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## PROPRIOCEPTION, NON-LAW, AND BIOLEGAL HISTORY

### The Dunwoody Distinguished Lecture in Law

Owen D. Jones\* †

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\* Visiting Professor of Law, University of Texas School of Law; Professor of Law, Arizona State University College of Law; Faculty Fellow, Center for the Study of Law, Science, and Technology; J.D., Yale Law School; B.A., Amherst College. This Article is based, in part, on a lecture delivered as the 20th Annual Dunwoody Distinguished Lecture in Law, on March 30, 2001, at the University of Florida College of Law. The lecture was titled "The Physics of Law, The Shape of Behavior, The Promise of Biology."

† I am grateful for the contributions of Patrick Brennan, David Buss, Ira Ellman, Lydia Jones, Lars Noah, Jeffrey Stake, and numerous colleagues at my home institution. I am also grateful for helpful comments from those who participated at, or in this volume comment on, the Dunwoody Lecture, as well as for comments from participants at the conference on *Law, Behavioral Biology, and Economics*. Charles Oldham provided valuable research assistance.

No receipt of an honor such as this one is complete without acknowledging the often unquantifiable influences of others. I first studied the intersection of law and biology in 1984, in an undergraduate course in behavioral biology taught by Bill Zimmerman, of Amherst College. That exposure initiated my continuing interest in the subject. Conferences of the *Gruter Institute for Law and Behavioral Research*, to the existence of which I was first exposed in a related and then-singular 1988 law school seminar with Donald Elliott and Roger Masters, as well as conferences of the *Human Behavior and Evolution Society*, led me to the company of others who share an interest in the relationship between law and biology. Those colleagues, as well as colleagues in the *Society for Evolutionary Analysis in Law* (SEAL), have been unfailingly generous with their time and insights, for which I am grateful.

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*Proprioception, n. Physiol.* the ability to sense, without seeing or touching, how the different parts of the body relate to each other, in space, position, posture, and internal condition.<sup>1</sup>

## I. INTRODUCTION

There are two paradoxes at the heart of what we do. First, while law is fundamentally about regulating human behavior, it has no independent theory of human behavior. Second, while all behavior relevant to law arises from the functional design of the human brain, we in law have historically exhibited little interest in learning anything about brain design. As a consequence, we maintain and often unknowingly manifest a rather quaint view of the relationship between behavior and brain—a view in which the brain is a general-purpose computer, utterly lacking in significant, meaningful, behavior-biasing, information-processing predispositions.

Picture for a moment the following body parts, momentarily disembodied: a heart, an eye, and a brain. If you are like most people, you see a muscular heart, with tubes running in and out, each dedicated to directing blood either to or fro. You are aware that inside the heart are four chambers, each equipped with a one-way valve, through which the blood is pumped. The heart has a visible, tangible, accessible, straightforward functionality.

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1. This is an amalgam of several definitions, including those appearing in THE OXFORD ENGLISH DICTIONARY (2d ed. 1989); THE NEW ENCYCLOPEDIA BRITANNICA (15th ed. 2001); INTERNATIONAL DICTIONARY OF MEDICINE AND BIOLOGY (1986).

You see an eye in its circular profile. You are aware that light crosses the cornea, passes through a refracting and focusing lens, and then stimulates retinal cells in the rear. The eye, too, has a visible, tangible, accessible, straightforward functionality.

And you see a two-hemisphered brain which, for all its storied capacities, just sits there like a bumpy lump of smart jello. There is no discernible movement in this organ. And, in contrast to virtually every other feature of the body, the brain's form offers little hint to its function. It deals in the invisibles of electricity, information, and consciousness. For this reason, among others, we do not ordinarily consider the brain to be as functionally specialized as the other organs of the body. That is, we do not ordinarily consider it to have physical design features for channeling information along specific behavior-biasing pathways the way the heart channels blood or the eye channels light.

The brain is not, in fact, as functionally specialized as the heart or eye. But acknowledging this need not require our current assumption that the brain is, for all important purposes, not very specialized at all. What would it mean for law if the brain were far more specialized than we commonly think? The heart has been designed by evolutionary processes to pump blood—a fluid of specific weight and viscosity, meaningfully dissimilar to tree sap. The eye has been designed by evolutionary processes to attend only to particular wavelengths of light—ignoring others, to which bees, for example, are sensitive. What if the brain, in generating its behavioral outputs, has been similarly designed by evolutionary processes to perform quite specific tasks—reflecting a specific (though invisible) neural architecture, rather than some amalgam of general-purpose, do-anything, interconnected cells? And what if those tasks, while not rigidly determining behavior, instead materially increase and decrease the probabilities of certain behaviors, upon encounters with certain patterns of stimuli? What if, in short, the brain is more akin to a swiss army knife, with particular tools appropriate to particular tasks, than it is akin to an empty beaker into which society pours some mind-bestowing elixir called culture?<sup>2</sup>

In fact, a growing body of evidence from behavioral biology (and cognates such as neuroanatomy) has revealed the brain to be quite functionally specialized, as a result of non-random and knowable evolutionary processes (including natural and sexual selection).<sup>3</sup> That is,

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2. The metaphor of the swiss army knife is commonly attributed to Leda Cosmides and John Tooby. The phrase "mind-bestowing elixir" is Steven Pinker's. STEVEN PINKER, *HOW THE MIND WORKS* 19 (1997).

