sections III.A–B.

If a general rule and a specific rule can both potentially apply, the more specific one trumps the more general one. A version of this principle holds in legal interpretation.[43] It also plays a large role in artificial intelligence.[44] The latter is partly the inspiration for cognitive science, and linguistics in particular, to build the specific-over-general principle into its models, which generally economize on rules.

To return to our verb tense example, in English, past tense is generally formed with "-ed," but some verbs take special past tense forms.[45] We have a general rule for forming the past tense with "-ed" and specific exceptions for small classes of verbs like "ring, rang" and even idiosyncratic forms like "be, was." The description is short, and it makes brevity correspond with generality. And subject only to specific exceptions, it correctly predicts that new verbs will form the past with "-ed," like "zing, zinged."

Combining the economizing function of concepts and rules with the specific-over-general principle exposes the commonality of some issues in evaluating alternative candidates for rules of a system. In the past tense, there is little question which is the rule and which is the exception because the "-ed" ending is the most frequent and generalizes the most easily. Sometimes, however, things are not so simple. In analyzing case marking in languages, we can come up with more and less specific rules; nevertheless, where multiple rules might apply, the specific one always wins.[46]

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[43] John Manning dubs the principle that "the specific governs the general" the "specificity maxim." John F. Manning, *Separation of Powers as Ordinary Interpretation*, 124 HARV. L. REV. 1939, 2012 (2011). The principle is also well known in contractual interpretation. *See, e.g.*, Smoot v. United States, 237 U.S. 38, 42 (1915) (Holmes, J.) ("In general, specific or individual marks prevail over generic ones."); DCV Holdings, Inc. v. Conagra, Inc., 889 A.2d 954, 961 (Del. 2005) ("Specific language in a contract controls over general language, and where specific and general provisions conflict, the specific provision ordinarily qualifies the meaning of the general one.").

[44] *See, e.g.*, JOHN H. HOLLAND ET AL., INDUCTION: PROCESSES OF INFERENCE, LEARNING, AND DISCOVERY 18-19 (1989) (discussing the use of default hierarchies in a knowledge structure and providing examples of how defaults avoid overwhelming a computational system); Marco Dorigo, *New Perspectives About Default Hierarchies Formation in Learning Classifier Systems* (noting that "default hierarchies" allow models to be built with fewer total rules), *in* TRENDS IN ARTIFICIAL INTELLIGENCE: 2ND CONGRESS OF THE ITALIAN ASSOCIATION FOR ARTIFICIAL INTELLIGENCE 218, 221-22 (Edoardo Ardizzone et al. eds., 1991).

[45] This is the central example in STEVEN PINKER, WORDS AND RULES: THE INGREDIENTS OF LANGUAGE 13-19 (1999).

[46] Case marking is a dramatic example in linguistics of a phenomenon that can be modeled with nested default rules. HENRY SMITH, RESTRICTIVENESS IN CASE THEORY (1996). Thus, Modern English, with very little case, could be analyzed as having the nominative case as the default case. It is used for subjects (*She runs*) and for apposition

The specific-over-general principle allows for economy of description and explanatory generalization to new cases. In particular, the most general default rule (such as the past tense "-ed" rule in English) should capture the most heterogeneous, "left over" (or "elsewhere" or "otherwise") distribution of instances. Capturing a heterogeneous "elsewhere" distribution with the most general (least restrictive) default is the most economical approach.[47]

As we will see, similar questions arise in property law, such as whether *nemo dat* is the rule and the good faith purchaser is the exception, or vice versa.[48] The cognitive theory of property suggests that simplicity of description at the level of theory will help answer this question.

C. *Managing Complexity with Modularity*

Property concepts and categories manage the complexity of interactions between actors over the use of resources. Building on Herbert Simon's work on the architecture of complexity and near decomposability (modularity),[49] I will show how hierarchy and redundancy allow property to solve the problem of multiparty interactions over resource use. To allow for the capacity to evolve, and for ease of understanding, systems ranging from architecture[50] to language[51] tend to be hierarchical and are founded on highly generative building blocks.

(*It is he*). The objective case is more specific, being used for objects of verbs and prepositions (*The dog bites him, The cat is with her*). The point is that case marking can be captured by a theory that posits rules of varying generality where the specific rule trumps more general ones in environments where more than one rule might apply. A telling controversy arose in the nineteenth century about how to analyze the accusative case in Vedic Sanskrit. Carl Gaedicke analyzed it as serving no particular function other than capturing functions not fulfilled by other cases. *See* CARL GAEDICKE, DER ACCUSATIV IM VEDA 22, 52-181 (Breslau, Verlag von Wilhelm Koebner 1880) (presenting the accusative case as the default case in Vedic Sanskrit). William Dwight Whitney, meanwhile, objected to defining the accusative as the default case, arguing that such a moniker could apply to any case. W.D. Whitney, *On Delbrück's Vedic Syntax*, 13 AM. J. PHILOLOGY 271, 285-86 (1892). Whitney is technically correct, but not all such formulations would be equally simple—that is, short—in the agreed-upon meta-language. *See* SMITH, *supra*, at 39-40.

[47] SMITH, *supra* note 46, at 40, 84-86.

[48] *See infra* Section III.A.

[49] *See* Herbert A. Simon, *The Architecture of Complexity*, 106 PROC. AM. PHIL. SOC'Y 467, 477 (1962) ("The fact . . . that many complex systems have a nearly decomposable, hierarchic structure is a major facilitating factor enabling us to understand, to describe, and even to 'see' such systems and their parts.").

[50] *See generally* CHRISTOPHER ALEXANDER ET AL., A PATTERN LANGUAGE: TOWNS, BUILDINGS, CONSTRUCTION (1977) (outlining various "patterns" of livability to illuminate potential solutions to various social problems).

1. Varieties of Modularity

Property theory can draw on other fields that have employed modularity theory to explain how systems manage complexity. Modularity has been fruitful but also quite controversial in cognitive science.[52] In 1983, Jerry Fodor suggested that the mind is modular.[53] For him, a modular component of mind was domain specific, autonomous, automatic, encapsulated, and hardwired.[54] Vision served as a prototypical example: the brain achieves vision in a speedy, involuntary manner, using dedicated structures whose processes are largely immune from correction, despite other information the mind possesses.[55] In the years since, many theorists have taken issue with modularity as a general architecture of the mind, citing mental capacities that lack one or more of Fodor's list of features.[56] The remaining alternative is often thought to be a general processing model, under which the mind and its processes theoretically have access to all types of information (so no encapsulation).[57] In a sense, this type of model is similar to the Realist picture of property based on the bundle of rights: all information is in principle accessible to any part of the system all the time.

