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Law's Coevolution

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LAW'S COEVOLUTION

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One of the most pervasive maxims of American jurisprudence is that law evolves. Applied metaphorically, it expresses the broad idea that law gradually adapts to its environment, unfolding in a linear and progressive manner through either human reason or social influence. Yet this belief has never been universal. Over a century ago, legendary jurist Oliver Wendell Holmes Jr. first argued that law does not evolve unilaterally and philosophically; it coevolves with everything in nature. Though Holmes's obscure rebuttal was largely overlooked, it is particularly relevant today. In fact, his theory of legal coevolution is now confirmed by science. At the individual level, human beings possess a

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*Professor of Law, Southwestern Law School. Because I see law as a natural phenomenon, I have attempted to study it from a variety of scientific perspectives. This is a challenging venture for any scholar, but it is especially formidable for legal theorists steeped in the analytic tradition of jurisprudence. Fortunately, scientists have eased this burden by making their findings increasingly accessible to all. By all, I include me. A number of researchers from across the empirical spectrum have inspired, shaped, and refined the interdisciplinary ideas in this article. In particular, I would like to acknowledge anthropologist Robert Boyd and evolutionary biologist Peter Richerson for unlocking the mysteries of cultural evolution. Developmental psychologist David Moore also deserves recognition for revealing and simplifying the exciting world of epigenetics. Finally, I am indebted to social cognitive neuroscientist Matthew Lieberman for illuminating the wonderous sociability of the human brain. Of course, any flaws in the description, interpretation, or application of this research are mine alone. I am, after all, just a creature of the humanities.

natural "legal" instinct that shapes their values, beliefs, and even their rationality. As people cooperate, this instinct foments prosocial impulses, social norm circles, and peer punishments. Because these proto-legal mechanisms are informal and localized, law emerges to coordinate, reconcile, and regulate them. Once entrenched, such interlocking "jurisystems" don't remain stagnant but trigger a number of downward effects. Most immediately, they resolve human conflicts, relieve social stress, and reinforce social bonds. But they also shape our cultural memory, which eventually becomes embedded in our DNA. In this way, law is a bio-social component of a perpetual information exchange that constantly renews our sense of legality.

I. INTRODUCTION

Law evolves. For nearly the last two centuries, perhaps no other adage has more fully captured the essence of modern jurisprudence.[1] In fact, it appears across the broad spectrum of legal theory, informing everything from conceptualism and pragmatism[2] to historicism, legal realism, sociological jurisprudence, and even the law and economics movement.[3] As Professor E. Donald Elliott explains, "Today the idea that law 'evolves' is so deeply ingrained in Anglo-American legal thought" that we lack "the slightest awareness of the jurisprudential tradition we are invoking."[4]

What *is* clear is the maxim's common meaning. Drawn loosely from Darwin's biological theory, legal evolution is a metaphor for describing the law's development. It holds that law continually adapts to its environment in a linear and progressive manner,[5] shedding old forms as it advances toward modernity.[6] Though the causes of this transformation are not certain, legal positivists typically point to human agency while legal realists cite social influences.[7]

But evolutionary jurisprudence has not *always* been metaphorical. As early as 1919, A.G. Keller presented a sociobiological account of law's evolution, arguing that "human institutions, and, among them, law, show adjustment to life-conditions by way of the stock Darwinian factors of variation, selection, and transmission" and these institutions "are as

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1. *See* Robert W. Gordon, *"Critical Legal Histories Revisited": A Response*, 37 L. & SOC. INQUIRY 200, 202 (2012) (noting that evolutionary theories of law have "dominated Western thinking about the relation between law and social change for the last two centuries").

2. *See generally* E. Donald Elliott, *The Evolutionary Tradition in Jurisprudence*, 85 COLUM. L. REV. 38 (1985) (noting the social, doctrinal, economic, and sociobiological approaches to legal evolution).

3. *See id.*; *see also* BRIAN Z. TAMANAHA, A REALISTIC THEORY OF LAW 16–27 (2017) (tracing the progression of this evolutionary theme through the first three movements).

4. Elliott, *supra* note 2, at 38.

5. *See id.* at 43–44 (discussing Sir Henry James Sumner Maine's evolutionary view that all "progressive societies" must go through several "successive stages" of adaptation).

6. *See id.* at 46 (quoting Maine's belief in "the upward march of society"); Gordon, *supra* note 1, at 200 (describing evolutionary functionalism as "a process of social development common to most 'advanced' or 'dynamic' societies, culminating in modernity").

7. *See* Anthony J. Sebok, *Misunderstanding Positivism*, 93 MICH. L. REV. 2054, 2062–64 (1995) (noting the conviction of classical legal positivists that law was founded on reason and human will); Joseph William Singer, *Realism Now*, 76 CALIF. L. REV. 465, 474 (1988) (claiming legal realism is the belief that "[l]egal principles are not inherent in some universal, timeless logical system; they are social constructs, designed by people in specific historical and social contexts for specific purposes to achieve specific ends").

much evolutionary products as are the horse's hoof and the camel's foot."[8] Keller was not the only *evolutionary realist*. In fact, his realism was inspired by renowned American jurisprudent Oliver Wendell Holmes Jr. Though Holmes famously declared that law emanates from experience and not logic,[9] he later described these supposed antipodes as symbiotic *natural* forces in the evolution of human problem solving.[10]

Keller and Holmes did more than expand the prevailing evolutionary metaphor. They introduced a radically different set of assumptions. To Keller, the evolution of law and society was not a heuristic; rather, it was a *real phenomenon* with *actual material causes*.[11] Holmes attributed this process not to any isolated factor, but rather to the *integration* of human rationality and surrounding social structures. This dynamic was *synergistic and systemic*, not accretive and linear. While reason guided the legal system from within, society provided a constant source of external information.[12] According to Holmes, these forces did not push law toward some inexorable end. Instead, they formed a *circular* feedback loop in which reason, society, and law continually enlightened and refashioned *each other*.[13] In short, law did not *just* evolve; it *coevolved* with the very things that make it intelligible.

Though Keller and Holmes's musings were merely theoretical, science has proven them mostly correct. The natural sciences now explain how humans develop biological instincts conducive to law,[14] while the social sciences demonstrate how these instincts grow into cultural and legal institutions.[15] In recent decades, these truths have been amplified by systems science, which reveals how such instincts and institutions become mutually reinforcing.[16]

One of the few fields to effectively merge these findings is sociology. While sociology does not specifically address *law's* coevolution, it has examined the causal relationship between human agency and social influence—the same relationship currently bedeviling legal theory. Historically, sociology theorists have mirrored their jurisprudential counterparts by splitting into feuding factions that defend one catalyst or the other. However, a new wave of thinkers has taken a more unifying approach. Backed by complex systems theory, they show that cultural artifacts like law naturally coevolve from the dynamic coordination of *both* factors.

The present article now brings this sociological insight to law. It argues that law is a complex information system coevolving with the biological, rational, and sociocultural systems that comprise it. Part II sets the stage by reviewing sociology's causality debate and tracing the field's movement towards reconciliation and complexity. Building on this

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8. A.G. Keller, *Law in Evolution*, 28 YALE L.J. 769, 773, 775 (1919).
9. *See* OLIVER WENDELL HOLMES, THE COMMON LAW 5 (1881).
10. *See generally* E. Donald Elliott, *Holmes and Evolution: Legal Process as Artificial Intelligence*, 13 J. LEGAL STUD. 113 (1984) (describing Holmes's transition to this position).
11. *See* Keller, *supra* note 8, at 771 (stating that "law, like all other living things, is evolutionary, persisting only as it secures adjustment to a changing environment").
12. *See* Elliott, *supra* note 10, at 140–44 (detailing Holmes's mixture of internal and external influences on law).
13. *See id.* at 115, 140–44.
14. *See* Alan Calnan, *Beyond Jurisprudence*, 27 S. CAL. INTERDISC. L.J. 1, 27–43 (2017).
15. *See id.* at 43–56.
16. *See id.* at 23–27.

systems approach, Part III reveals the natural and social synchrony behind human evolution. Specifically, it shows how human legality passed through a process of circular causality—beginning first in our biological systems, spreading upward through our social systems, and eventually seeping downward into our genetic subsystem through a combination of epigenetics and gene-culture coevolution.[17]

With this background in place, Part IV identifies the coevolutionary patterns of law. It argues that our inner legal instinct expanded outward into the social world, initially inspiring a collection of proto-legal mechanisms like prosocial impulses, social norm circles, and peer punishments.[18] Over time, these mechanisms formed a complex legal network that was prominent, permanent, autonomous, and preeminent.[19] This network of "jurisystems" emerged and continues to flourish not only because it satisfies our need for social stability, but also because it reinforces our heritable urges for cooperation and coordination.[20] The Conclusion explores how these explosive findings are likely to affect the future of jurisprudence.

II. SOCIOLOGY'S INSIGHTS

Law is one of the tools used by societies to solve the problem of group living. Though individuals within the collective choose their survival strategies, these decisions gain true power when they are approved and enforced by others. As the consensus expands, private preferences soon become community practices and social norms. Before long, these expectations carry a force all their own, exerting pressure for conformity that galvanizes group solidarity.

Because sociology studies societies and their members, it is uniquely positioned to assess not only how these associations form and transform, but also what determines their dynamics. Traditionally, sociologists have framed the causality question in binary terms: Do people control society or does society control its people? Dissatisfied by either choice, some theorists have attempted to reconcile or synthesize these causes, often by combining their effects. Today, a new generation of skeptics has offered yet another alternative: societies are complex information systems that shape their human constituents even as they are constituted by them, though the network as a whole always remains different from and greater than the sum of its parts.

A. Agency and Structure

Sociologist Dave Elder-Vass has described sociology's causality dispute as "nothing less than a battle for the heart and soul" of the field "and indeed of the social sciences more generally."[21] Because law is a central feature of society, this sociological controversy has tremendous relevance for law and legal theory. In fact, sociology's search for the nature or essence of society is strongly reminiscent of the two main trends in jurisprudence. Legal positivists embrace the agency position, arguing that people make law through their

17. *See infra* Part IV.
18. *See infra* Part IV.B.
19. *See infra* Part IV.C.
20. *See infra* Part IV.C.
21. DAVE ELDER-VASS, THE CAUSAL POWER OF SOCIAL STRUCTURES 3 (2010).

rational choices.[22] Conversely, realists and social theorists say law is a "social institution" shaped by changing social circumstances even if human choices have a hand in its development.[23] Given the obvious overlap, sociology's perspective on these matters is particularly instructive for our jurisprudence.