3. It would be impractical to summarize these processes here, and some familiarity must be assumed. Summaries written specifically for legal thinkers appear in Owen D. Jones, *Evolutionary Analysis in Law: An Introduction and Application to Child Abuse*, 75 N.C. L. REV. 1117 (1997)

the principal, biological task of the brain is to process information in ways that tend to bias behavior in ways that contributed to continued survival and reproductive success in the face of specific challenges commonly encountered in deep ancestral environments.

My general purpose, here, is to explore several implications for law of this research in behavioral biology. In prior work, I have attempted to demonstrate that behavioral biology has practical utility in the arena of legal affairs, if deployed with care (and non-normatively) in a process that I have referred to as “evolutionary analysis in law.”<sup>4</sup> That analysis, in part,

[hereinafter Jones, *Evolutionary Analysis in Law*] (Part I provides “A Primer in Law-Relevant Evolutionary Biology”); Owen D. Jones, *Sex, Culture, and the Biology of Rape: Toward Explanation and Prevention*, 87 CAL. L. REV. 827 (1999) [hereinafter Jones, *Biology of Rape*]; and Timothy H. Goldsmith & Owen D. Jones, *Evolutionary Biology and Behavior: A Brief Overview and Some Important Concepts*, 39 JURIMETRICS J. 131 (1999).

Treatments of modern behavioral biology for the general audience include: TIMOTHY H. GOLDSMITH, *THE BIOLOGICAL ROOTS OF HUMAN NATURE: FORGING LINKS BETWEEN EVOLUTION AND BEHAVIOR* (1991); PINKER, *supra* note 2; MATT RIDLEY, *THE RED QUEEN: SEX AND THE EVOLUTION OF HUMAN NATURE* (1994); ROBERT WRIGHT, *THE MORAL ANIMAL: EVOLUTIONARY PSYCHOLOGY AND EVERYDAY LIFE* (1994).

Textbooks for gaining more technical familiarity with behavioral biology include: JOHN ALCOCK, *ANIMAL BEHAVIOR: AN EVOLUTIONARY APPROACH* (6th ed. 1998); DAVID BUSS, *EVOLUTIONARY PSYCHOLOGY: THE NEW SCIENCE OF THE MIND* (1999); MARTIN DALY & MARGO WILSON, *SEX, EVOLUTION, AND BEHAVIOR* (2d ed. 1983); SCOTT FREEMAN & JON C. HERRON, *EVOLUTIONARY ANALYSIS* (1st ed. 1998); DOUGLAS J. FUTUYMA, *EVOLUTIONARY BIOLOGY* (2d ed. 1986); TIMOTHY H. GOLDSMITH & WILLIAM F. ZIMMERMAN, *BIOLOGY, EVOLUTION, AND HUMAN NATURE* (2001); JAMES L. GOULD & CAROL GRANT GOULD, *SEXUAL SELECTION* (1989); J.R. KREBS & N.B. DAVIES, *AN INTRODUCTION TO BEHAVIOURAL ECOLOGY* (3d ed. 1993); MARK RIDLEY, *EVOLUTION* (1993); ROBERT TRIVERS, *SOCIAL EVOLUTION* (1985).