Recently, a more modest version of modularity has gained traction as an alternative to the general processing model. New modularity

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[51] *Cf.* NOAM CHOMSKY, SYNTACTIC STRUCTURES 24 (1957) (discussing the hierarchy that any linguistic theory requires).

[52] *See, e.g.*, William Marslen-Wilson & Lorraine Komisarjevsky Tyler, *Against Modularity* (rejecting the understanding of "special properties of language" as a distinct "module" and arguing for the inclusion of inferences deriving from "nonlinguistic knowledge"), *in* MODULARITY IN KNOWLEDGE REPRESENTATION AND NATURAL-LANGUAGE UNDERSTANDING 37, 58 (Jay L. Garfield ed., 1991).

[53] JERRY A. FODOR, THE MODULARITY OF MIND 37 (1983).

[54] *Id.*

[55] *Id.* at 48.

[56] *See, e.g.*, WILLIAM R. UTTAL, THE NEW PHRENOLOGY: THE LIMITS OF LOCALIZING COGNITIVE PROCESSES IN THE BRAIN 89-146 (2001) (noting difficulties with the argument that cognitive functions may be localized in particular parts of the brain); David J. Buller, *Get Over: Massive Modularity*, 20 BIOLOGY & PHIL. 881, 885 (2005) (reviewing EVOLUTION AND THE PSYCHOLOGY OF THINKING: THE DEBATE (David E. Over ed., 2003)) (suggesting that the massive modularity hypothesis may not be "a theoretically viable hypothesis about the structure of the mind."). In some sense, even Fodor is in this camp. *See generally* FODOR, *supra* note 53, at 38 (noting that modularity may be limited to specific parts of the mind).

[57] UTTAL, *supra* note 56, at 218-19 (suggesting a model that views "behavior in terms of the overall, unitary, integrated activity").

theory is based on functional specialization, not spatial definition.[58] Rather than positing a unitary self, one version of the theory divides the mind into modules relating to seeking food and sex, which compete with self-control and moral modules; at the same time, a separate module from those restraining one's own behavior judges others irrespective of the first modules' success (hence the hypocrisy).[59]

Now consider modularity theory as applied in the organizational literature. Organizations share many features and purposes with property. In a sense they *are* property—what might be termed "entity property."[60] The organizational literature using modularity starts with the interactions of transactors as a complex system.[61] A complex system is one in which internal interactions are so numerous and dense that is it difficult to infer the properties of the whole from the properties of its parts.[62] It is a system in which any change to an element of the system might affect any other element or combination of elements directly or indirectly. In a fully interconnected system, ripple effects make change so unpredictable that change may not even be an option. The choice, in other words, is between near-chaos and rigidity.[63]

One way out of this bind is to break up the system into semi-autonomous components (modules). Modularization depends on the

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[58] For an accessible introduction to modularity in cognitive theory that argues that evolution only acts to connect modules if it leads to better functioning, see ROBERT KURZBAN, WHY EVERYONE (ELSE) IS A HYPOCRITE: EVOLUTION AND THE MODULAR MIND 50 (2010). For an argument that although modules are rigid the mind can be flexible, see Dan Sperber, *Modularity and Relevance: How Can a Massively Modular Mind Be Flexible and Context-Sensitive?*, *in* THE INNATE MIND: STRUCTURE AND CONTENTS 53, 57 (Peter Carruthers et al. eds., 2005).

[59] *See* KURZBAN, *supra* note 58, at 159-60, 203-05, 214-17.

[60] *See generally* THOMAS W. MERRILL & HENRY E. SMITH, PROPERTY: PRINCIPLES AND POLICIES 684-829 (2007) (discussing entity property).

[61] *See generally* 1 CARLISS Y. BALDWIN & KIM B. CLARK, DESIGN RULES (2000) (characterizing complex systems and changes as ultimately composed of simpler ones); MANAGING IN THE MODULAR AGE: ARCHITECTURES, NETWORKS, AND ORGANIZATIONS (Raghu Garud et al. eds., 2003) (exploring and comparing modularity in technology and organizational settings); Richard N. Langlois, *Modularity in Technology and Organization*, 49 J. ECON. BEHAV. & ORG. 19, 32-34 (2002) (noting increased modularity in American industries, such as the automobile industry); Ron Sanchez & Joseph T. Mahoney, *Modularity, Flexibility, and Knowledge Management in Product and Organization Design*, 17 STRATEGIC MGMT. J. 63, 64 (1996) (analyzing product design and organizational processes for developing products through the prism of the structural conception of hierarchy in complex systems).

[62] Simon, *supra* note 49, at 468.

[63] *See* BALDWIN & CLARK, *supra* note 61, at 58-59, 236-37, 257.

system being what Herbert Simon termed "nearly decomposable."[64] A nearly decomposable system consists of a pattern of interactions such that module boundaries can be drawn so that interactions are intense within the module but sparse and constrained between modules.[65] This system allows for information hiding: decisions and innovations in one module can progress largely without regard to what is happening in other modules, with satisfaction of the interface conditions serving as the only constraint.

One function of institutions, from business organizations, to bureaucracies, to communities, is to manage the complexity of aggregating information. In a sense, organizations face the same problem as the mind: how to aggregate and process information. The New Institutional Economics points to the importance of many institutions for managing information in market exchange.[66]

Markets have a strongly modular flavor. On Adam Smith's account, each actor only needs to consult his self-interest against the background of the market and will be guided as if by an invisible hand towards actions that contribute to efficiency.[67] The informational responsibility of each actor is limited and local. Likewise, Hayek's theory of markets as devices for processing information partakes of modularity.[68] Each market actor possesses a variety of local knowledge about his own uses of resources, but need only consult prices and the general "rules of the game" in order to make economizing decisions about acquiring and using those resources. The information that each actor uses can impact prices, but no other actor needs to know that information. The prices and the rules are the interface conditions among market participants and allow other information to be hidden. By contrast, a central planner is nonmodular and is expected to gather and act on all this information without necessarily ruling out any interaction among pieces of information.