The gist of the problem lies in the concept of social structure. Sociologists do not agree about which social phenomena structure human agency or even what "structure" is supposed to mean. As Elder-Vass reports,

> Sometimes it is used to refer to an entity, paralleling the sense of structure in which a house, for example, is a structure; sometimes to refer to the way in which an entity is organised, paralleling the sense in which a house has a structure. At other times it is used to refer to persistent patterns of behaviour – empirical regularities – and at still others to refer to social properties without making clear what they are properties of, or as if there can be social properties that are not properties of some particular entity.[24]

While there may be many different kinds of social structures—like customs, traditions, practices, organizations, institutions, and so forth—such specific structures are aspects of culture, language, discourse, and knowledge.[25] But even these forces can be refined still further. At bottom, social structures are social forces with the causal power to influence human affairs.[26]

The difficulty in identifying these structures has fomented skepticism about their existence. Ontological individualists believe that social structure is not real at all but actually just a shorthand summary of aggregated individual behavior.[27] By contrast, methodological individualists hold that although social structures possess properties that presently cannot be reduced to individual agency, science eventually will provide a methodology for explaining these structures in individual terms.[28]

While both groups agree that people shape society, they differ on how this occurs. Voluntarist scholars say that people's choices are rational and free, resulting from unabridged exercises of human will.[29] A more recent sect of biological reductionists look for deeper explanations. They argue that human agency derives from our genetics or the neural networks in our brains.[30]

Other sociologists take the opposite view of social structure. Such structural determinists or sociological holists believe that macrosocial phenomena have primacy over individuals; indeed, social structure "is the driving causal force in social life, determining even properties of the individual such as consciousness, rationality, and cognitive capacities."[31] This approach dates back to nineteenth-century philosopher Karl

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22. *See* Sebok, *supra* note 7, at 262–64.
23. *See* Singer, *supra* note 7, at 474.
24. DAVE ELDER-VASS, THE REALITY OF SOCIAL CONSTRUCTION 21 (2012) (citing RAYMOND WILLIAMS, KEYWORDS: A VOCABULARY OF CULTURE AND SOCIETY 153–57 (1st ed. 1976)).
25. *See id.* at 15.
26. *See id.* at 21.
27. *See* R. KEITH SAWYER, SOCIAL EMERGENCE: SOCIETIES AS COMPLEX SYSTEMS 49 (2005).
28. *See id.* at 30.
29. *See id.* at 2.
30. *See id.*
31. *Id.* at 48; *see also id.* 192–93 (making the same point).

Marx, who wrote that "[i]t is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness."[32] Marx was joined by famed sociologist Émile Durkheim in the belief that people are dominated by a collective moral reality.[33] This holistic view spread to different fields throughout the twentieth century. Today, structural determinism still enjoys a considerable following, influencing the work of sociocultural psychologists, structural sociologists, and network theorists alike.[34]

Despite the persistent turf war between these camps, there always has been at least some common ground. "[I]f we look more closely," Elder-Vass advises, "it is striking that many apparently structuralist thinkers have been unable or unwilling in practice to dispense with agency and apparently individualist thinkers have been unable or unwilling in practice to dispense with structure."[35] For example, Marx the structuralist not only believed that people can make their own history, he also exhorted them to do so.[36] Likewise, Durkheim balanced his determinist sociology with an insistence that people have the power to resist collective pressures.[37] On the other side of the divide, individualist Max Weber certainly touted society's rational basis, but he also attributed social behavior to cultural forces like the protestant ethic and free-market capitalism.[38]

B. Reconciliation

Sociology's struggle over causality has fostered various attempts at rapprochement. According to Elder-Vass, "many contemporary authors . . . reject the implication that structure and agency represent a binary choice: that either social behaviour is determined by structural forces or it is determined by the free choices of human individuals."[39] Rather, these progressives see the two forces as compatible or even complementary. Thus, they have explored various middle-ground solutions in the hope of finding some means of reconciliation.

One synthesis theory—called structuration—emphasizes the importance of structure *and* agency.[40] Under this approach, it is not possible to analytically separate individual action and macrosocial structure because the two are bound in a continual loop of circular causality. During this process, human agency shapes society even as it is being constrained and informed by existing social structures. Thus, structure is not external to agency; rather, structure is at least partly a set of memories and instincts internal to the individuals making the choices.[41] In this sense, structure and agency serve to mutually constitute each other.[42]

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32. ELDER-VASS, *supra* note 21, at 1 (quoting Karl Marx, *Preface to a Contribution to the Critique of Political Economy*, *in* THE MARX-ENGELS READER 4 (R. C. Tucker ed. 1978)).
33. *Id.* (quoting ÉMILE DURKHEIM, SUICIDE 318–19 (George Simpson ed., John A. Spaulding & George Simpson trans., Routledge & Kegan Paul ed. 1952) (1897)).
34. *See* SAWYER, *supra* note 27, at 48, 161.
35. ELDER-VASS, *supra* note 21, at 3.
36. *See id.* at 3.
37. *See id.*
38. *See id.*
39. *Id.*
40. ELDER-VASS, *supra* note 21, at 4.
41. *See id.*; SAWYER, *supra* note 27, at 87–88.
42. *See* SAWYER, *supra* note 27, at 54.

Structurationists have been taken to task by a group of post-structurationists. These critics highlight structuration's crucial failure to explain the apparent causal power of social structures.[43] At the very least, they say, structuration is inconsistent on this point. Though it calls structure an abstraction with no causal powers, it also promotes the causal efficacy of social relations.[44] These critics also condemn structuration for conflating individuals and society—treating them as essentially the same thing.[45] Post-structurationists resolve this paradox by separating structure from agency and ascribing causal influence to each. Under this view, *both* structure *and* agency are distinct but real things that *jointly* constitute a society.[46]

Yet the post-structurationists also are not immune from criticism. By proposing the causality of people and societies, the post-structurationists appear to support a dualist ontology of rational and social kinds.[47] The catch is, dualism is rapidly disappearing. As Sawyer relates, dualist ontologies today "are rejected as unscientific by the mainstream of all scientific disciplines."[48] Since science now accepts the interdependence of mind and matter,[49] the structure/agency debate in sociology continues to rage.

C. Complexity

Recently, however, a new voice has begun to alter the discussion: complex systems theory. Prior to the 1990s, sociologists generally ignored systems theory,[50] and until the last decade or so, "complex systems conceptions of [causality] have had almost no impact on [sociological] debates."[51] But that tide is now turning. Beginning in the mid-2000s, social theorists started experimenting with complexity theories devoted to explaining the phenomenon of social emergence. That momentum continues to build, and today constitutes a full-blown movement.[52]

In fact, one multiauthor publication boldly proclaims that "[t]he most widely accepted account of social systems today is that they are complex and adaptive."[53] "They are complex," the authors note, "in the sense that they are 'made up of a large number of parts that interact in a non-simple way' and that 'given the properties of the parts and the laws of their interaction, it is not a trivial matter to infer the properties of the whole.'"[54] Such systems also are considered adaptive "in as far as they operate in relation to their environment in such a manner that preserves a certain set of their characteristics invariant

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43. *See id.* at 88.
44. *See id.*
45. *See id.* at 125.
46. *See* ELDER-VASS, *supra* note 21, at 4.
47. *See* SAWYER, *supra* note 27, at 49, 93.
48. *Id.* at 29.
49. *See id.*
50. *See id.* at 2.
51. *Id.* at 7.
52. *See* ELDER-VASS, *supra* note 21 (published in 2010); SAWYER, *supra* note 27 (published in 2006); Christian Fuchs & Wolfgang Hofkirchner, *The Dialectic of Bottom-up and Top-down Emergence in Social Systems*, 3 TRIPLEC 28, 28–30 (2005) (published in 2005); Marta Lenartowicz et al., *Social Systems: Complex Adaptive Loci of Cognition*, 18 EMERGENCE: COMPLEXITY & ORG. 1, 1 (2016).
53. Lenartowicz et al., *supra* note 52, at 1.
54. *Id.* at 1–2.

or within a limited range of variation."[55]

This burgeoning account of social complexity has developed in four directions. The first is a zealous pursuit of interdisciplinarity. As cultural evolutionist Alex Mesoudi points out, although systems theory requires a linkage between micro- and macro-level processes, the social sciences traditionally have separated these levels, tasking psychology with examining individuals and assigning societies to cultural anthropology.[56] Consequently, "macrolevel researchers are often unwilling to explain macrolevel patterns and trends that they document in terms of underlying individual-level processes," and "micro-level disciplines such as psychology have failed to acknowledge the extent to which macrolevel cultural processes shape individual behavior."[57]

To achieve the necessary synthesis, Mesoudi proposes a "unified science of culture" that "transcends traditional social science disciplinary boundaries."[58] He even maps out such a scheme to demonstrate its plausibility.[59] Sociologist Keith Sawyer urges other researchers to follow suit. Complex sociology "must be fundamentally interdisciplinary," Sawyer explains, "because a focus on [social] emergence requires a simultaneous consideration of multiple levels of analysis: individuals, their communication language, and the group."[60]

The next dimension of social complexity is its trans-systemic medium for connecting processes at the higher and lower levels. Increasingly, systems theorists agree that *information* is that medium. Genes embed information in brains, brains inform bodily acts, bodies communicate information to other individuals, who then share information within groups, organizations, and institutions.[61] Ultimately, these information exchanges create the knowledge, beliefs, and norms of culture, which further informs human behavior.[62] So rather than focusing exclusively on human agency or social structure, social complexicists now study all of mankind's data streams and the communication processes used to disseminate them.[63]

This expanded viewpoint led sociologists to a third revelation. Society's information system is not *just* social in nature, but also has clear biological origins. Information, after all, is merely a collection of smaller data points. To assess facts at the macrolevel, one must examine the bytes informing them from below. In human systems like society and law, this means looking down to the level of biology. Indeed, Elder-Vass says that

> a *full* account of human action *must* recognise and seek to theorise the *biological* basis of that action and its relationship to the higher-level influences on that action, and to show that

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55. *Id.* at 2.

56. *See* ALEX MESOUDI, CULTURAL EVOLUTION: HOW DARWINIAN THEORY CAN EXPLAIN HUMAN CULTURE & SYNTHESIZE THE SOCIAL SCIENCES 51 (2011).

57. *Id.* at 51, 52.

58. *Id.* at xii.

59. *See id.* at 208–19.

60. *Id.* at 7.

61. *See* ROBERT BOYD & PETER J. RICHERSON, THE ORIGIN AND EVOLUTION OF CULTURES 3–4, 6 (2005).

62. *See id.* at 6; MESOUDI, *supra* note 56, at 2–3.