4. The term first appears in Jones, *Evolutionary Analysis in Law*, *supra* note 3, at 1124. This was not the first time that law and behavioral biology had been linked. The general idea that legal thinkers should take account of the influence of human biological heritage on human behavior relevant to law has been raised on numerous occasions, in a variety of contexts. And such work provides important background for all that I attempt here. *See, e.g.*, RICHARD ALEXANDER, *Evolution, Law, and Justice, in DARWINISM AND HUMAN AFFAIRS* (1979); JOHN H. BECKSTROM, *EVOLUTIONARY JURISPRUDENCE: PROSPECTS AND LIMITATIONS ON THE USE OF MODERN DARWINISM THROUGHOUT THE LEGAL PROCESS* (1989); *THE SENSE OF JUSTICE: BIOLOGICAL FOUNDATIONS OF LAW* (Roger Masters & Margaret Gruter eds., 1992); Monika Gruter Morhenn & Margaret Gruter, *The Evolution of Law and Biology, in EVOLUTIONARY APPROACHES IN THE BEHAVIORAL SCIENCES: TOWARD A BETTER UNDERSTANDING OF HUMAN NATURE* 119 (Steven A. Peterson & Albert Somit eds., 2001); RICHARD A. POSNER, *SEX AND REASON* (1992); Amicus Brief of the Gruter Institute, *In the Matter of Baby M.*, 537 A.2d 1227 (N.J. 1988); Kingsley R. Browne, *Sex and Temperament in Modern Society: A Darwinian View of the Glass Ceiling and the Gender Gap*, 37 ARIZ. L. REV. 972 (1995); E. Donald Elliott, *Law and Biology: The New Synthesis?*, 41 ST. LOUIS U. L.J. 595 (1997); Robin Fox, *In the Matter of “Baby M”*: *Report from the Gruter Institute for Law and Behavior Research*, 7 POL. & LIFE SCI. 77 (1988); Lawrence Frolik, *The Biological Roots of the Undue Influence Doctrine: What’s Love Got to Do With It?*, 57 U. PITT. L. REV. 841 (1996); Oliver Goodenough, *Biology, Behavior, and Criminal Law: Seeking a Responsible Approach to an Inevitable Interchange*, 22 VT. L. REV. 263 (1998); Mark F. Grady & Michael T. McGuire, *A*

investigates what can be learned about law-relevant human behaviors from the study of evolutionary processes that have influenced them, and how that knowledge may increase the effectiveness of law in pursuing pre-existing legal goals. For example, evolutionary analysis can clearly aid our efforts to understand and prevent child abuse, and to understand and prevent sexual aggression.<sup>5</sup> What I want to attempt here, however, is to take this enterprise of linking behavioral biology and law to a more systemic, theoretical level, which may offer new insights about the relationship between law, biology, and human behavior. In particular, I will explore how the function and form of the human brain, in light of what we are learning from behavioral biology, affects and reflects the function and form of law.

Four Parts follow. Part II provides context. It first introduces a metaphor from physiology that provides analytic direction to the balance of the Article, and then clarifies the aspects of behavioral biology on which my discussion focuses. Part III concerns the function of law. Part IV concerns law's form. Part V provides a summary, as a prerequisite to discussion of several related issues.

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*Theory of the Origin of Natural Law*, 8 J. CONTEMP. LEGAL ISSUES 87 (1997); Margaret Gruter, *Law in Sociobiological Perspective*, 5 FLA. ST. U. L. REV. 181 (1977); Cheryl Hanna, *Can a Biological Inquiry Help Reduce Male Violence Against Women?*, 22 VT. L. REV. 333 (1997); John O. McGinnis, *The Original Constitution and Our Origins*, 19 HARV. J.L. & PUB. POL'Y 251 (1996); William H. Rodgers, Jr., *Bringing People Back: Toward a Comprehensive Theory of Taking in Natural Resources Law*, 10 ECOLOGY L.Q. 205 (1982); Jeffrey E. Stake, *Darwin, Donations, and the Illusion of Dead Hand Control*, 64 TUL. L. REV. 705 (1990); Margo Wilson, *Impact of the Uncertainty of Paternity on Family Law*, 45 U. TORONTO FAC. L. REV. 217 (1987); E. Donald Elliott & Roger Masters, *Seminar on Ethology of Law: Biological Bases of Legal Behavior*, Yale Law School (1988); and sources cited in Jones, *Evolutionary Analysis in Law*, *supra* note 2, at 1121-23 n.3 (1997).

A partial listing of many other sources relevant to the connection between law and evolution appears on the "Readings" page of the website for the *Society for Evolutionary Analysis in Law* (SEAL), at <http://www.sealsite.org>. Interest in these topics has grown quickly, due in part to programs organized since 1981 by the *Gruter Institute for Law and Behavioral Research* (about which see <http://www.gruterinstitute.org>), and more recently by the *Society for Evolutionary Analysis in Law* (<http://www.sealsite.org>).

5. See, e.g., Jones, *Evolutionary Analysis in Law*, *supra* note 3; Jones, *Biology of Rape*, *supra* note 3. For further information on these subjects, see Owen D. Jones, *Law and Biology: Toward an Integrated Model of Human Behavior*, 8 J. CONTEMP. LEGAL ISSUES 167 (1997) [hereinafter Jones, *Law and Biology*]; Owen D. Jones, *Law and the Biology of Rape: Reflections on Transitions*, 11 HASTINGS WOMEN'S L.J. 151 (2000).

## II. PROPRIOCEPTION AND BEHAVIORAL BIOLOGY

### A. *Proprioception*

Proprioception is a term from physiology that refers to the ability to sense, without seeing or touching, how the different parts of the body relate to each other, in space, position, posture, and internal condition.<sup>6</sup> Proprioception in humans is accomplished by means of hidden receptors that sense muscle stretch, joint position, and tendon tension—in ways that would allow you, for example, to close your eyes, reach behind your head, and touch your fingertips together. Proprioception is useful because it provides a sense, in the absence of external clues, of where you are, where you have been, where you are going, and what—in effect—is physiologically possible.