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[64] *Id.* at 474-75; *see also* BALDWIN & CLARK, *supra* note 61, at 252 ("The essential aspect of modularity lies in the fact that . . . [t]asks within different modules can . . . proceed independently.").

[65] Simon, *supra* note 49, at 474.

[66] *See* Yoram Barzel, *Measurement Cost and the Organization of Markets*, 25 J.L. & ECON. 27, 40-42 (1982) (highlighting the role of various institutional actors in overcoming the challenge of measuring asset values in a complex market system).

[67] 1 ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS 477 (Edwin Cannan ed., Univ. of Chi. Press 1976) (1776).

[68] *See* F.A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, 524-26 (1945) (arguing that markets enable the employment of widely dispersed information).

This Article suggests that modularity is a characteristic of one of the institutions supporting a wide range of market and nonmarket interactions: the law of property. Property law manages complexity through modularity. The exclusion strategy is the starting point in property, and this strategy economizes on information costs. By setting up cheap and rough proxies like boundary crossings, property law can indirectly protect a wide range of largely unspecified interests in use, the details of which are of no particular relevance to those under a duty to respect the right (in this case, by not crossing boundaries without the permission of the owner). The basic (rebuttable) presumption in property law is delegation to the owner through the right to exclude, which serves to economize on information costs.[69] In effect, the exclusion strategy allows the property system to manage the complexity of resources uses through modularity, with much information hidden in property modules. In trespass to land, an unauthorized crossing of a boundary serves as a (very) rough proxy for harmful use; any voluntary entry into the space defined by the *ad coelum* rule counts as a trespass.[70] "Keep out" *usually* means keep out. Likewise in personal

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[69] *See* Henry E. Smith, *Property and Property Rules*, 79 N.Y.U. L. REV. 1719, 1767 (2004) ("[T]he use of exclusion together with a property rule sweeps a broad class of uses into the definition of the entitlement."). This theory differs from those that see the right to exclude as the sine qua non of property. *See, e.g.*, Thomas W. Merrill, *The Property Strategy*, 160 U. PA. L. REV. 2061, 2066 (2012) ("[T]he owner's right to exclude is a necessary condition of identifying something as being property."). It also differs in emphasis from theories that posit a necessarily tighter connection between the mechanism of delineation and the interests in use. *See, e.g.*, RICHARD A. EPSTEIN, TAKINGS: PRIVATE PROPERTY AND THE POWER OF EMINENT DOMAIN 61 (1985) ("Linking rights of possession, use, and disposition into a single bundle of rights offers powerful utilitarian advantages."); Larissa Katz, *Exclusion and Exclusivity in Property Law*, 58 U. TORONTO L.J. 275, 290 (2008) ("Ownership's defining characteristic is that it is the special authority to set the agenda for a resource."); Adam Mossoff, *What is Property? Putting the Pieces Back Together*, 45 ARIZ. L. REV. 371, 397-403 (2003) (noting the centrality of possessory rights, such as exclusion, use, enjoyment, and alienation, to the concept of property).

[70] The full statement of the maxim is *cujus est solum, ejus est usque ad coelum et ad inferos* ("he who owns the soil owns also to the sky and to the depths"). The maxim is routinely followed in resolving issues about ownership of air rights, building encroachments, overhanging tree limbs, mineral rights, and so forth, and is subject to certain limited exceptions, for example, for airplane overflights. *See* Brown v. United States, 73 F.3d 1100, 1103-04 (Fed. Cir. 1996) (explaining that "the advent of human flight" justifies an exception to the common law rule); THOMAS W. MERRILL & HENRY E. SMITH, THE OXFORD INTRODUCTIONS TO U.S. LAW: PROPERTY 31-32, 57-58 (2010) (reviewing the principle of, and modern exceptions to, *ad coelum*); Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 VA. L. REV. 965, 992 (2004) (noting the heavier reliance of the law of trespass on the physical boundaries of parcels, as defined by the *ad coelum* rule, as compared to the law of nuisance).

property, I know not to take a car from a parking lot if it is not mine and I do not have the owner's permission; I need not know anything about the identity of the owner, nor whether the car is subject to a security interest or the subject of a bailment.[71] Thus, to the nonowner, property is like a black box, a module where the type of use is simply irrelevant to the duty of abstention.

Only in specialized contexts does the law start inquiring into uses more directly, as where one landowner is annoying another with odors. In this case, rules of nuisance law implement a governance strategy that can be thought of as the interface between adjacent bundles of rights. But it is the exclusion factor that keeps the bundles lumpy, opaque, and operating as modules in which interactions and interdependencies are intense inside but sparse outside the individual property. As a result, actions within a module do not have hard-to-predict ripple effects through the entire system. On the information-cost theory, the combination of exclusion and governance in property furnishes modules and interfaces for actors taking potentially conflicting actions with respect to resources.[72]

The exclusionary strategy is not the only source of formal modular concepts in property. Paralleling the recent debates over modularity in cognitive science,[73] we can expand the concept of modularity from spatial notions, like the definition of a parcel of land or an object of personal property, to intangibles. Various aspects of property law operate as semiautonomous components, which are not fully transparent to each other and not fully responsive to contextual information.[74] Often these aspects of property are associated with traditional concepts and baselines. Later I will show how traditional and familiar baselines like the principle of *nemo dat* and concepts like title—which are often devalued on a Realist framework—can be seen as managing complexity through formalism.[75] These traditional concepts and baselines are *functional modules* of the system of property law.

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[71] *See* J.E. PENNER, THE IDEA OF PROPERTY IN LAW 75-76 (1997).

[72] *Cf.* Smith, *supra* note 27, at S468-69 (noting the need for mixed strategies of property delineation where resources are shared among multiple claimants); Henry E. Smith, *Intellectual Property as Property: Delineating Entitlement in Information*, 116 YALE L.J. 1742, 1806-07 (2007) (noting the parallel concepts in use in intellectual property law).

[73] See *supra* notes 56-59 and accompanying text.

[74] *See infra* Sections III.A–B.

[75] *See infra* Section III.A.