63. Lenartowicz et al., *supra* note 52, at 2; *see also* SAWYER, *supra* note 27, at 8 (relying on recent empirical studies, Sawyer concludes that "group properties emerge from rather complex and subtle differences in symbolic communication" and these informational dynamics "distinguish[] complex social systems from the complex systems studied in the natural sciences").

> this relationship can potentially be theorised as an emergence relation of mental phenomena from our physical brains and bodies.[64]

This means that social and legal phenomena may be influenced "both by the social structures in our environment, but also by our own uniquely human powers of conscious reflexive thinking and indeed by biological factors."[65]

But even this deep dive does not go far enough. Because information systems are recursive, sociologists finally had to account for their interrelationship. Relying on complexity theory, they now portray social dynamics as a circular or dialectical flow of information. Such information is not just transmitted from one system node to another; instead, it is locked in a continuous cycle of cognition, action, and recreation. Individual choices affect society, but social structures simultaneously inform those decisions. As Christian Fuchs and Wolfgang Hofkirchner explain,

> Social information can be seen as a type of social consciousness that emerges from the social relations of the individual consciousness of participating subjects in a social situation. . . . Social information constrains and enables individual consciousness and action. In this dialectical relationship of individual and social information, we have the bottom-up-emergence of social information and the top-down-emergence of individual information. . . . The endless movement of individual and social information, i.e. the permanent emergence of new information in the system, is a two-fold dialectical process of self-organisation that is inherent to [the] social system.[66]

Together, these developments have effectively systematized sociology. Given its growth, this field now has the capacity to connect agency and structure and solve one of its longest enduring mysteries. But it also holds promise for legal theory. Because social complexity permeates all cooperative cultures, it can help us grasp the complex nature of mankind's highest cultural institution, law.

III. Natural and Social Synchrony

Sociology's insights shed light on an important jurisprudential question: Do people posit law as rational agents or do their legal decisions arise from powerful social influences? Traditionally, this was the *only* question sociology could address since its focus was conceptually restricted to society and its members. But that field now reveals that law, like other social institutions, is not *just* a *social* phenomenon. While law is part of our social system, it emerges from our *lower* biological subsystems as a perpetual urge for coordination and stability. And that's not all. Law is also a cultural system situated *above* society, exerting a coordinative force on the systems below.

So to truly understand law, we first must explain these bottom-up and top-down dynamics. We will begin by exploring the natural foundations of human sociality, specifically detailing the path of their emergence. We'll then see how these systems coevolve over time as nature, agency, and social structure form a real, indivisible whole that is constantly shaping and being shaped by its equally real parts.

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64. Elder-Vass, *supra* note 21, at 92 (emphasis added).
65. *Id.* at 194.
66. Fuchs & Hofkirchner, *supra* note 52, at 46.

A. Cultural Emergence

The thrust of my argument is that human beings are born with an ingrained "legal" sense that scales up from their biological systems to their social and cultural systems. Though the transitions at each level are emergent, the systems' formal and functional similarities ensure a remarkable degree of consistency. In effect, our inner regulatory system eventually produces external regulatory systems with corresponding coordinative properties. Because the clearest way to see this symmetry is to locate commonalities at each level, our examination will take an upward trajectory, moving from genes and brains to the sociocultural systems above.

But an initial word of caution is in order. Any linear approach to these subjects will necessarily be a bit misleading. As neuroscientist Robert Sapolsky has observed, "when you explain a behavior with one of these disciplines, you are implicitly invoking all the disciplines—any given type of explanation is the end product of the influences that preceded it."[67] "Thus," Sapolsky concludes, "it is impossible to conclude that a behavior is caused by a gene, a hormone, a childhood trauma, because the second you invoke one type of explanation, you are de facto invoking them all."[68] It follows that my neurobiological, genetic, and developmental descriptions are really just a type of "shorthand" that, in Sapolsky's words, allows me to "temporarily approach[] the whole multifactorial arc from a particular perspective."[69]

That said, even a workable shorthand depends on a recognized set of universal principles. Beneath our diverse human systems exist a number of common natural laws. One of these is complementarity. Discovered by acclaimed physicist Niels Bohr, complementarity holds that things in nature have contradictory tendencies that form a complementary whole.[70] Often, people will see only one extreme or another, but their perception depends both on their particular vantage point and on their means of investigation. Bohr first noticed this feature in photons of light, which could be viewed as an intangible wave or a material particle, but he later extended the idea to "living organisms," "conscious individuals," and "human cultures."[71]

The next fundamental principle complements the first. Known as coordination dynamics, it explains how natural systems—including parts and wholes—reconcile their internal and external tensions.[72] This process seeks to diminish the instability of such antinomies by perpetually searching for stabilizing, middle-ground solutions.[73] The objective is not necessarily to achieve balance but rather to find the right accommodation of properties to maintain system function.[74] Now recognized in fields ranging from theoretical physics to physical chemistry,[75] this interdisciplinary insight helps to explain

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67. ROBERT M. SAPOLSKY, BEHAVE: THE BIOLOGY OF HUMANS AT OUR BEST AND WORST 15 (2017).
68. *Id.* at 16.
69. *Id.* (making the same point about the descriptions in his book).
70. *See* Calnan, *supra* note 14, at 16.
71. *Id.* (discussing Bohr's work).
72. *See id.* at 23–27.
73. *See id.* at 67.
74. *See id.* at 24.
75. Calnan, *supra* note 14, at 24–25 (citing J.A. SCOTT KELSO & DAVID A. ENGSTRØM, THE COMPLEMENTARY NATURE (2006)).

how information is coordinated in genes and proteins, different brain regions, various body parts, organisms and their environments, and people and their social structures.[76]

A final law—homeostasis—sets the parameters for such coordinative variation. Homeostasis is a self-operating process that allows natural systems to maintain stability while adjusting to conditions that are optimal for survival.[77] Though it sets a range of functional tolerances or restrictions on system performance, these set points are not static; rather, they represent a continuous succession of profile changes within upper and lower limits.[78] In this way, homeostasis serves as a kind of biological regulator, sustaining the human body by maintaining steady levels of temperature, water, salt, sugar, protein, fat, calcium, blood pressure, and oxygen.[79] But, as we will see shortly, this stabilizing force is not reserved solely for bodily functions. It actually regulates the entire human condition, including the conditions of human association.

Collectively, these system laws play vital roles in the emergence of all human systems. Thus, any claim of emergence must account *both* for the system under scrutiny *and* for the circumstances of its change. This system analysis requires an identification of the parts, the relations between the parts, and the boundary constraints limiting their interaction.[80] The system's volatility depends on three other factors—namely, the causes that bring an emergent into existence, the mechanisms precipitating these causes, and the forces that stabilize and sustain the emergent's existence.[81]

While the parts vary by system, the remaining features abide nature's general rules. System parts are related by complementarity, though their competitive relationship can take any number of specific forms. Once the system's bipolarity is detected, its polar extremes establish its operational boundaries. Change begins when destabilizing forces disrupt the system's function, thus mechanizing the adaptation process. The animating cause of that process is coordination dynamics, which seeks to restore the system's functional equilibrium. If and when that state is reached, homeostasis sets the guidelines for its continued stability—but only until some new destabilizing mechanism comes along to stimulate another cycle of emergence.

These dynamics begin at humanity's core. If human beings are complex information systems, the human genome is mankind's most basic operating system. Over millennia, human beings have developed two basic genetic traits—one for selfishness and the other for sociality. Though the egocentric drive is more widely publicized, our social sense is equally strong. In fact, according to social cognitive neuroscientist Matthew Lieberman,

> We are wired to be social. We are driven by deep motivations to stay connected with friends and family. We are naturally curious about what is going on in the minds of other people. And our identities are formed by the values lent to us from the groups we call our own. These

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76. *See* KELSO & ENGSTRØM, *supra* note 75, at 111.

77. *See* Kelvin Rodolfo, *What Is Homeostasis?*, SCI. AM. (Jan. 3, 2000), https://www.scientificamerican.com/article/what-is-homeostasis/; *see generally* ANTONIO DAMASIO, THE STRANGE ORDER OF THINGS: LIFE, FEELING, AND THE MAKING OF CULTURES (2017) (arguing that homeostasis informs the evolution of all life).

78. *See* ANTHONY DAMASIO, DESCARTES' ERROR: EMOTION, REASON, AND THE HUMAN BRAIN 135 (1994).

79. *See* Rodolfo, *supra* note 77.

80. *See* ELDER-VASS, *supra* note 21, at 38–39.

81. *See id.* at 39, 68–69.

> connections lead to strange behaviors that violate our expectation of rational self-interest and make sense only if our social nature is taken as a starting point for who we are.[82]

These contradictory characteristics create an informational complementarity. Our genetic blueprint instills us with discordant instructions: to care for ourselves but also to care about others. As human relations become more complex—moving from families to clans to tribes and beyond—this conflict becomes increasingly more difficult to reconcile. The genome's first emergent response was to expand and strengthen mankind's information networks, developing aptitudes for mimicry, mindreading, learning, reciprocation, and cooperation.[83] These faculties prompted the development of groups and in-group hierarchies, which communicated important social cues like status, respect, deference, obedience, and responsibility.[84]

Before long, such coordinative information became encoded and embedded in a suite of complementary moral dispositions. According to moral psychologist Jonathan Haidt, these universal dispositions include preferences for security, liberty, fairness, loyalty, respect for authority, and integrity or sanctity; and a corresponding distaste for harm, oppression, cheating, betrayal, subversion, and degradation.[85] Such diversification was itself an emergent outgrowth of mankind's primal genetic dyad—with the security and liberty norms elaborating the selfish impulse; and the fairness, loyalty, and authority norms refining the sociality norm. Meanwhile, the integrity and sanctity norms appeared to solemnify the very notion of systemic coherence, emphasizing values of purity and wholeness and elevating certain people, places, and principles above all else.[86] Of course, cultures around the globe synthesize these dispositions in widely divergent ways, but every member of the human survival system now enters the world with the same set of coping instructions.

Notice that while these moral emergents are unpredictable, their development is biologically constrained. The process begins when lower system features impact the systems above. As social philosopher Peter Manicas explains,

> From the point of view of biology, an organism is an ordered complex of orderly complex systems. Biochemistry starts from the level of atoms and molecules and works upward through the larger and more complex molecules to complicated systems, organelles, cells, tissues, organs, systems and finally to the organism itself. Activities within systems may have, as the outcome of their causal transactions, properties at higher levels.[87]

Because living organisms are open systems, "the effects of micro-processes at the molecular level are mediated not only at that level but by mediations in a wider environment, an environment which, strictly speaking, extends to the far reaches of the universe."[88] These environmental factors—which include groups of other people—

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82. MATTHEW D. LIEBERMAN, SOCIAL: WHY OUR BRAINS ARE WIRED TO CONNECT 2 (2013).