My question is this: What would it mean to have proprioceptive sense of law? My conclusion is that it would mean several different things at once. First, it would mean that we would have greater awareness than we now manifest of the deep internal structure of law, reflected in the subsurface interconnections between the many limbs of law. Second, it would mean that we had a sharper sense of why legal systems in the world are as they are today. Third, it would mean that we could better predict where law can go, how, and with what likely effects. Finally, it would mean that we would have a more robust theoretical basis on which to fashion better methods for achieving the goals of law.

If we would find these things valuable then, it seems to me, we should more actively seek to gain and develop a proprioceptive sense of law. We might begin to do this by considering more closely the dynamic processes that influence the relationship between law and human behavior. That would require that we become more attentive to the possibilities and constraints that those processes contribute to the shape and movement of the body of law. That attention, in turn, would require a better appreciation of both the function and form of law.

Because behavioral biology can highlight new aspects of law's form and law's function, it is one of several disciplines that is useful in developing a proprioceptive sense of law. Behavioral biology enables us to better understand the processes that built the human brain that has in turn built that structure of law. Following some definitional preliminaries in the brief section immediately below, we will therefore turn to consider how behavioral biology may add to our understanding of function and form in law, in furtherance of a proprioceptive perspective.

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6. See *supra* note 1.

## B. Behavioral Biology

I have used the term behavioral biology several times, without yet defining it. This is, in part, because the breadth of things comprising behavioral biology defies easy synopsis. But here is one way to understand both the important components of behavioral biology and my specific meaning when I refer to it.

When most people think of the relationship between law and the field of biology, generally, they think first of such things as the legal regulation of, among other things, healthcare, genetically engineered foods, new reproductive technologies, and environmentally damaging products and activities. In my experience, people rarely think of law and biology as extending meaningfully into the realm of behavior. On those occasions when people do think of law and the biology of behavior, they tend to think exclusively of behavioral genetics (though typically not in that term). And this often leads them (quite improperly, as it turns out) to think that behavioral biology's principal relevance to law is in criminal trials and genetic defenses. Allergic responses ensue. This is most unfortunate, and it likely follows from two things.

First, biology has been over-separated, in universities, from other things interesting about life.<sup>7</sup> So we are unpracticed in recognizing how biological processes influence all aspects of the human condition, directly or indirectly. Second, what little background most people have acquired in biology is principally anatomical, rather than behavioral. We studied the parts of a flower, but not how it came to pass that flowers turn toward the sun, rather than away from it. We studied the parts of a frog, but not why males are more likely to compete for the attention of females than vice versa. We studied the physical characteristics of birds, but not the process by which it came to pass that males of singing species sing more in the spring than they do in the fall. And if we reached humans at all, in our biological coursework, we studied human physiology. We did not study why the human brain is set up in a way that induces the specific states of the nervous system we call emotions, in response to some kinds of stimuli but not to others.

As a result, there is ample room for the mistaken notion that biology is both mechanistic and deterministic and, in the human context, somehow inconsistent with the idea that culture, environment, learning, and behavioral flexibility are essential features of the human condition. As a consequence, many people apparently view biology as the study of living mechanisms, with assembly-line products, or the study of mundane molecular and physical interactions that are taken as given.

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7. For more on this point, see Owen D. Jones, *Evolutionary Analysis in Law: Some Objections Considered*, 67 BROOK. L. REV. (forthcoming 2001).



But to understand behavior in light of this popular misconception of biology is (to paraphrase the Chinese philosopher Lao Tsu) like trying to understand running water by catching it in a bucket. In fact, humans are participants in a dynamic process, subject to powerful evolutionary forces that blend environment, learning, culture, and behavioral flexibility into the flow of genetically influenced human development, activities, experience, and achievements. So evolutionary processes are not only consistent with extraordinary human capacities for rational analysis and decisionmaking, they have helped to create them. Yet the presence of such capacities does not logically imply the absence of any behavioral predispositions. Even a moment's reflection makes obvious that all living organisms must come equipped with behavioral predispositions. For an anatomy lacking behavioral predispositions does nothing, and is soon dead. Behavioral predispositions are therefore inherent in the behavior of all living organisms, including humans, and they can manifest themselves in condition-dependent, subtle, variable, responsive, algorithmic, complex ways. Although we cannot know all of those ways, we can know a great deal about the processes that influenced the connections between environment, behavior, and reproductive success that led to behavioral predispositions. These processes include, of course, natural and sexual selection.