2. Nonmodularity as a Theoretical Baseline

The functional modules of property law are easier to understand against a theoretical baseline of full nonmodularity. The Realists' rhetoric often sounded in themes about how property law concepts (mis)lead one into a "heaven of legal concepts"[76] and "transcendental nonsense."[77] There is some irony in this, because assuming that law can be fully contextualized in an extreme version of the bundle of sticks leads to an otherworldly place where a Hohfeldian or "Coasean" baseline is unrealistically substituted for our reality. By taking concepts and modularity seriously, we can avoid this trap.

Property modules allow for bundling that is not captured by simply regarding a bundle as the mere sum of its constituents. In property, the exclusion strategy results in property's being not just a bundle of sticks but something more that high transaction costs prevent us from fully achieving by contract. Property functions in part as a shortcut over all the regulations or bilateral contracts that would have to be devised to govern all members of society in all their interactions.[78] As has been the case in cognitive science, and linguistics in particular, a modular system turns out to be easier to describe in an economical fashion.

What we still need is a theory of which modules and interfaces are (and should be) chosen and how decentralized the modularization of the system should be. Work on community structure and optimal modularization can be a source of testable hypotheses. In particular, the application of network theory, community structure, and the notion of the strength of ties in social networks is well-established.[79] These

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[76] The Realists were fans of von Jhering's sarcastic dismissal of Savigny's legal metaphysics as a "heaven of legal concepts." Rudolf von Jhering, *In the Heaven of Legal Concepts, in* READINGS IN JURISPRUDENCE AND LEGAL PHILOSOPHY 678, 679 (Morris R. Co-Cohen & Felix S. Cohen eds., Edith Lowenstein trans., 1951).

[77] Cohen, *supra* note 22.

[78] In similar fashion, a firm is a nexus of contracts, but the firm has special modular bundling features that are only achievable by contract under the property-like aspect of organizational law. The asset-partitioning theory of the firm can be interpreted as an example of using modularity to manage complexity. *Cf.* Henry Hansmann & Reinier Kraakman, *The Essential Role of Organizational Law*, 110 YALE L.J. 387, 390 (2000) (arguing that asset-partitioning is not achievable by contract, making it the "essential role" of organizational law).

[79] *See, e.g.*, Aaron Clauset et al., *Finding Community Structure in Very Large Networks*, 70 PHYSICAL REV. E 066111-1 (2004) (determining community structure within a network based on Amazon.com purchase data); M.E.J. Newman, *Modularity and Community Structure in Networks*, 103 PROC. NAT'L ACAD. SCI. 8577, 8578-79 (2006) (proposing a modularity matrix for community detection); Henry E. Smith, *Community and Custom in*

theories, along with the organizational modularity literature, can draw on general modularity theory. These implications I leave for further work, but modularity theory provides some hypotheses about the tradeoffs and some directions for empirical inquiry.

D. *Recursion and Generativity*

Recursion—the ability of a rule or rules to feed themselves—achieves dramatic savings on information costs.[80] Recursion has been central to generative linguistics,[81] and it should be to a cognitive theory of property as well.

The following is a recursive rule: $A \rightarrow AB$, or "Rewrite *A* as *AB*." *A* appears on both sides of the arrow. So starting with *A*, we get *AB* by one application of the rule, *ABB* by another application of the rule, *ABBB* by a third application of the rule, and so on. Starting with a set of inputs that includes *A*, we can generate an infinite set of outputs.

Recursion helps generative grammar employ finite grammars to capture the open-endedness of the set of sentences of a language.[82] The set of English sentences is infinite in principle. Natural languages tend to contain structures like "that"-clauses that seem to call for recursion in syntax. The sentence, "Chris said that Kim was sick," exhibits

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Property, 10 THEORETICAL INQUIRIES L. 5, 24-34 (2009) (discussing the importance of strong ties in effective custom-based property law).

[80] For an engaging introduction that describes recursion through real-life examples, see DOUGLAS R. HOFSTADTER, GÖDEL, ESCHER, BACH: AN ETERNAL GOLDEN BRAID 127-57 (1979). For another introduction, see generally JOSEPH R. SHOENFIELD, RECURSION THEORY (1993).

[81] *See, e.g.*, Marc D. Hauser, Noam Chomsky, & W. Tecumseh Fitch, *The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?*, 298 SCIENCE 1569, 1577 (2002) ("It is a foundational observation of modern generative linguistics that, to capture natural language, a grammar must include [a capacity for recursion]."); Steven Pinker & Ray Jackendoff, *The Faculty of Language: What's Special About It?*, 95 COGNITION 201 (2005) (explaining the role of recursion in language). *But see* Daniel L. Everett, *Cultural Constraints on Grammar and Cognition in Pirahã: Another Look at the Design Features of Human Language*, 46 CURRENT ANTHRO. 621 (2005) (questioning recursion's centrality in linguistics by way of an example language that lacks it). *See generally* RECURSION AND HUMAN LANGUAGE (Harry van der Hulst ed., 2010).

[82] The need for recursion in syntax and the creativeness of language is a loose and suggestive relationship, contrary to a common assumption among linguists. *See* Geoffrey K. Pullum & Barbara C. Scholz, *Recursion and the Infinitude Claim*, *in* RECURSION AND HUMAN LANGUAGE, *supra* note 81, at 113, 118-24 (refuting the "Standard Argument").

embedding, but can be embedded again as in "Pat believed that Chris said that Kim was sick," and on and on.[83]

Something similar allows for a small number of basic property forms to achieve complex ends. Thus, the rule carving a remainder out of an interest is recursive.[84]

(i) Fee simple → Life estate + Reversion
(ii) Reversion → Life estate + Reversion

Notice that in (ii) "Reversion" appears on both sides of the arrow: the rule can feed itself. Thus, we can break a fee simple into a life estate plus a reversion (by (i)): *O* to *A* for life (then to *O*). And then we can break the reversion into another life estate plus a reversion, pushing back the first reversion, by applying (ii): *O* to *A* for life, then to *B* for life (then to *O*). We can now apply (ii) again: *O* to A for life, then to *B* for life, then to *C* for life (then to *O*). We can do this as many times as we like. Other examples include trusts (and trusts of trusts, trusts of trusts of trusts, etc.) and other layers of ownership (nested corporate subsidiaries, for example). Recursion lets one analogize the basic forms of property to Lego-like building blocks. Legos combine with each other in generative ways and complexes of blocks can combine further in just the ways simpler ones do.