83. *See* Calnan, *supra* note 14, at 29–33.

84. *See* JONATHAN HAIDT, THE RIGHTEOUS MIND: WHY GOOD PEOPLE ARE DIVIDED BY POLITICS AND RELIGION 165–69 (2012); SAPOLSKY, *supra* note 67, at 534–35.

85. *See* Calnan, *supra* note 14, at 47.

86. *See* HAIDT, *supra* note 84, at 174.

87. PETER T. MANICAS, A REALIST PHILOSOPHY OF SOCIAL SCIENCE: EXPLANATION AND UNDERSTANDING 44 (2006).

88. *Id.* at 44–45.

certainly increase the latitude for genetic variation, but such changes are "restricted by our 'biologically determined' human nature."[89] Given this natural fact, there are some obvious biologic boundary conditions that "make[] some capacities possible and others impossible."[90] "Humans cannot fly," Manicas quips, "and . . . lacking gills, they cannot breathe in water."[91]

Perhaps the greatest marvel of this biological emergence process is the human brain. A specialized information processing system, the brain emerged to calculate ways to protect and serve the body's selfish genes.[92] Its capacities followed the same emergent arc as the human genome, beginning as a selfish survival machine and then adding a layer of social ingenuity.[93] These competitive subsystems eventually spawned a master module to interpret and coordinate the conflicting signals within the now tripartite neural super-system.[94] According to psychologist Daniel Kahneman, such a fully realized brain has two opposite but integrated systems that think fast and slow.[95] The older selfish and social system "operates automatically and quickly, with little or no effort and no sense of voluntary control," while the interpretive system "allocates attention to the effortful mental activities that demand it, including complex computations" and "the subjective experience of agency choice, and concentration."[96]

The slow deliberative system creates the emergent property of consciousness. Consciousness is the unified feeling of one's self that comes from the chaotic interaction of billions of neurons.[97] This mental command center gives us a sense of choice, autonomy, and free will—in fact, the very power of agency sociologists have long believed accounts for our social practices and institutions. Yet this feeling is oddly misleading. Our "free" will, it seems, is not nearly as free as we think. According to Professor Haidt, ninety-nine percent of our mental processes occur in our fast, intuitive system and are unrecognized or inaccessible to our consciousness.[98] Moral intuitions come to mind first, and strategic reasoning straggles along after.[99] This timing is not accidental. The thinking system is simply not equipped to lead because it lacks an emotive catalyst to activate our intuitions.[100] Though our consciousness can be a useful advisor, it typically seeks to justify the mind's initial intuitive instinct, much like an attorney rationalizing her client's behavior on the basis of stipulated facts.[101]

What's more, the brain's automatic system is generally set to sociality, not selfishness. Studies show that when we are not actively thinking, "the brain's free time is

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89. *Id.* at 45.
90. *Id.*
91. *Id.*
92. *See* Calnan, *supra* note 14, at 17.
93. *See id.* at 38–40.
94. *See id.* at 40–41.
95. *See generally* DANIEL KAHNEMAN, THINKING, FAST AND SLOW (2011) (discussing the brain's fast and slow modes of thinking).
96. *Id.* at 20–21.
97. *See* DAVID EAGLEMAN, THE BRAIN: THE STORY OF YOU 88 (Vintage Books ed. 2017).
98. *See* HAIDT, *supra* note 84, at xxi.
99. *See id.* at xx, 61.
100. *See id.* at 66.
101. *See id.* at 79, 81–82, 91–95, 104–05.

devoted to thinking socially[,] . . . processing (and perhaps reprocessing) social information, as well as priming us for social life."[102] As the mind engages with other people, its social judgments "depend heavily on quick intuitive flashes."[103] These flashes are accompanied by an acute social receptivity as the brain absorbs incoming social cues like a sponge. In fact, says Professor Lieberman, "our brains are designed to be influenced by others" and "are built to ensure that we will come to hold the beliefs and values of those around us."[104]

Even our sense of agency has both social and systemic origins. As neuroscientist J.A. Scott Kelso indicates, "agency arises when spontaneous activity is coupled to the world."[105] This informational exchange initiates a complex feedback cycle in which the actor's movements affect the environment and the perceived change stimulates the actor's cognition of her agency, which then serves to inform her next action.[106] Thus, the system theorists seem to get things right. Social structure may have more to do with biology, ecology, and complexity than it does with pure reason. To hold otherwise, says Haidt, is nothing but a "rationalist delusion."[107]

Whatever the brain's sources may be, it clearly provides the impetus for some kind of action. Because human beings depend on each other for survival, such acts often are committed on or around other people who live together in groups. The resulting social systems are much like the neural systems that create it: though they function as a whole, they are composed of contradictory parts. People have different wants and goals, even if they share the same needs. These antagonisms only grow more prodigious as simple societies turn into complex cultures.

Like the human body, these sociocultural systems must reconcile their differences to maintain system function. This means they must establish both boundary conditions for stable social behavior and effective mechanisms of enforcement. As an emergent phenomenon, the resulting system of sociocultural homeostasis inherits its key survival principles from our biology. The genetic moral instincts of security, liberty, fairness, loyalty, respect for authority, and sanctity give rise to social norms that set the parameters for group living. When people clash or their conduct otherwise violates these norms, the deviations create social instability, which in turn triggers the need for coordination between the offenders and the collective. Once again, coordination dynamics provides the means of systemic reconciliation—correcting culprits through gossip, ostracism, or punishment; and uplifting damaged victims through retribution, grievance, or amends.

Now that we have scaled the levels of human existence, a few things immediately begin to stand out. Society is not solely a product of human design and agency. Nor is it a brooding omnipresence detached from human nature. Rather, society is a survival system spontaneously organized from the ground up. Though it develops organically, it adheres to the laws of homeostasis and complexity. Yet this narrative is still incomplete. After

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102. LIEBERMAN, *supra* note 82, at 22.

103. HAIDT, *supra* note 84, at 82.

104. LIEBERMAN, *supra* note 82, at 8.

105. J.A. Scott Kelso, *On the Self-Organizing Origins of Agency*, 20 TRENDS IN COG. SCI. 490 (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4912857/ (author manuscript).

106. *Id.*

107. HAIDT, *supra* note 84, at 103.

societies form, how do they coordinate with the systems below? The answer, we shall see, is they systematically coevolve.

B. Epigenetics and Coevolution

Systems in every walk of life are naturally dynamic. Sociocultural systems are no different. In fact, societies and their institutions are subject to two powerful coordinative forces. Epigenetics blends cultural and genetic information in the short term, while gene-culture coevolution extends this synergy down through the ages. Together, these processes ensure that neither the genetic subsystem nor the social super-system becomes stagnant. Instead, each system serves to complement, revitalize, and stabilize the other.

The new science of epigenetics studies the interaction between genes and their contexts or environments.[108] A well-established subsidiary of biology, epigenetics has exploded in popularity over the last decade, inspiring a dramatic upsurge in scholarly papers and an international research project mapping the human epigenome.[109] According to behavioral epigeneticist David Moore, the "revolutionary" and "truly groundbreaking" discoveries of epigenetics have "generated an enormous amount of excitement in several different disciplines, including oncology, nutrition, psychology, philosophy, and others."[110] To date, epigenetic processes have helped to explain a multitude of biological and psychological enigmas, including "psychosis, memory and learning, depression, cancer, circadian rhythms, obesity and diabetes, autism, trait inheritance, homosexuality, addiction, aging, insects' body shapes, the effects of factors like exercise, nutrition, environmental toxins, and early-life experiences . . . the list goes on and on."[111]

Epigenetics compels a momentous revision of prior scientific thinking. Biologists throughout the twentieth century held that genes passed down from parents to children remain relatively fixed. Although people might change over the course of a lifetime, their genomes typically do not.[112] Because life experiences cannot impact an individual's DNA, we live, reproduce, and die with the same genetic information we inherited at the start.[113] Any modifications to the gene line that *do* occur take place through evolution, affecting entire populations across many generations.[114]

Epigenetics doesn't quite flip this script, but it does affect its interpretation. Growing evidence reveals that genes and environments interact throughout a person's life.[115] In fact, genes respond to contextual signals, exchanging information in a life-long conversation between the host's inner and outer worlds.[116] Ultimately, this exchange alters the genome's dynamics; and this change directly shapes our physical and psychological

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108. *See* DAVID S. MOORE, THE DEVELOPING GENOME: AN INTRODUCTION TO BEHAVIORAL EPIGENETICS 20–22 (2015).
109. *See id*. at 6, 8, 101.
110. *Id.* at 6, 9.
111. *Id.* at 8 (internal footnote omitted).
112. *See id.* at 15.
113. MOORE, *supra* note 108, at 43.
114. *See id.* at 15.
115. *See id.* at 12.
116. *See id.* at 102.

characteristics.[117]

To fully grasp this mind-bending idea, it is helpful to think of DNA as a light bulb. Attached to every gene are epigenetic molecules that serve as switches.[118] Environmental factors flip these epigenetic switches, effectively turning the associated gene on or off, or up or down in intensity.[119] When a gene is epigenetically deactivated, its information cannot be read or accessed by the body's biochemical machinery.[120] As a result, the gene's instructions no longer have a physiological influence, or its physiological influence is substantially changed.[121] While the DNA material remains the same, the gene's epigenetic adjustments can be just as important to its performance.[122] In the cogent words of Professor Moore, "[g]iven that genetic activity levels change in different circumstances, what really matters is" not what genes you have, but rather "what your DNA is doing."[123]

Many different types of environmental catalysts can trigger these epigenetic effects. A person's diet or lifestyle choices can leave a mark.[124] So can external conditions like pollution, toxins, or weather.[125] In fact, any environmental factors that create significant physiological or psychological stress can flip the epigenetic switch.[126] This includes family dynamics, group interactions, or other forms of social experience.[127] For example, children can be epigenetically influenced by poverty or abuse, and at least one study suggests that adult genomes may be affected by the host's low socio-economic status.[128]

Such stressors impact the host in a variety of ways. They stimulate neuronal activity in the body's sensory organs, release hormones into the bloodstream, and modulate genes in cell nuclei.[129] These ripples eventually reach the brain, where they alter the host's

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117. *See id.* at 5, 12.

118. MOORE, *supra* note 108, at 14. The term "epigenetic" literally means upon or above the gene to reflect the molecule's switch-like control over the gene beneath.

119. *See id.*

120. *See id.* at 39, 42.