To think about the effect of these processes on humans, we need to step back and recognize a distinction between the two main components of behavioral biology. The first component is behavioral genetics. It mainly involves efforts to trace the different behaviors of different individuals to different genes among them.<sup>8</sup> There is a role for behavioral genetics in law. I think, however, that the long-term promise of behavioral genetics for law is comparatively limited. Accordingly, it is not the component of behavioral biology I intend to discuss below.

The second component, more promising in my view, goes by many often confusing names, including behavioral ecology, evolutionary biology, ethology, evolutionary psychology, evolutionary ecology, and evolutionary anthropology, among others. Not one of the names is without drawbacks, and each name misconveys scope, to one degree or another. But the overall, shared perspective transcends efforts to name it, and the core idea follows this logic. Evolutionary processes (such as natural selection and sexual selection) combine with environmental and physical inputs to build the brains that yield behaviors. There is therefore a necessary and important relationship between the non-random operation of these evolutionary processes and observable human behaviors. That

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8. Technically, the issue is differences in *alleles* of genes, but it is a common convention to speak of different genes when one is referring to different alleles.

relationship yields widely-shared (often species-typical) heritable behavioral predispositions that are often highly condition-dependent. (That is, they are context-specific—sensitive to varying environmental circumstances an individual encounters—rather than automatic.) As a consequence, some of the different behaviors we observe, from different individuals, can be traced not to different genes but rather to widely-shared species-typical information-processing algorithms that encounter different environmental contexts.

This sounds more difficult than it is. To both clarify and oversimplify, one can consider that behavioral geneticists study how, when encountering the exact same environment, organism A will respond with behavior X, and organism B will respond with behavior Y, when A and B have different genes relevant to that behavior, manifested in slightly different neural architecture, brain structure, and function.

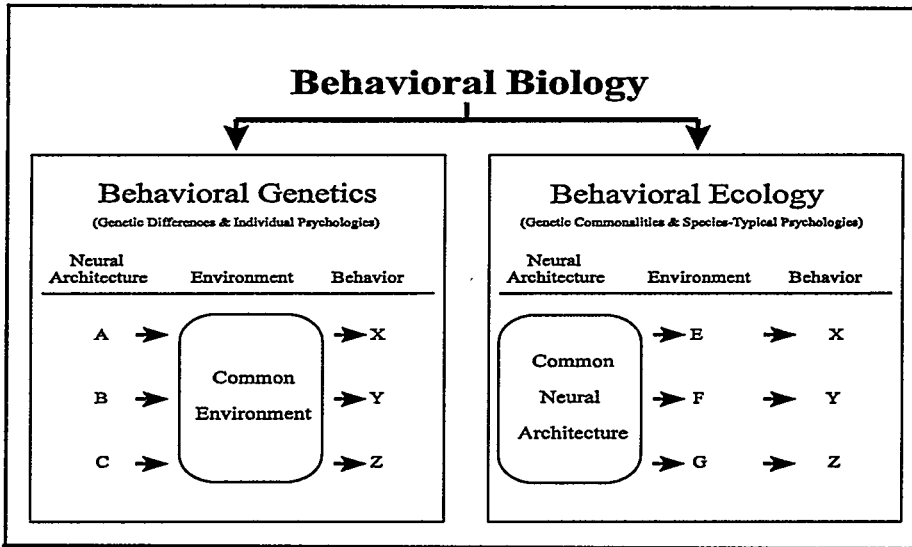
In important contrast to those interested in behavioral genetics, those interested in the evolutionary bases of species-typical behaviors study how, when encountering *different* environments, A and B may still respond with behaviors X and Y respectively, *despite* the fact that neither their genes nor their neural architectures differ materially. For example, evolutionary processes may have equipped the entire population with a conditional decisional rule that A and B share, which in over-simplified essence provides: “if in environment E, then employ behavior X, but if in environment F then employ behavior Y.” Thus, the shared genetic influences on behavior can yield behaviors X and Y from individuals A and B *not* because of their genetic differences, but simply because they encountered environments E and F, respectively. The behavior is enormously influenced by the environment, but the environment affects the probability of behavior in ways reflecting the influence of widely-shared behavioral predispositions. The distinction between behavioral genetics and behavioral ecology is difficult to overemphasize, and is illustrated in Figure 1.

To be clear, then, where I use in this Article the broad (but at least brief) term behavioral biology, it refers to this latter of the two components of behavioral biology. Specifically, it refers to the behavioral ecology aspect that attends principally to evolved, species-typical, condition-dependent, behavior-influencing algorithms that influence the way human brains process information and thereby increase or decrease the probabilities of various behaviors.<sup>9</sup>

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9. Again, further background on these subjects is available in the sources cited *supra* note 3.