E. *Towards an Architecture of Property*

The foregoing devices work in tandem to economize on information costs, as reflected also in the shortness of a description in an appropriate meta-language. Ultimately though, whether a cognitive theory of property can succeed will depend on its application. Before examining its application, note one phenomenon that many modular systems exhibit: the convergence of static and process explanations. Modular systems evolve easily. As a result, some psychologists hypothesize that the system of conflicting modules—within which specific rules trump general ones and modules have different strengths in different

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[83] *See, e.g.*, IVAN A. SAG & THOMAS WASOW, SYNTACTIC THEORY: A FORMAL INTRODUCTION 36, 259 (1999) (describing the recursion of prepositional phrases and *that*-clauses).

[84] MERRILL & SMITH, *supra* note 60, at 576-77; *see also* MERRILL & SMITH, *supra* note 70, at 105 (describing the "generative quality" of life estates and remainder interests in property); Henry E. Smith, *Standardization in Property Law* ("Property rights can be standardized because they combine recursively . . . ."), *in* RESEARCH HANDBOOK ON THE ECONOMICS OF PROPERTY LAW 148, 152-53 (Kenneth Ayotte & Henry E. Smith eds., 2011).

contexts—may reflect the evolution of the system.[85] Because they are detachable, modules can be added and subtracted in response to pressures of evolution. As Herbert Simon recognized decades ago, nearly decomposable systems tend to be susceptible to congruent static and process descriptions because processes come to effectively reach a desired state of affairs.[86] Very roughly, ontogeny really does recapitulate phylogeny in these kinds of systems.[87]

I suggest that something similar is true of property law. Some of the baseline rules like *nemo dat* and *ad coelum* have over time been subject to exceptions, and for reasons of economizing, a static description still makes sense. *Nemo dat* and *ad coelum* remain the basic default rules subject to exceptions like the good faith purchaser to *nemo dat* and airplane overflights to *ad coelum*. It is to these applications of the cognitive theory of property to which we now turn.

III. APPLICATIONS

A cognitive theory of property can capture many aspects of property involving baselines and exceptions. The point is that the cognitive theory allows for a real theory and an elegant one at that—a brief and rigorous description, whose brevity corresponds to true generalization. At the same time, the cognitive theory of property suggests why baselines are important and robust, in a fashion that is hard to capture on the bundle-of-rights picture. The power of the cognitive theory can be illustrated, as we have seen, with the structure of trespass and its limitations and qualifications. Here, I focus on *nemo dat*, title, and the law-versus-equity distinction.

A. Nemo Dat *and Other Baselines*

Consider first the rule of *nemo dat quod non habet*, or "one cannot give that which one does not have." If *A* transfers to *B*, and then *A* purports to transfer to *C*, *B* has better title than *C*. At the time *A* transferred to *B*, *A* had something to transfer. When it comes time that *A* tries to transfer to *C*, *A* has nothing to transfer. It sounds like common sense, and it is. One could imagine all sorts of different rules, based on the relative qualities of *B* and *C*, to determine who had the better

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[85] *See, e.g.*, KURZBAN, *supra* note 58, at 65 (noting that modules evolve over time to fit different situations).

[86] Simon, *supra* note 49, at 479-80.

[87] *Id.* at 480.

title—their virtue, their need, and so on—but *nemo dat* is a highly formal rule, relatively invariant to context.

In practice, exceptions to *nemo dat* apply often, if not most of the time. In the case of land, recording statutes govern the question of whether a good faith purchaser for value can acquire good title from a seller with no title.[88] Generally the answer is yes, provided the later purchaser (the person in *C*'s position) has no notice (and, in many jurisdictions, also records before the competing claimant).[89] The land records furnish constructive notice, so that good faith is only possible if the land is unrecorded.

Which is the baseline case, *nemo dat* or the good faith exception? One could describe the situation as later purchasers winning except when they do not acquire for value or have notice (or, in some jurisdictions, fail to record first)—or if the recording act does not apply (e.g., wild deeds and early or late recorded deeds). The question is which baseline provides a simpler way to describe the law.

Personal property is another area featuring *nemo dat* and the good faith exception. Legal systems have a wider or narrower good faith exception to *nemo dat* for personal property turning often on the void–voidable distinction (a good faith purchaser can gain good title from someone with voidable title, as in cases of fraud, but not from someone like a thief, with void title).[90] Usually, the broad version of the good faith purchaser exception depends on lack of notice or some form of it. The market overt rule is one example of an implicitly notice-based exception to *nemo dat* in favor of good-faith purchasers.[91]

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[88] *See* 4 AMERICAN LAW OF PROPERTY § 17.10 (A. James Casner ed., 1952).

[89] *Id.*

[90] *See* U.C.C. § 2-403(1) (2011) ("A person with voidable title has power to transfer a good title to a good faith purchaser for value.").

[91] The market overt rule allows a good faith purchaser to beat the original title holder, even with a thief in the chain of title, if the purchaser bought in an open market, (i.e., from a merchant dealer openly displaying the goods). *See, e.g.*, CODE CIVIL [C. CIV.] art. 2277 (Fr.) (requiring the original owner to pay the purchaser the purchase price to regain item the item if bought in open market), *translation available at* http://www.legifrance.gouv.fr/content/download/1950/13681/version/3/file/Code_22.pdf (listed in translation at art. 2280); BÜRGERLICHES GESETZBUCH [BGB] [CIVIL CODE], Aug. 18, 1896, as amended, § 935, para. 2 (Ger.) (allowing someone that purchases an item at public auction to retain ownership even if the item was stolen), *translation available at* http://www.gesetze-im-internet.de/englisch_bgb/englisch_bgb.html. The French and German rules are broader than the American rule, which requires that the original owner have entrusted the goods to a merchant dealing in "goods of that kind." U.C.C. § 2-403(2); *see also id.* ("Any entrusting of possession of goods to a merchant who deals in goods of that kind gives him power to transfer all rights of the entruster to a buyer in ordinary course of business."). For a summary of various

This heterogeneous set of circumstances is easier to describe as a set of exceptions to *nemo dat* than as a set of freestanding rules with a freestanding *nemo dat* rule alongside them. The hypothesis advanced here is that a description of the system with good faith purchaser and various other exceptions as specific exceptions, and the *nemo dat* rule as the general rule, will be shorter in an agreed-upon meta-language than one with *nemo dat* as an exception to some other general rule. This is because the good faith purchaser exception—or set of exceptions—can be described relatively simply, leaving *nemo dat* to be defined implicitly at low cost. By contrast, all the (on the traditional account, interstitial) applications of *nemo dat* as an exception would require lengthy descriptions—the intricacies of good faith purchase, wild deeds, etc.—unaided by the generality of good faith purchase as a unitary rule.