121. *See id.*

122. *See id.*

123. MOORE, *supra* note 108, at 14.

124. *See id.* at 217 (stating that "it is now clear that a wide variety of experiences can influence epigenetic marks, from exposure to certain chemicals or diets to interaction with a nurturing mother or a stimulating physical environment"); Oliver Burkeman, *Why Everything You've Been Told about Evolution Is Wrong*, GUARDIAN (Mar. 19, 2010), https://www.theguardian.com/science/2010/mar/19/evolution-darwin-natural-selection-genes-wrong (discussing these factors in general); '*Epigenetics' Means What We Eat, How We Live And Love, Alters How Our Genes Behave*, SCIENCEDAILY (Oct. 27, 2005), https://www.sciencedaily.com/releases/2005/10/051026090636.htm [hereinafter *'Epigenetics'*] (addressing these influences in general); *Gene Mutations Caused by a Father's Lifestyle Can Be Inherited by Multiple Generations*, SCIENCEDAILY (July 1, 2013), https://www.sciencedaily.com/releases/2013/07/130701135550.htm (noting the effect of a father's lifestyle choices on his children).

125. *See* MOORE, *supra* note 108, at 217; *'Epigenetics'*, *supra* note 124.

126. *See How Epigenetic Memory Is Passed through Generations: Sperm and Eggs Transmit Memory of Gene Repression to Embryos*, SCIENCEDAILY (Sept. 18, 2014), https://www.sciencedaily.com/releases/2014/09/140918141448.htm.

127. *See* MOORE, *supra* note 108, at 100, 217; *Social Experience Tweaks Genome Function to Modify Future Behavior*, SCIENCEDAILY (June 7, 2017), https://www.sciencedaily.com/releases/2017/06/170607123933.htm; *Unraveling the Gene-Environment Interaction*, SCIENCEDAILY (Feb. 17, 2016), https://www.sciencedaily.com/releases/2016/02/160217181108.htm.

128. *See* MOORE, *supra* note 108, at 146.

129. *See id.* at 60.

memory and learning capacity.[130] As the field of behavioral epigenetics shows, the ensuing epigenetic cascade can have powerful psychological effects, transforming the host's emotional reactivity, mental health, and even her social behavior.[131]

Even more important, the environment's genetic legacy is not temporary or isolated. Instead, epigenetic activity can have residual or even enduring ramifications. For instance, every time a cell divides during its normal replication process, its epigenetic markers get passed on from the parent cell to its daughter cells, so the gene's modified expression can persist for the rest of the host's life.[132] But that's not all. A person with a particular epigenetic trait can transmit this informational switch to her children—not just in one way, but two. If the epigenetic marker affects the parent's behavior toward her child, that behavior may flip the same switch in the child, thus prompting the child to display similar behavioral characteristics during her own lifetime.[133] This may help explain why child abusers often were abused children themselves.[134] Most amazing of all, recent research strongly suggests that some epigenetic features can actually be passed on through the germline,[135] and can persist in the genome for up to five generations.[136]

While some writers have urged caution about the rapid rise of epigenetics,[137] its central message now seems widely accepted. As evolutionary biologist John Thompson succinctly summarized, "evolution is as much an ecological process as it is a genetic process" and "[t]he pacesetters of day-to-day evolution seem to be at least as much, and maybe more, ecological rather than genetic."[138] Indeed, "[w]ell-studied examples of ongoing evolution within our lifetimes are being published in professional journals at such a fast rate that it is hard to keep up with them" and "[e]ven those of us who have studied the ongoing evolution of populations have become increasingly impressed by the speed at which some populations are evolving in nature."[139]

Yet even this realization is driven by a still deeper truth. Genetic, epigenetic, and environmental factors operate synergistically as a complex, integrated system.[140] Environments do not just manipulate genes; genes affect environments—the interaction is bidirectional.[141] According to Professor Moore, "people and things in the environment influence behavior, behavior influences neurons, and neurons influence genetic activity," but "genes [also] interact with chemicals like hormones, hormones interact with organ systems like the brain, and the brain interacts with factors in the external world, like

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130. *See id.* at 63, 107–08, 114.

131. *See id.* at 8.

132. *See id.* at 148.

133. *See* MOORE, *supra* note 108, at 160.

134. *See id.* at 77–79 (discussing rodent research suggesting that a neglected child can "inherit" the parents' neglectful characteristics without direct genomic transmission).

135. *See id.* at 146, 155, 157, 162, 163, 167.

136. *See Problems with DNA Replication Can Cause Epigenetic Changes That May Be Inherited for Several Generations*, SCIENCEDAILY (Aug. 16, 2017), https://www.sciencedaily.com/releases/2017/08/170816145357.htm.

137. *See* MOORE, *supra* note 108, at 9, 63.

138. JOHN N. THOMPSON, RELENTLESS EVOLUTION 6 (2013).

139. *Id.* at 3–4.

140. *See* MOORE, *supra* note 108, at 213.

141. *See id.* at 21.

parents, teachers, political leaders, and economic systems."[142] If genes and environments are the system's key parts, epigenetics is the switchboard facilitating their communication.

The gene-environment dialogue is not just epigenetic but generational. Since culture often is the most influential and enduring part of a society's environment, genes and cultures coevolve across entire populations over long periods of time. This idea is not particularly new, dating back at least to the 1980s when it was described as culturgen[143] or dual inheritance.[144] But after being rejuvenated in 1998 by Edward O. Wilson's groundbreaking work, *Consilience: The Unity of Knowledge*,[145] gene-culture coevolution has enjoyed a widespread revival in recent years.[146]

The process of gene-culture coevolution is relatively clear when it produces obvious adaptations to the human phenotype. Perhaps the most striking examples concern the human larynx and facial musculature. As behavioral scientist Herbert Gintis observes, "The increased social importance of communication in human society rewarded genetic changes that facilitate speech,"[147] including the development of "nerves and muscles to the mouth, larynx and tongue."[148] Yet other illustrations abound. Societies that raise cows and drink milk develop lactose tolerance.[149] Cultures exposed to malaria generate a sickle-cell gene to combat it.[150] Plant domestication helped us detoxify certain chemical compounds found in our crops,[151] and cooking food may have altered the jaw muscles and teeth we use to eat.[152]

Behavioral adaptations require greater explanation. Earlier, we described culture as a pool of information stored in the brains of people and transmitted by communication.[153] Individuals striving for natural selection must accumulate and master enough cultural information to ensure their survival. Although one could try to do it all alone, this trial-and-error approach is incredibly time-consuming, extremely inefficient, and potentially dangerous or deadly.[154] Instead, human beings learned to learn from each other. This evolution toward social learning was driven by two selection pressures: the ability to safely navigate and exploit the environment, and the need to coordinate with other people.[155]

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142. *Id.*

143. *See generally* CHARLES J. LUMSDEN & EDWARD O. WILSON, PROMETHEAN FIRE: REFLECTIONS ON THE ORIGINS OF MIND (1983) (explaining this concept as an evolved unit of culture).

144. *See* ROBERT BOYD & PETER J. RICHERSON, CULTURE AND THE EVOLUTIONARY PROCESS 2–3 (1985) (discussing gene-culture coevolution as a dual inheritance theory).

145. EDWARD O. WILSON, CONSILIENCE: THE UNITY OF KNOWLEDGE (1998).

146. *See* BOYD & RICHERSON, *supra* note 61 (published in 2005); Maciej Chudek & Joseph Henrich, *Culture–Gene Coevolution, Norm-Psychology and the Emergence of Human Prosociality*, 15 TRENDS COG. SCI. 218 (2011) (published in 2011); Herbert Gintis, *Gene–Culture Coevolution and the Nature of Human Sociality*, 366 PHIL. TRANS. ROYAL SOC. B 877 (2011) (published in 2011).

147. *See* Gintis, *supra* note 146, at 880.

148. *Id.* at 880, 881.

149. *See* Jason G. Goldman, *How Human Culture Influences Our Genetics*, BBC FUTURE (April 10, 2014), http://www.bbc.com/future/story/20140410-can-we-drive-our-own-evolution.

150. *See id.*

151. *See id.*

152. *See id.*

153. *See* BOYD & RICHERSON, *supra* note 61, at 6.

154. *See* BOYD & RICHERSON, *supra* note 144, at 19–20, 421, 423; BOYD & RICHERSON, *supra* note 61, at 14.

155. *See* Chudek & Henrich, *supra* note 146, at 218.

The coordination part is especially tricky since the learning process itself requires social coordination between the learner and her prospective teachers. At first, such learning might occur directly along three axes—vertically from parent to child, horizontally from peer to peer, and obliquely from elder to younger.[156] But even this strategy is less than perfect. Besides raising trust and competence issues, it still offers the learner an insufficiently small sample size. So humans adapted once again, this time by learning through observation and imitation.[157] Since the learner is surrounded by people whose ancestors passed the test of natural selection, copying their behavior is a practical short-cut to accessing their collective cultural wisdom.

Of course, observational and imitative learning—and the coordinative relations that flow from them—require skills of their own. The learner must be welcomed around others and be capable of engaging in acceptable forms of interaction. To achieve these things, she must possess a number of psychological dispositions, like cooperativeness, trust, fairness, and conformity.[158] People displaying these dispositions will be more successful in accumulating cultural information and will hold an adaptive advantage over their less socially skilled counterparts.

As this coevolving psychology develops, such new knowledge gets downloaded into mankind's genetic and neural operating systems.[159] Now internalized, these social norms readily transform into moral values that induce people to conform to the duties and obligations of society even without external pressure or punishment.[160] In this way, morality erupts as an emergent property of gene-culture coevolution,[161] initiating a stabilizing domino effect that is both self-organized and self-enforcing.[162] So viewed, this coevolutionary process is yet another manifestation of humanity's systemic complexity. As Professor Gintis instructs,

> we know that life-forms affect their own environment and the environments they produce change the pattern of genetic evolution they undergo. . . . Gene–culture coevolution . . . recogniz[es] that both genes and culture are subject to similar dynamics, and human society is a cultural construction that provides the environment for fitness-enhancing genetic changes in individuals. The resulting social system is a complex dynamic non-linear system. Such systems have emergent properties, . . . [including] social norms, morality, other-regarding

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156. *See* Gintis, *supra* note 146, at 878.

157. *See* BOYD & RICHERSON, *supra* note 61, at 14–15; BOYD & RICHERSON, *supra* note 144, at 8–9, 428. Because gene-culture coevolution is a process, it is perhaps best explained as a series of evolutionary steps. Famed evolutionary biologist, Edward O. Wilson, describes the progression this way:

> *Genes prescribe epigenetic rules, which are the regularities of sensory perception and mental development that animate and channel the acquisition of culture.*
>
> *Culture helps to determine which of the prescribing genes survive and multiply from one generation to the next.*
>
> *Successful new genes alter the epigenetic rules of populations.*
>
> *The altered epigenetic rules change the direction and effectiveness of the channels of cultural acquisition.*

WILSON, *supra* note 145, at 157.