Figure 1



### III. THE FUNCTION OF LAW

#### A. Law as Lever

Proprioception, as mentioned earlier, requires some sense of function. Gaining a proprioceptive sense of law therefore requires greater awareness of the function of law. In my view, this awareness can be enhanced, in part, by thinking of law in terms of physics—an approach that ultimately clarifies the functional relationship between behavioral biology and law.

We already use many images of physics and physical phenomena to capture the process and substance of law.<sup>10</sup> We speak of arguments that lay foundation or provide support, that buttress or bridge, that are filled with force, power, or the weight of authority, and that are invested with inertia or momentum, demonstrating reasoning that is linear, circular, or parallel. We speak of analytic tools, slippery slopes, balancing tests, swinging

10. Examples include Laurence H. Tribe, *The Curvature of Constitutional Space: What Lawyers Can Learn from Modern Physics*, 103 HARV. L. REV. 1 (1989); Seth P. Waxman, *The Physics of Persuasion: Arguing the New Deal*, 88 GEO. L.J. 2399 (2000); R. George Wright, *Should the Law Reflect the World?: Lessons for Legal Theory from Quantum Mechanics*, 18 FLA. ST. U. L. REV. 855 (1991). Useful sources addressing the use of physical metaphors in law include Bernard J. Hibbitts, *Making Sense of Metaphors: Visuality, Aurality, and the Reconfiguration of American Legal Discourse*, 16 CARDOZO L. REV. 229 (1994); Note, *Organic and Mechanical Metaphors in Late Eighteenth-Century American Political Thought*, 110 HARV. L. REV. 1832 (1997).

pendulums, narrow ends of wedges, leaps of logic, seamless webs of logic, and logic stretched to the breaking point. And we often speak of law as being flexible or rigid.

In my view, however, the most useful and least developed images of physics are the lever and the fulcrum.<sup>11</sup> Figure 2 conveys the basic idea.<sup>12</sup> In this image, the human behavior that law seeks to affect is represented as a sphere. The legal mechanism or regime we employ to move that behavior is represented as a lever. And the fulcrum, upon which the lever of law lies, and against which it presses to effect a change of behavior, is the law's behavioral model. By the term behavioral model, I refer to our conception of where behavior generally comes from and what in particular influences the specific behavior at issue. For example, if the deployment of a particular legal mechanism in furtherance of a specific behavioral modification ever strikes us as at all plausible, it is because we are

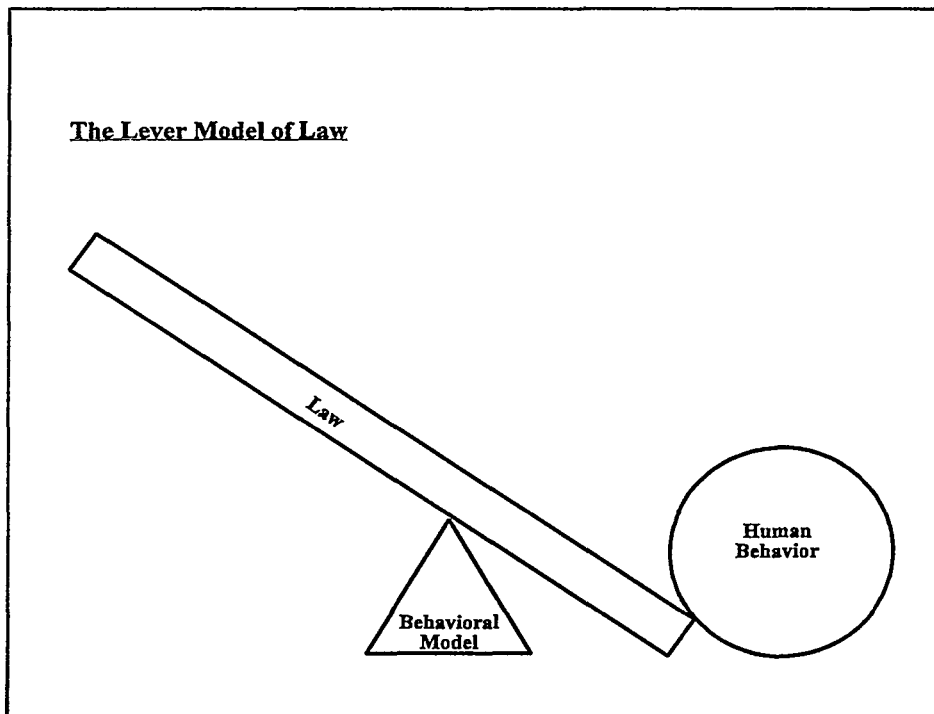
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11. Like other images from physics mentioned in the text, the lever metaphor has previously appeared in a wide variety of legal contexts. Sometimes it is used to emphasize the way a lever multiplies force, effecting large changes with small efforts. *See, e.g.*, E. Donald Elliott, *Environmental Law at a Crossroad*, 20 N. KY. L. REV. 1, 2 (1992) (using the concept of regulatory leverage to describe a ratio of government agency expenditures to consequently—and disproportionately large—redeployed behavior). Sometimes it is used to describe a force applied by threat of criminal conviction. *See, e.g.*, Seth F. Kreimer, *Releases, Redress, and Police Misconduct: Reflections on Agreements to Waive Civil Rights Actions in Exchange for Dismissal of Criminal Charges*, 136 U. PA. L. REV. 851, 929 (1988) (“Both the tradition of legal ethics and the common law definition of extortion suggest that the use of possible criminal prosecution as leverage to obtain advantage in a civil lawsuit is inappropriate.”); Rachel Ratliff, *Third-Party Money Laundering: Problems of Proof and Prosecutorial Discretion*, 7 STAN. L. & POL’Y REV. 173, 181 (1996) (“To counter these incentives to keep quiet, prosecutors often use the leverage of a potential criminal charge.”). It is often used to describe the economic effects of market power. *See, e.g.*, Louis Kaplow, *Extension of Monopoly Power Through Leverage*, 85 COLUM. L. REV. 515, 515 (1985) (discussing the “ability of firms to use restrictive practices to leverage their monopoly power from one market to another”). And it has been used in the context of civil disputes as well. *See, e.g.*, Ira Mark Ellman, *The Theory of Alimony*, 77 CAL. L. REV. 1, 7 (1989) (“The fault rules gave great bargaining leverage to the spouse who felt no urgency to end the marriage . . .”).