Whether using *nemo dat* as a baseline provides for a simpler description of the system is an empirical question. But the cognitive theory here can explain a striking fact: *all* systems, despite their diversity in which exceptions they allow, treat *nemo dat* as the baseline case.[92] I would go further and claim that any rigorous descriptions of a system—even ones like German civil law with a broad good faith exception[93]—will find it more convenient to treat *nemo dat* as the baseline. One could regard this as a matter of history, but experience has been that the system is easier to understand with *nemo dat* as the baseline.[94] This may be an example in which, as Simon noted, state and process descriptions converge—ontogeny replicates phylogeny.[95]

Again, what no system seems to do is to make good faith purchaser the rule and *nemo dat* the exception.[96] This is not a statement about the relative frequency of the application of the baseline rule or the exception, and it is certainly not a moral evaluation of *nemo dat* titleholders and good faith purchasers. It is simply an explanation of the

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jurisdictions' approaches to this question, see Alan Schwartz & Robert E. Scott, *Rethinking the Laws of Good Faith Purchase*, 111 COLUM. L. REV. 1332, 1378, 1380, 1382 (2011).

[92] *See* Schwartz & Scott, *supra* note 91, at 1378, 1380, 1382 (tabulating countries adopting *nemo dat* as a base principle).

[93] *See* BGB, *supra* note 91, §§ 932, 935.

[94] This has been the author's experience, and it is reflected in the treatment of title records and the transfer of property in MERRILL & SMITH, *supra* note 60, at 884-936.

[95] *See* Simon, *supra* note 49, at 480-81.

[96] For a survey of ancient and modern treatment of the good faith purchaser rule, see Saul Levmore, *Variety and Uniformity in the Treatment of the Good-Faith Purchaser*, 16 J. LEGAL STUD. 43, 49-65 (1987).

pattern of delineation based on relative costs. The point is not that *nemo dat* is numerically important or morally worthy, but that it covers a heterogeneous set of circumstances that reflect its being the general baseline, however compromised it may be in practice.

This pattern of nested defaults holds for exclusion and governance. Why is exclusion the baseline for delineation purposes? Because it is the general case, and governance is special. Exclusion and governance are methods of delineation that are arrayed along a spectrum of more use-neutral to more use-specific. The characteristics of resource uses and their users are suppressed in the interests of formalism and modularity—more in the case of exclusion than governance. Again, this has no bearing on whether exclusion is the moral "core" of property, or whether it corresponds to an interest at all.[97] Rather, it is cheaper to delineate from the general case, with adjustments for important matters, than to jump in and start delineating at a specific level and hope the outcome will be the same (extensionally). As in many instances of cognitive architecture, particularly when it comes to concepts and categories, the specific overrides the general to economize on mental resources.[98]

One might make a similar point about other baselines, like the *ad coelum* rule. Here, the residual case of ownership within the column of space can be overridden on a presumptive basis. When an important issue like airplane overflights comes along, the presumptive ownership can be overcome.[99] Whether one thinks that the *ad coelum* rule literally described true ownership to the heavens and was overridden in the interests of high altitude overflights, or whether one regards the traditional formulation as a loose and convenient one that needed disambiguating in the face of a new problem, the *ad coelum* rule was and, despite dictum to the contrary,[100] continues to be an important baseline governing building air rights, overhanging eaves, and the like. Here again we can witness the state and process description—with *ad coelum* as a strong but only presumptive default—converging.

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[97] *See* Henry E. Smith, Response, *Mind the Gap: The Indirect Relation Between Ends and Means in American Property Law*, 94 CORNELL L. REV. 959, 963-65 (2009) (arguing that property serves interests in use indirectly through exclusion and more directly through governance such that conceptualizing property as based in exclusion with various exceptions does not diminish the importance of the exceptions).

[98] *See supra* notes 45-46 and accompanying text.

[99] *See* MERRILL & SMITH, *supra* note 60, at 9-15, 175-83 (providing and discussing examples of exceptions to the *ad coelum* rule).

[100] *See* United States v. Causby, 328 U.S. 256, 261 (1946) ("[The *ad coelum*] doctrine has no place in the modern world . . . .").

Interestingly, the value of a simple uniform concept may also hold true for the much-maligned notion of title, where property intersects with commercial law. Karl Llewellyn believed that concepts had to prove their worth in terms of real world concepts (which made him a moderate anticonceptualist). He believed that the older sales-act approach of asking in transactions who had title (to answer questions about default risk allocation and remedies, among other things), was unjustified overconceptualism.[101] In drafting the Uniform Commercial Code, Llewellyn set out to diminish the importance of title, a decision fully justified according to the Realist-inspired conventional wisdom. Yet even for Llewellyn, title retained some use: he conceded that "it should be made to serve merely as the general residuary clause."[102] Indeed, having a simple concept that one can plug into various contexts and that requires little special tailoring has a complexity-managing virtue that should make it presumptively usable until the utility of a tailored concept in a particular situation-type clears some higher threshold. What exactly that threshold should be is difficult to say, but it is far from clear that an exact answer to such questions is needed in order to make a system of presumptive modular concepts like title useful.

Beyond the scope of this Article are similar questions that can now be framed with respect to a wide range of concepts and baselines in property. Other questions that might be asked and that the cognitive approach might help answer are: Why is the fee simple the "basic" interest? Why do we have a law of property instead of laws relating to particular resources? In each case, simplicity and the convergence of state and process descriptions help explain why property employs the baselines it does, and why departure from these baselines is harder than it would seem.