158. *See* Chudek & Henrich, *supra* note 146, at 219.

159. *See id.* at 224; Gintis, *supra* note 146, at 880.

160. *See* Ginitis, *supra* note 146, at 881.

161. *See id.* at 883.

162. *See* Chudek & Henrich, *supra* note 146, at 224.

preferences[,] and the internalization of norms.[163]

The longer this system persists, the harder it becomes to tell genes from memes.

IV. JURISYSTEMS

With this understanding in place, we now can begin to explain the legal system—mankind's *social* form of homeostasis. Like the body's homeostatic system, law sets control parameters for human survival, monitors instability, and takes corrective action to resolve conflicts. While these rules have biological origins, they constantly adapt our moral impulses to challenges presented by the environment. This evolving sense of legality scales up from individuals to groups and influences social behavior. Over time, these informal constraints become proto-legal mechanisms for maintaining social equilibrium. When societies diversify, these mechanisms often falter, so a higher authority is needed. That authority is the complex legal network we now call law. Informed by its coordinative constituents, law is prominent, permanent, autonomous, and preeminent. It also is incredibly dynamic. Once entrenched, this formal regulatory network coevolves with the "jurisystems" below, reshaping social norms, changing human rationality, and even revising our most basic homeostatic instincts.

A. Legality

Legal theorists intuitively equate the idea of legality with the rules, principles, or norms underlying human legal systems. But this interpretation is unduly narrow. In fact, it is neither sufficiently *human* nor sufficiently *systemic*. Let's consider these limitations in reverse order, moving from the general to the specific.

All systems—whether natural or human—are lawful in at least two different senses. The first is the idea that systems are governed by the laws of nature in that they display regular patterns according to accepted physical principles. The other connotation speaks more to system properties. As we saw earlier, all systems contain boundary conditions or control parameters that not only restrict and coordinate the interaction of their parts, but also guide their relations, shape their functions, and define their holistic identity.[164] In this respect, systems possess a behavioral legality.

Because human systems are natural, they possess the same law-like characteristics. Molecular, genetic, neural, and other bodily systems all obey both physical laws and the laws of complexity. They operate under the systemic constraint of homeostasis, which sets performance rules for every biologic part to protect the health and welfare of the whole person. Because these biological systems inform the host's decision-making, both human agency and its worldly effects are susceptible to natural influence as well. In fact, these laws readily scale up to societies. When interpersonal encounters create conflict, the human homeostatic impulse kicks in once again, alerting people to the life-threatening imbalance and prompting them to take action to restore social stability. Such responses are not haphazard but convey the law-like complexity of coordination and reconciliation.

Law emerges to regulate this social layer and all the systems below. As a complex

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163. Gintis, *supra* note 146, at 885 (emphasis omitted).

164. *See supra* text accompanying notes 77–80.

system, law exudes the same lawful properties as its subsidiaries, creating boundary conditions that order relationships, coordinate interactions, and resolve conflicts for individuals, groups, organizations, institutions, and societies. Yet law's legality is not solely the result of social emergence. Rather, legality is part of a larger cycle of human emergence—one that begins in mankind's physiology and ascends all the way up to the species' highest cultural institutions and all the way back down into our DNA. Thus, legality also is not just a social or cultural construction. Instead, it is embedded in human nature.

That nature consistently externalizes its homeostatic values into social practices we describe as law. Law does not pop up sporadically over time in scattered cultures particularly suited for its creation. Rather, legal systems exist *everywhere* in one form or another.[165] The reason is that law is not simply historical or diachronic, as most legal theorists assume. Rather, the legality of legal systems is characteristically synchronic, constantly reconciling mankind's selfish, social, and rational impulses in cyclical patterns of conflict. Thus, all legal systems develop laws of contract, tort, crimes, property, and domestic relations to handle recurrent social problems, like consensual and nonconsensual squabbles, resource distribution matters, and issues relating to procreation.[166]

As we shall see momentarily, other legal features vary with a system's complexity, but at higher levels, the details are remarkably consistent with mankind's lower biological precursors. In earlier works, I noted that such complex systems generally create complementarities of rights and duties and reconcile them by coordinating "intuitive" rules or standards with "rational" policies or principles.[167] These legal norms, in turn, link to deeper value conflicts which force us to harmonize our egocentric drives, our social instincts, and our ratio-holistic urge for integrity and sanctity.[168] Because such qualities create a homeostatic rubric for the survival of our species, they imbue the law with a distinctively human sense of legality.

B. Proto-Legal Mechanisms

Although mankind's legal sensibility is innate, that proclivity increased in complexity over the course of human evolution. Eventually, this self-regulatory impulse reached a watershed moment when its internal operations became externalized. Homeostasis was no longer just the law of the person; it was a proto-legal mechanism for guiding and coordinating groups of people. Though society alone did not cause law, it did coax law's emergence into a higher survival system. Yet law's emergents were far from fully realized. Though such proto-legal mechanisms initially harmonized social systems, they proved too unstable to last for long.

Law's tale begins where our coevolutionary story left off. People living in proximity to each other needed to cooperate in order to survive. The better they were at cooperating, the more successful they became at passing on their genes. Over time, the cooperator's

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165. *See* Calnan, *supra* note 14, at 53 (noting that anthropologist, Donald Brown, considered law a human universal).

166. *See id.* at 66 (reporting this finding from other sources).

167. *See id.* at 61–69.

168. *See supra* text accompanying notes 85–86.

genome developed traits to better facilitate cooperation, and these traits ultimately gave rise to a supporting set of moral values.

At this point, mankind had evolved into a social animal. According to Professor Lieberman, "To the extent that we can characterize evolution as designing our modern brains, this is what our brains were wired for: reaching out to and interacting with others."[169] Professor Haidt analogizes this instinct to the "groupish" mindset of bees, which exists in our brains as a kind of "hive switch."[170] "The hive switch," says Haidt, "is an adaptation for making groups more cohesive, and therefore more successful in competition with other groups."[171] Though there are many ways of flipping this switch—including law—the effect is utter eusociality. As Haidt explains, "Under the right conditions, [people are] able to enter a mind-set of 'one for all, all for one' in which they [are] truly working for the good of the group, and not just for their own advancement within the group."[172]

Such groupishness is fomented in other ways as well. The hormone oxytocin makes people feel a special connection to their kin or their social group.[173] Meanwhile, mankind's imitative instinct leads to a powerful urge for conformity, causing people to adopt behaviors simply because everyone else is doing them.[174] Such groupish tendencies then spread like a social contagion. Because of our "mindreading" capacity, people's emotions and moods are affected by the affect of others, initiating an unstoppable chain-reaction.[175] Besides forging social bonds, such interactive emotional synchrony offers a quick way to convey information about the environment and its relative safety or danger.[176] Before long, people within this circle of trust begin to identify themselves not by their personal attributes, but rather by the groups to which they do or do not belong.[177]

If this were the end of the story, human social systems would never have needed law. But the evolution of social intercourse has a twist of complementarity. Human groupishness divides as much as it binds. While oxytocin makes you more prosocial to people like you, it biases you against others who appear different.[178] This rift is deepened by a psychological grouping bias. Merely separating people into groups causes them to hold negative views of the out-group, even when the distinctions are tenuous or arbitrary.[179] The resulting Us/Them mentality is further enhanced by inflating the merits of the arbitrary markers, attaching them to the out-group's value system, and automatically assuming the superiority of the in-group's own core values.[180] People eventually cluster into separate "norm circles" in which members both endorse the same set of values and

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169. LIEBERMAN, *supra* note 82, at 9.
170. HAIDT, *supra* note 84, at 259.
171. *Id.*
172. *Id.* at 258.
173. *See id.* at 270–72.
174. *See* SAPOLSKY, *supra* note 67, at 572.
175. *See* NICHOLAS A. CHRISTAKIS, CONNECTED: THE SURPRISING POWER OF OUR SOCIAL NETWORKS AND HOW THEY SHAPE OUR LIVES 35 (2009).
176. *Id.* at 37.
177. *See* SAPOLSKY, *supra* note 67, at 576.
178. *See id.* at 152.
179. *See id.* at 491–93.
180. *See id.* at 493–95.

are expected to observe and enforce them.[181]

The formation of these social cells has immediate systemic consequences. The morality of each group not only defines and coheres its normative system, it also distinguishes and distances its members from other social groups, which now appear as competitors. Even within groups, a cell of dissent can arise to challenge the whole. These agonistic systems now face the same survival problem originally confronting their individual members. They must find ways to cooperate and coordinate or risk sudden or gradual extinction.

The regulatory system of homeostasis provides a ready solution. People can maintain social equilibrium by enforcing the boundaries of essential group harmony. This requires decisive action to prevent destabilizing deviations. As I noted in prior work, one early strategy was to impose peer-to-peer sanctions, either by gossiping about the violator or by subjecting her to physical punishment.[182] Here, the stabilizing system—the group—regulates the behavior of a destabilizing inferior system—the individual. Such tactics were succeeded by group punishments in which representatives of the social whole control its recalcitrant parts.[183] In each case, forces *outside* the actor serve to correct the homeostatic disruption. Thus, these proto-legal mechanisms mark the first giant leap towards an *external* form of law.

While this historic development solved one stability problem, it also created others. Peer punishments could result in injury or death to the punisher or could incite acts of retribution by the offender or her friends. Group or social sanctions could provide greater security to the punishers, but still would be far from ideal. Changing environmental conditions might cause constant shifts in societal values, making it more difficult both to assess deviance and to muster willing punishers. In time, these shifts could cause fissures that splinter society into factions, so even a punishing group may not remain free from aggressive reprisal. Given all these uncertainties, a pall of unpredictability inevitably settled over these proto-legal communities. This unease surely increased the probability of future confrontations. But it also may have incited something far more consequential—the emergence of mankind's greatest survival stratagem, a complex legal network.

C. A Complex Legal Network

Though we do not know exactly why or when human beings developed formal legal systems,[184] science now helps us understand the social conditions that made it not only possible, but likely. Research in the biological and social sciences confirms that "social stress is a chronic or recurring factor in the lives of virtually all higher animal species."[185] According to neuroscientist Sapolsky, "A 'stressor' is anything that disrupts homeostatic

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181. ELDER-VASS, *supra* note 21, at 123.

182. *See* Calnan, *supra* note 14, at 33–35.

183. *See id.* at 35 (discussing the practices of public grievance and group punishment).