My own uses of the lever metaphor have been for highlighting the necessary existence of a “fulcrum,” which I suggest both best represents the point of transfer between the energy vested in law and the behavior we hope to achieve with the tools of law and also focuses attention on the utter dependence of law on solid knowledge about human behavior. *See, e.g.*, Owen D. Jones, *Evolution, Value-Clarification, and Legal Policy*, Address at the Human Behavior and Evolution Society Annual Meeting (July 1, 1995); Jones, *Law and Biology*, *supra* note 5; Owen D. Jones, *Time-Shifted Rationality and the Law of Law’s Leverage: Behavioral Economics Meets Behavioral Biology*, 95 NW. U.L. REV. 1141 (2001) [hereinafter Jones, *Time-Shifted Rationality*]. The discussion here expands and improves on my previous uses of the metaphor.

12. I subscribe to the view of the famous physicist, Leon Lederman, that if a basic idea is too complicated to fit on a T-shirt, it is probably wrong. TIMOTHY FERRIS, *THE WHOLE SHEBANG: THE STATE OF THE UNIVERSE(S)* REPORT 272 (1997).

Figure 2



explicitly, or more often implicitly, adopting some behavioral model that suggests that there is a meaningful connection between what the law is about to do and the outcome we seek to achieve. What are the limitations and advantages of this image from physics?

### B. *Limitations*

The image of law as lever is not perfect. The metaphor has at least three limitations worth noting. First, the use of legal tools to accomplish some change in human behavior is, itself, an instance of human behavior. So there is some inherent dualism. This shortcoming does little harm, in itself, provided we remember that the behavioral model illuminating how and why people will respond to changes in incentives also illuminates how and why people in positions to influence the use of the machinery of law will themselves behave and how they will prefer that other people behave.

Second, we do not always know much about the contours of the landscape of behavioral possibilities into which the behavior may roll. That is, the image of law as lever affords little sense of how the surrounding landscape—the existing features of a person’s environment—may affect behavioral moves. Is there some environmental feature, such as religion or

some other cultural proscription, that is analogous to the slope of the landscape? Is the behavior currently resting at the top of a behavioral hill, suggesting easy movement in a variety of directions? Or is the behavior at rest at the bottom of a behavioral valley, suggesting only a Sissyphean future for legal interventions? Poverty, for example, may impose limits on the behavioral landscape. For tax incentives designed to encourage donations to charity will have less effect on poor people than rich ones. Discrimination, also, may impose limits. For incentives intended to encourage minority youths to attend college will have less effect if an environment of pervasive discrimination dampens the hopes of youths that they may ultimately achieve employment in preferred occupations. The existence of these sorts of constraints, among others, which are external to individuals and which vary among individuals and groups, suggests that in suitable cases my metaphor would need supplementation with and elaboration of features (such as local inclines) beyond law, behavior, and behavioral model.