B. *Law Versus Equity*

I have argued in other work that equity supplies "a safety valve" in order to discourage opportunistic misuse of legal rules.[103] But how do

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[101] *See* K.N. Llewellyn, *Through Title to Contract and a Bit Beyond*, 15 N.Y.U. L.Q. REV. 159, 169 (1938) ("[Title] remains, in the Sales field, an alien lump, undigested.").

[102] *Id.* at 170.

[103] Henry E. Smith, *Rose's Human Nature of Property*, 19 WM. & MARY BILL RTS. J. 1047, 1050 (2011); *see also* Henry E. Smith, An Economic Analysis of Law Versus Equity 17-18 (May 30, 2011) (unpublished manuscript) (on file with author) [hereinafter Smith, Law Versus Equity] (showing "that equity is a coherent mode of decision making

we know that equity is the exception and law the baseline? For one thing, courts and commentators say so,[104] and so state the old jurisdictional rules, by which equity was supposed to apply only when the legal remedy was inadequate and such that it did not disturb legal property rights.[105] Many suspected that this prescribed separation did not describe reality.[106] But what would a world of mostly equity and exceptional law look like? It would be very uncertain and expensive to apply. As we will see, this is especially so if we assume that most actors are not opportunistic. In such a world, the rules of thumb for when equity applies—continuing trespass and the like, and the exceptions to the exceptions, such as for bad faith—would be harder to describe. In general, it is easier to describe—and to navigate—a system of simple rules backed up by a no-misuse principle than it would be to specify the methods of misuse (or even its outer contours) and then treat non-misuse as an exception.

This specific-over-general architecture can exhibit multiple levels, with nested presumptive rules. Consider building encroachments.[107]

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in which features work together to combat opportunistic behavior that undermines the modular structures of the common law").

[104] *See, e.g.*, F.W. MAITLAND, EQUITY 19 (A.H. Chaytor & W.J. Whittaker eds., 1929) ("Equity was not a self-sufficient system, at every point it presupposed the existence of common law. Common law was a self-sufficient system . . . . Equity without common law would have been a castle in the air, an impossibility.").

[105] *See, e.g.*, Pardee v. Camden Lumber Co., 73 S.E. 82, 83 (W. Va. 1911) (noting that the "chief restraint" on a court's revisiting a legal rule is that it not "disturb[] property rights"); Charles M. Gray, *The Boundaries of the Equitable Function*, 20 AM. J. LEGAL HIST. 192, 202-06 (1976) (illustrating how courts of equity were supposed to refrain from declaring property rights).

[106] Common law lawyers were always skeptical that equity could be cabined, as famously captured by Selden's quip about the Chancellor's foot:

> Equity is a Roguish thing, for Law we have a measure, know what to trust to, Equity is according to the Conscience of him that is Chancellor, and as that is larger or narrower, so is Equity. 'Tis all one as if they should make the Standard for the measure, a Chancellors Foot, what an uncertain measure would this be? One Chancellor has a long Foot, another a short Foot, a Third an indifferent Foot: 'Tis the same thing in the Chancellors Conscience.

JOHN SELDEN, TABLE-TALK: BEING THE DISCOURSES OF JOHN SELDEN, ESQ. 18 (London, E. Smith 1689). Recently, Douglas Laycock has argued that the irreparable injury rule presents no constraint on the issuance of injunctions. *See, e.g.*, DOUGLAS LAYCOCK, THE DEATH OF THE IRREPARABLE INJURY RULE 106 (1991) ("[C]ourts do not deny specific relief because of the irreparable injury rule alone. There is always another reason.").

[107] *See* Smith, Law Versus Equity, *supra* note 103, at 14-15 (discussing equity's ability to "soften the remedy" in specific cases to avoid socially wasteful behavior). Part of the problem is the modern lack of understanding of the undue hardship defense. *See generally* Douglas Laycock, *The Neglected Defense of Undue Hardship (and the Doctrinal Train Wreck in* Boomer v. Atlantic Cement*)*, 4 J. TORT L., no. 3, 2012, at 1, 4-5

This area of the law is often taken to be unpredictable,[108] but the general contours are not mysterious once equity is recognized as the safety valve it is. The general rule is that equity will not enjoin a trespass, but for continuing trespasses equity will presume irreparable injury and generally afford an injunction.[109] A building encroachment, then, might be a candidate for an injunction. A good faith encroachment, for which an injunction would cause undue (or disproportionate) hardship, can, however, be remedied by the payment of damages.[110] Bad faith encroachers, on the other hand, cannot avail themselves of this good faith exception and so are subject to injunctions.[111] This nested set of presumptions and exceptions is easy to describe. It may well be that most encroachments are in good faith. But a system that took that as the base case and made exceptions for bad faith and for situations of continuing trespass without hardship would receive a less elegant description.

The cognitive approach can show how viewing equity as an exception aimed at discouraging opportunism provides a unified explanation of the equitable tradition. Equity courts and commentators going back to Christopher St. German[112] invoked Aristotle's notions of equity, in which equity corrects "law where law is defective because of its generality."[113] One reason law can be defective is that its generality leaves

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(outlining the complexity of the undue hardship defense in the encroachment and nuisance contexts).

[108] *See, e.g.*, Golden Press, Inc. v. Rylands, 235 P.2d 592, 595 (Colo. 1951) ("A study of many decisions discloses no specific and universally-accepted rule as to encroachments.").

[109] *See, e.g.*, Pile v. Pedrick, 31 A. 646 (Pa. 1895) (granting an injunction for a permanent trespass).

[110] *See Rylands*, 235 P.2d at 595 ("[W]here the encroachment was in good faith, we think the court should weigh the circumstances so that it shall not act oppressively."); RESTATEMENT (THIRD) OF RESTITUTION AND UNJUST ENRICHMENT § 10 (2011) (providing that a mistaken improver "has a claim in restitution as necessary to prevent unjust enrichment"); RESTATEMENT (FIRST) OF RESTITUTION: QUASI CONTRACTS AND CONSTRUCTIVE TRUSTS § 42(1) (1937) (providing that, in the case of a building encroachment, where a trespasser's "mistake was reasonable," the plaintiff is entitled to an injunction only if she compensates the defendant to the extent that her land was "increased in value" by the encroachment); *see also* Kelvin H. Dickinson, *Mistaken Improvers of Real Estate*, 64 N.C. L. REV. 37, 42-49 (1985) (discussing the range of relief available to mistaken improvers).