184. *See* GILLIAN HADFIELD, RULES FOR A FLAT WORLD: WHY HUMANS INVENTED LAW AND HOW TO REINVENT IT FOR A COMPLEX GLOBAL ECONOMY 41 (2016) (stating that "[w]e don't really know when law first emerged in human societies").

185. C.R. McKittrick et al., *Social Stress Effects on Hormones, Brains, and Behavior*, *in* HORMONES, BRAIN AND BEHAVIOR 333, 334–35 (D.W. Pfaff et al. eds., 2009).

balance."[186] A physical stressor poses actual, external challenges like raging wildfires or knife-wielding muggers.[187] But stressors also can be psychosocial. These are things in society that make someone *fear* that her homeostatic balance will be disrupted, even if she faces no immediate danger.[188]

Various factors can trigger such an anticipatory stress response, including the absence of stress outlets or social support, and the exposure to high rates of physical stressors.[189] But perhaps the most common and critical factor is one's self-perceived inability to predict or control the anticipated hazard.[190] While these conditions can exist in any social setting, they are exaggerated in status-based hierarchical arrangements. Such stressors are especially pronounced at the bottom and top of the social hierarchy. As one might expect, people with low social status feel more stress about basic necessities like food, shelter, security, and so on.[191] Yet the rich and powerful sense extreme pressure as well, often because they bear responsibility for subordinates, confront challenges from competitors, and face heightened expectations for their achievement.[192]

Both physical and psychosocial stressors have biological, epigenetic, and behavioral effects. Besides inducing an array of endocrine and neural adaptations,[193] social stress can have debilitating consequences for the body, including altering immune system function, increasing the risk of cardiovascular disease and metabolic syndrome, inhibiting male and female reproduction, and contributing to psychopathologies like anxiety, depression, post-traumatic stress disorder, and acute stress disorder.[194] Eventually, such stress can influence the epigenetic markers of the genome, destabilizing sufferers throughout their lives and possibly impacting their descendants.[195]

As for behavior, stress can have devastating consequences for social solidarity. Psychosocial stress causes children to be "hypervigilant, slow to trust, and quick to deploy [their] defenses."[196] Stressed kids "have difficulty regulating negative emotions, actions, and thoughts"[197] and thus are more prone to "'flipping their lids' and either blowing up or freezing in fright when they detect signs of negative intentions or rejection."[198] Because adults are more socially active, their anticipatory stress reactions are even more disruptive.

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186. SAPOLSKY, *supra* note 67, at 163.

187. *See* Robert M. Sapolsky, *The Influence of Social Hierarchy on Primate Health*, 308 SCIENCE 648, 648 (2005).

188. *See* SAPOLSKY, *supra* note 67, at 164–65; Sapolsky, *supra* note 187, at 648.

189. Sapolsky, *supra* note 187, at 650.

190. *Id.*

191. *See* McKittrick et al., *supra* note 185, at 335.

192. *See* Sapolsky, *supra* note 187, at 648–50.

193. *See id.* at 648; SAPOLSKY, *supra* note 67, at 162.

194. *See* McKittrick et al., *supra* note 185, at 335.

195. *How Stress Can Change Your DNA*, SCI. NEWS (Nov. 6, 2017), http://sitn.hms.harvard.edu/flash/2017/stress-induced-dna-modification-may-play-role-mental-illness/; Mitchell L. Gaynor, *How Stress Changes Your Genes*, PSYCH. TODAY (Jan. 6, 2015), https://www.psychologytoday.com/us/blog/your-genetic-destiny/201501/how-stress-changes-your-genes-0.

196. Jonathan Baylin, *Behavioral Epigenetics and Attachment*, NEUROPSYCHOTHERAPIST, Oct.–Dec. 2013, at 67, 70.

197. *Id.* at 73.

198. *Id.* at 71, 73.

People under social stress not only display "reduced affiliativeness and social contact,"[199] they also are more selfish, fearful, and aggressive.[200] Their social conduct is less measured and more risky and impulsive.[201] When stress fosters these behaviors, they rapidly pass like a virus from person to person.[202] In short, stress makes human beings unsociable, impeding our essential bonding faculties of "cognition, impulse control, emotional regulation, decision making, empathy, and prosociality."[203]

This is the likely environment of our proto-legal forebears. Social organization was informal and stratified. Given the hierarchical inequalities, people at the bottom of the pecking order had a lot to worry about. In addition to scrapping for bare necessities, they had to stress over constant encroachments from above. The lowly might make accusations of unfair treatment, but they were not guaranteed credibility or assistance. Even if they found a helping hand, the attempted punishment could easily culminate in a blood feud.

Dominant parties faced similar uncertainties. They were under continual threat from subordinates intent on lowering their alpha status and usurping their social power. If underlings sought their protection, group leaders would be expected to intervene on their behalf, often by using physical force.[204] When punishments were required, the strong would be called upon to implement them. Yet, like the bottom-dwellers they served, the top dogs could never rest at ease because their disgruntled punishees could always seek vindication, reproval, or retaliation. Since such proto-legal corrections came from within an unstable and unpredictable system, their authority could appear contingent and ephemeral.

Of course, we cannot say conclusively what happened next, but social network theory offers some valuable clues. Simple networks—like proto-legal societies—typically contain chains of dyadic relationships founded on notions of reciprocity and mutuality.[205] These dyads create the kind of contagious homophily that make social living possible.[206] While these networks may spawn status hierarchies, relationships within the hierarchy remain largely reciprocal, with the polar strata exchanging protection for loyalty. More important, all members continue to adhere to the same local values, and no person is juridically superior to anyone else. Status positions merely rise and fall depending on changing social dynamics.

Because any dyadic conflict automatically disturbs homeostatic equilibrium, such stressed networks naturally develop a triadic structure. Adding a third element to an existing dyad not only makes the system complex, it restores a state of balance.[207] So long as the new member has a positive relationship with the dyad, the addition inevitably moves

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199. McKittrick et al., *supra* note 185, at 342.

200. *See* SAPOLSKY, *supra* note 67, at 170–72.

201. *See id.* at 169–70.

202. *See Is Your Stress Changing My Brain? Stress Isn't Just Contagious; It Alters the Brain on a Cellular Level*, SCIENCEDAILY (Mar. 8, 2018), https://www.sciencedaily.com/releases/2018/03/180308143212.htm.

203. SAPOLSKY, *supra* note 67, at 175.

204. *See* HAIDT, *supra* note 84, at 166; SAPOLSKY, *supra* note 67, at 545.

205. *See* CHARLES KADUSHIN, UNDERSTANDING SOCIAL NETWORKS: THEORIES, CONCEPTS, AND FINDINGS at 21–22 (2012).

206. *See id.* at 18–20.

207. *See id.* at 23.

the system towards harmony and stability.[208] Proto-legal societies apparently followed this pattern. These dyadic systems added a third component—law—to quell inner tensions. Legality was no longer just an internal instinct or a desultory intra-system practice. Rather, it had been transformed into a *prominent* and *permanent* set of fundamental principles, incorporated into a *separate* regulatory system, and elevated in authority *over* society. What had been a simple cooperative association was now a complex legal network.

Although this transformative development cannot be traced to any specific historical event, it may have occurred as early as the fourth millennium BCE in societies within Mesopotamia and Egypt.[209] Perhaps the best and most notable illustration of law's emergence is Hammurabi's Code, the 1800 BCE Babylonian artifact that many scholars believe was among the first of its kind.[210] King Hammurabi's compendium of social rules checks all of the boxes for a complex legal network. He made the code separate and permanent by carving his rules into massive, seven-foot-tall stone monuments instead of inscribing them on flimsy materials like clay or papyrus tablets.[211] Besides its material durability, the code also possessed normative staying power. Hammurabi accomplished this by including a persistence clause that threatened divine vengeance against any subsequent rulers who dared to corrupt his words or change his monument.[212] The king also ensured the code's prominence, erecting several such monuments in conspicuous places throughout his kingdom.[213]

Finally, Hammurabi made no mistake about the code's authority over his people. While the ruler was an imposing figure in his own right, he invoked the gods' supreme will to sacralize his rules. To this end, Hammurabi decorated the monuments with a picture of himself communing with the Sun-God[214] and declared in the prologue that "Anu and Bel [two gods] called by name me, Hammurabi, the exalted prince, who feared God, to bring about the rule of righteousness in the land, to destroy the wicked and the evil-doers; so that the strong should not harm the weak."[215]

On reflection, the transition to legal systems like this seems completely natural. Besides its network origins, law emerges from many of mankind's deepest drives. Placing law at the top of the social pyramid satisfies our urge for hierarchy,[216] and reflects our inbred deference to authority.[217] As Professor Sapolsky confides, "humans show obedience to authority that transcends any given occupant of a throne."[218] In fact, Haidt notes that "[t]he urge to respect hierarchical relationships is so deep that many languages

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208. *See id.*
209. *See* HADFIELD, *supra* note 184, at 41.
210. *See id.* at 77 (noting the common belief that Hammurabi's stone pillars represent a watershed in the evolution of law).
211. *See id.* at 41, 77.
212. *See id.* at 77.
213. *See id.*
214. *See* HADFIELD, *supra* note 184, at 42.
215. HAIDT, *supra* note 84, at 167 (quoting HAMMURABI, ROBERT FRANCIS HARPER, THE CODE OF HAMMURABI, KING OF BABYLON, ABOUT 2250 B.C. 4 (Robert Francis Harper trans., Univ. of Chi. Press 2d ed. 1904) (1901)).
216. *See* SAPOLSKY, *supra* note 67, at 540.
217. *See* HAIDT, *supra* note 84, at 165–69.
218. SAPOLSKY, *supra* note 67, at 571.

encode it directly."[219] And for good reason. People crave authority for its security. Human authority is not just raw power backed by brute force; rather, it is a responsibility for maintaining order and justice.[220]

Law fills this role openly and exclusively. Hammurabi's code certainly did, repeatedly touting the king's commitment to protect the weak and the poor.[221] As society's highest authority, law-the-protector possesses an independence and objectivity unsullied by the pressures and biases plaguing its proto-legal forerunners. In this sense, law is the positive force of the new social triad, preserving people's rights from on high even as they clash below. Everyone has a stake in supporting this new legal authority because no one is ever above it.