[111] *Rylands*, 235 P.2d at 595.

[112] *See* CHRISTOPHER ST. GERMAN, DOCTOR AND STUDENT 94-107 (T.F.T. Plucknett & J.L. Barton eds., 1974) (discussing the function of equity as a corrective principle).

[113] ARISTOTLE, THE NICOMACHEAN ETHICS 317 (H. Rackham trans., Harvard Univ. Press 1982); *see also, e.g.*, Riggs v. Palmer, 22 N.E. 188, 189 (N.Y. 1889) (quoting Aristotle for the proposition that equity prevents exceptionally strained applications of rigid rules of law); Eric G. Zahnd, *The Application of Universal Laws to Particular Cases: A Defense of Equity in Aristotelianism and Anglo-American Law*, 59 LAW & CONTEMP. PROBS.

loopholes for bad faith actors—namely, opportunists.[114] General concepts, including legal concepts and rules, are useful because they are general (as many including de Tocqueville and Hayek recognized), but they leave the door open to misuse. Law can afford to be simple as long as it is backed up by equitable anti-opportunism principles.

C. *Complexity and the Conflict Between Reductionism and Holism*

Finally, in an even more speculative vein, the cognitive approach to the economy of concepts suggests a reconciliation between seemingly inconsistent perspectives in property theory. Property theorists can typically be described as either reductionists or holists. Reductionists, including those in law and economics, want to reduce property to something smaller or make property reflect directly the purposes it serves—be they efficiency, fairness, or even, in a way, human flourishing.[115] Holists, by contrast, emphasize the unity of ownership (as in civil law), the pluralism of ends in property, or the irreducible social dimension of property.[116] The cognitive theory allows us to be, in Simon's words, "in principle" reductionists and practical holists.[117] This combination could be termed "pragmatic holism" (or "pragmatic

263, 270-75 (1996) (documenting the influence of Aristotelian equity on the development of Anglo-American law). *But cf.* Darien Shanske, Comment, *Four Theses: Preliminary to an Appeal to Equity*, 57 STAN. L. REV. 2053, 2066-68 (2005) (arguing that Aristotle's equity was not primarily legal but instead a "personal virtue").

[114] *See supra* note 103; *see also* Dennis Klimchuk, Is the Law of Equity Equitable in Aristotle's Sense? 4 (June 2011) (unpublished manuscript), *available at* http://www.law.ucla.edu/workshops-colloquia/Documents/Klimchuk.%20Is%20the%20Law%20of%20Equity%20Equitable%20in%20Aristotles%20Sense.pdf ("Correction is sometimes necessary because all law is universal and, owing to its universality, can lead to error in particular cases.").

[115] *See* Smith, *supra* note 97, at 967-68 (discussing the single-mindedness of mainstream theories of property).

[116] *See, e.g.*, DAGAN *supra* note 28, at 72 ("The legal conventions encapsulated in property law . . . do not merely supply an assortment of disconnected choices. Rather, . . . they offer a repertoire that responds to various forms of valuable human interaction."); Nestor M. Davidson, *Standardization and Pluralism in Property Law*, 61 VAND. L. REV. 1597, 1638 (2008) (supporting the pluralist approach to property that first demands "recogni[tion] of the influence of a diversity of institutions, communities, and corresponding perspectives and "then seeks to draw meaning from that mosaic"); Emily Sherwin, *Two- and Three-Dimensional Property Rights*, 29 ARIZ. ST. L.J. 1075, 1082 (1997) (treating property "as a social institution, justified by the advantages that the institution of property rights provides to all").

[117] Simon, *supra* note 49, at 468.

reductionism").[118] When we develop the tools for analyzing how the law (or other systems) deal with complexity, it turns out that, for most purposes, reductionism and holism are not far apart. I have argued something similar with respect to torts—that the modularity employed by tort law makes an economic account more congruent with the law and with basic morality than a conventional economic account.[119] In previous work, Thomas Merrill and I have argued something similar about holistic moral theories and information costs[120]—a special case of complexity pointing toward information-cost rationales for practical holism. The potential intractability of a world without property, including its concepts and categories, is one reason that property appears to be holistic. Property manages complexity with concepts.

CONCLUSION

Cognitive science allows law and economics to refine its analysis of legal concepts and the architecture of property. Cognitive theory shows how the nominalist impulse, associated especially with Legal Realism, tends to efface the "intensional level" in law: there are only facts and results, and we are relatively unconstrained in how to relate the former to the latter. Because property employs formal concepts and rules—the specific-over-general principle, modularity, and recursion—the law can manage the complex interactions of actors in a range of settings, from the personal to the numerous and anonymous. The cost-effectiveness of organizing facts one way or another is downplayed by many of the Realists and their successors.[121] The cognitive theory of property identifies the importance of concepts in reducing information costs and building the overall architecture of property.

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[118] For a defense of pragmatic holism, see Bruce Edmonds, *Pragmatic Holism (or Pragmatic Reductionism)*, 4 FOUND. SCI. 57 (1999), which suggests that "a very similar range of issues . . . face both the in-principle reductionists and the in-principle holist."

[119] *See* Henry E. Smith, *Modularity and Morality in the Law of Torts*, 4 J. TORT L., no. 2, 2011, at 1, 16-28 (analyzing the modularity of four common issues in tort law).

[120] Thomas W. Merrill & Henry E. Smith, *The Morality of Property*, 48 WM. & MARY L. REV. 1849, 1852-66 (2007) (discussing the moral and economic dimensions of in rem rights).

[121] *See, e.g.*, Cohen, *supra* note 22, at 812 ("[T]he language of transcendental nonsense . . . is entirely useless when we come to study, describe, predict, and critique legal phenomena."); Roscoe Pound, *Mechanical Jurisprudence*, 8 COLUM. L. REV. 605 (1908) (criticizing a conception of the law as a set of rigid rules applied in a "scientific" way); *see also* Thomas C. Grey, *Langdell's Orthodoxy*, 45 U. PITT. L. REV. 1, 9 n.28 (1983) ("The indirect effect of category-assignments and the ideological importance of legal categorical schemes have been neglected both by advocates and by legal scholars.").