As Hammurabi's code attests, law's heightened status also appears to be grounded in the moral foundation of sanctity. Once the rules of social intercourse are designated as laws, they lose their mundane quality. The most fundamental rules are regarded as "natural" or "inalienable" and treated as timeless and untouchable.[222] The sanctification of these norms, we saw, bolsters feelings of group exceptionalism and reinforces social connectivity.[223] Even when laws are less essential, they are shrouded in ritual, ceremony, and formality. These trappings project law's "specialness" and enhance its social authority.[224] By embedding our beliefs and values in law, and then placing them on a pedestal, our psychology of sacredness helps to galvanize our moral communities. Thus, should someone under the law desecrate one of its lofty pillars, our social response is sure to be, in Haidt's words, "swift, emotional, collective, and punitive."[225]

But what about law's creators or administrators? It's possible the Hammurabis of the world thought *they* were *above* the law since they acted with divine authority. If so, they undoubtedly learned a quick and costly lesson. Hierarchical command is not the only source of human authority, and godly affirmation is not the only source of legal sanctity. As noted earlier, our moral compass also points to a strong ethic of community, which sanctifies values like fairness, justice, and reciprocity. Thus, a complex legal network could be based on longstanding *social* custom or *rational* secular principles fundamental to human flourishing.

In fact, in the years following Hammurabi's code, societies experimented with an assortment of legal systems ranging from religious groups, local despots, and family dynasties to communes, co-ops, and merchant guilds.[226] Inevitably, the coexistence of these systems placed them in direct or indirect competition.[227] Those that promoted group cohesion would persist, while those that sowed dissension might wither and die. Thus, the best legal systems would seek to coordinate their conflicting values to avoid getting stuck at extremes. In the end, even monarchs and emperors had to adapt to this reality. Under

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219. HAIDT, *supra* note 84, at 165.
220. *See id.* at 167.
221. *See* HADFIELD, *supra* note 184, at 42.
222. *See* Calnan, *supra* note 14, at 64.
223. *See supra* text accompanying notes 169–77.
224. *See supra* text accompanying notes 169–77.
225. HAIDT, *supra* note 84, at 174.
226. *See* HADFIELD, *supra* note 184, at 6.
227. *See id.* at 6–7.

the medieval divine right of kings, sovereigns had to enter into reciprocal protection pacts with their subjects and could lose their divine powers if they engaged in acts of tyranny.[228]

So the upward dynamics behind law's emergence were enabled by several propitious factors which eventually took shape as defining characteristics. These assets certainly allowed human beings to escape their precarious existence and develop more enduring social structures. But the very same features also helped to perpetuate mankind's complex legal network. Through a process of downward causation, the cultural genius of law coevolved with human biology to constantly refresh our innate legality.

Law's immediate effect is to make life more predictable. Its norms do not hide inside the minds of strangers or transform with their tastes or moods. Law also is not left to the chance initiative of one's peers. Instead, our complex legal network coordinates social intercourse from a detached but propitious vantage point, applying discernable and consistent principles in an open and even-handed fashion. Its visible accouterments—lawmakers, judges, lawyers, law books, legal temples, and even monumental law codes—fill us with confidence should we ever find legal trouble. But law's more important predictability is what we do not see, experience, or even think about. People living under law do not face the persistent imminent threat of extinction. Unlike their proto-legal ancestors, who constantly feared for their safety, law's charges engage in social activities expecting that their permanent protector will secure their possessions, bodies, and loved ones.

Such predictable stability has circular prosocial effects. Legal subjects feel less stress about their social surroundings. As a result, they become less fearful, suspicious, and aggressive and reopen themselves to social interaction. Because of this dramatic stress reduction, individual genomes do not undergo antisocial epigenetic modification. Instead, people's hive switches stay flipped on, causing them to increase their prosocial behaviors. These behaviors are learned and copied by other stress-free observers, who perpetuate the wave of sociability. These sociophiles give birth to even less stressed children, and the coevolutionary cycle repeats its escalating march toward social harmony.

While this predictability pattern is circuitous, law's other socializing effects are far more direct. The conspicuous glorification of law induces sociability in two critical respects. It plays a major role in flipping our hive switch in the first place. A legal system is the highest expression of shared intentionality—the human capacity to share mental representations for a common purpose.[229] As Haidt points out, "When everyone in a group began to share a common understanding of how things were supposed to be done, and then felt a flash of negativity when any individual violated those expectations, the first moral matrix was born."[230] So was the basis of law. Though people shared social intentionality in proto-legal systems, law literally took it to another level. Law not only embodies these norms, it customizes, preserves, and sacralizes them. These become *our* rules, so their exclusivity makes them special. Yet law is also bigger and better than us, reflecting a consciousness greater than any individual or group. By highlighting and dignifying our

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228. *See* ALAN CALNAN, A REVISIONIST HISTORY OF TORTS: FROM HOLMESIAN REALISM TO NEOCLASSICAL RATIONALISM 94 (2005).

229. *See* HAIDT, *supra* note 84, at 238.

230. *Id.* at 239.

social bonds, law effectively switches our mindsets from selfish to social, inducing our fidelity to the collective even without coercing our obedience.

In fact, law makes us *want* to comply on our own. As Professor Lieberman elaborates, "[e]volution has wired us with panoptic self-control in which the mere possibility of being judged and evaluated by others dramatically increases our tendency to behave in line with society's values and morals."[231] That instinct is so sensitive it can be triggered abstractly, so long as the impetus somehow reminds people of their potential visibility to others.[232] For example, a person acting in front of a mirror is far less likely to violate a social norm because the reflection allows the actor to see herself as others do.[233] Law seems to serve as such a magic mirror. A public projection of *everyone*'s norms and values, law—the revered overseer—reminds us of society's expectations and alerts us to the reality that we are always being watched and evaluated.[234] Because this awareness elicits self-restraint, law constantly prods us towards sociability just by its very conspicuous and reflective existence.[235]

Law's final effect is to facilitate social learning. In a broad sense, law acts as society's social memory, storing in its data banks all of the system's most vital information. So when people seek to discover how to behave, they do not have to rely on their family and friends or even their own powers of observation. Instead, they need only turn to law, society's oracle of collective wisdom. On a smaller scale, law's memory tends to inform and reinforce the values and beliefs of society's many norm circles. Whether they arise in communities, businesses, professions, schools, religions, hobbies, sports, or what have you, these subgroups play perhaps the most direct role in shaping people's behavior. Thus, just as norm circles contribute to the upward trajectory of law's emergence, law continuously trickles down into the threads of our social fabric, priming us for compliance by connecting to our inner social being.[236]

Still, one might wonder how seemingly disparate and intangible things like information, instincts, social cues, coordination dynamics, or even law, could have a real causal impact on something as tangible as a human being. The trick is to see them not as several different phenomena, but as complementary aspects of one big system. If being social is like flipping a switch, it is easy to attribute the cause to the switch flipper. In legal terms, this might seem to single out punitive or regulatory sanctions, which we associate with direct and indirect deterrence of antisocial behavior.

But really, the legality switch and its flipper are just parts of an extended super-system. Evolution designed our biological switch and eons of culture refined it. During that process, the human genome and brain assembled the switch's physiological and psychological components to ensure its mechanical efficacy. Even as the switch was under development, society tested various switch-flipping techniques—like imitation, norm

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231. LIEBERMAN, *supra* note 82, at 228 (emphasis omitted).
232. *See id.* at 229, 232.
233. *See id.* at 231–32.
234. *See id.* at 231, 234.
235. *See id.* at 232.
236. *See* Janice Nadler, *Expressive Law, Social Norms, and Social Groups*, 42 L. & SOC. INQUIRY 60, 63, 69, 70–71 (2017) (noting that law works only if people are open to it; and they are open to it only if it reflects their values).

circles, and peer punishments—and trained generations of novice flippers. Were we to eliminate any one of these features, we would have a completely different network, if one existed at all. Of course, law finally emerged as humanity's flipper extraordinaire, so it often receives causal credit. But in truth, it never mastered or secured the job. Instead, it continues to coevolve with genes and culture to synchronously coordinate our complex jurisystems.

V. CONCLUSION

Jurisprudence and empirical science historically have had little in common. Yet they do share one core concept: evolution. Granted, the jurisprudential usage of this term has never been scientific. Instead, evolution has served mostly as a convenient analogue for describing the law's process of social adaptation and gradual change. Though this explanation was never supported by evidence, it has persisted because it clearly and succinctly conveys a familiar idea.

Unfortunately, this evolutionary maxim is misconceived. Law does not evolve in the linear, progressive, and unilateral fashion described by jurisprudents. Instead, law coevolves with genes, brains, people, societies, and cultures in a loopy, coordinative, information exchange that promotes stability and survival. The question now is what to make of the error. If the problem were merely conceptual, we might simply correct the record and adjust the analogy. But the ramifications here are far more fundamental.

Since law's coevolution is real, it cannot be captured by jurisprudence alone. Instead, it must be founded on science, which employs a reliable methodology to justify such ontological claims. Thus, any "evolutionary" theory of law that continues to depend solely on humanities disciplines like analytic philosophy or history cannot escape appearing unnecessarily speculative. It also follows that theories *ignoring* law's coevolutionary nature must bear a heightened responsibility to justify the oversight. Works of specific jurisprudence could still meet this burden by performing the important spadework of unearthing granular truths about law's doctrines, practices, and policies. However, scholars seeking to assemble these facts into theories of general jurisprudence would seem hard-pressed to grasp law's essence without conducting a more holistic investigation.

In this spirit, some legal theorists already have enlisted the help of the social sciences. But even this is not enough. Because legal coevolution is polycentric and bi-directional—scaling up and then back down through human biology, society, and culture—the social science perspective is necessarily too narrow. Indeed, given the interconnectedness of these causes, a blinkered focus on any single factor alone may be potentially misleading. Such a complex subject requires a comprehensive point of view—one capable of uniting the natural sciences, the humanities, *and* the social sciences.

The field best suited for this purpose is systems science. As sociologists now recognize, systems science not only accounts for the nested and interdependent structure of cultural phenomena like law, it also strives to explain *all* of the dynamic forces that create, sustain, and transform them. This view stands in stark contrast to existing evolutionary theories that define law in only social or historical terms, or conceptual approaches that treat law as an abstract immutable ideal. The central lesson of systems theory is, while change has *infinite* sources, it is the *only* changeless feature of law.

In fact, the same principle applies to jurisprudence. Because legal theory is one of law's main information systems, it must either coevolve or perish. This truth certainly was not lost on Holmes, who popularized law's evolutionary narrative. As a commentator, Holmes originally believed that the life of the law was not logic, but experience. But after years serving as a judge, he gradually changed his mind. According to Professor Elliott, Holmes's later mantra could have read: "The life of the law is the cybernetic process by which experience modifies the available logic set."[237] Perhaps if Holmes had lived long enough to see the dramatic breakthroughs in the natural, social, and systems sciences, his thinking would have coevolved further still. Law, he might surmise, is not limited by logic *or* experience, but is a *systemic* and *coordinative synthesis* of the genetic, epigenetic, neuropsychological, and sociocultural forces that help to sustain life itself.

237. Elliott, *supra* note 10, at 144.