As a third limitation, the image of lever, fulcrum, and movable object risks some confusion by inadequately conveying the full variety of human behaviors to which this image can apply. For example, when we think of law intervening to “move” behavior, the examples that come first to mind are from criminal law. For instance, if we want people not to rob, we establish penalties for doing so, in hopes of preventing behavior that might otherwise occur. But the image of the lever of law, as presented here, is intended to extend beyond criminal behaviors to *all* behaviors we try to change with law, from Securities and Exchange Commission filings, to the division of marital property upon divorce, to respecting the constitutional rights of others, to litigation practices, to compliance with regulations of our many administrative agencies. For in each case, the way we attempt to inspire behavioral changes with the tools of law depends on our understanding of how people will perceive legal changes and how they will respond. And this depends, in turn, on the behavioral model that happens to inform our thinking at the time.

### C. *Strengths*

Despite these limitations, which strike me as neither irrelevant nor insurmountable, the image of law as lever displays at least four important advantages. First, and at the most general level, the image of law as lever reminds us that all law is intervention, because the purpose of deploying law’s tools, in their wide variety, is always to achieve some result that we believe would not happen all by itself.<sup>13</sup> We have been inclined to think

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13. This remains true, of course, whether legal policy-makers intend to enforce the law, or merely to express it in a way that may render it self-enforcing, by virtue of what it signals to people

that law intervenes when it changes incentives instrumentally (as when establishing penalties for crimes), and that law does something else when it either balances competing rights (as when it weighs the right to free speech against the right to be free from sexual harassment), establishes efficient regularities (as when it designates the side of the road on which people must drive), or dispenses justice (as when providing equitable remedies). But these very different functions of law are best viewed as varying in degree, not in kind. For while the purpose of the intervention differs, as does the willingness of the governed to seek intervention, and as do the legal mechanisms deployed, there can be little doubt that law is always intended to alter the world—in ways large or small, but always in ways we deem unlikely to arise on their own.

Second, and relatedly, the law as lever metaphor reminds us that the *success* of law's intervention always depends on subsequent, corresponding human action. For law is impotent, but for the effects it inspires in individual humans. Some legal policies are specifically intended to change human behavior (e.g., to reduce the incidence of robbery) while others are intended to achieve a wholly dissimilar result (e.g., safe drinking water). In all cases, however, law's only physical manifestation is through the actions of human beings. As a clarifying reminder, we do not secure safe drinking water by passing laws that chemicals shall not pollute groundwater, nor do we protect wildlife by passing laws that species shall not go extinct. We pass laws to alter human behavior in ways that will help to achieve desired outcomes, whether the change in behavior was (as in the robbery case) the target of law or not. We threaten an undesirable outcome or promise a desirable one. But no matter what we want to achieve with legal policy, we achieve it only by changing human behavior. Thus, regardless of desired outcome, every statute, every regulation, and every judicial decision must, to be effective, move the behavior of individuals—alone or in populations—along some path or at some speed that it would not travel if left alone. And it is this necessity that must ultimately focus the attention of legal policy-makers on the design and operation of the human brain.

Third, the image of law as lever encourages us to think meaningfully about the resistance of behavior to the efforts of law. To extend the metaphor, behavior left alone and uninfluenced by law may have an inertia—a comfortable resting—that requires some quantum of effort to shift. The law as lever image both clarifies and accommodates the fact that some behaviors will be more difficult to shift than others. These differences in the resistance of various behaviors can be graphically

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about the norms of those around them. On this “expressive function of law,” see generally Richard H. McAdams, *The Legal Construction of Norms: A Focal Point Theory of Expressive Law*, 86 VA. L. REV. 1649 (2000).

captured with different shapes. For instance, a sphere represents a behavior easily moved. A flat slab represents a behavior moved only with great difficulty. And intermediate shapes represent intermediate difficulty.<sup>14</sup> Moreover, the existence of multiple but discrete equilibria for some kind of behaviors, amenable to study with the tools of game theory, can be captured by polygonic shapes. This enables a simple visual representation of the often overlooked phenomenon that a behavior, shifted in a given direction, may not be equally stable at all possible points. Once moved from a point of stability, it will continue to rotate until the next stable position, which may be as far as legal policymakers hoped, less far, or too far. Figure 3 illustrates.

Fourth, and most importantly for present purposes, the image of law as lever highlights what is in fact generally and unfortunately ignored: the necessary existence and critical importance of a robust behavioral model fulcrum. Historically, we have concentrated our attentions on the tools of law and the resultant outcomes. We tend to think of the tools of law as carrots and sticks, that lure or threaten. But the law as lever metaphor better captures the idea that behavioral outcomes are necessarily mediated through a corporeal brain, the functions of which we are always attempting to estimate with a behavioral model, whether we are self-conscious of this or not. And, just as a lever's efficiency is dependent on a solid fulcrum, law's efficiency is dependent on a solid (that is, accurate and robust) behavioral model. For law can be no more effective than the solidity that its fulcrum affords. Thus, the law as lever metaphor starkly clarifies that efforts to improve the effectiveness of law inevitably require efforts to improve the behavioral models on which law relies.

#### D. *Building Solid Fulcra*

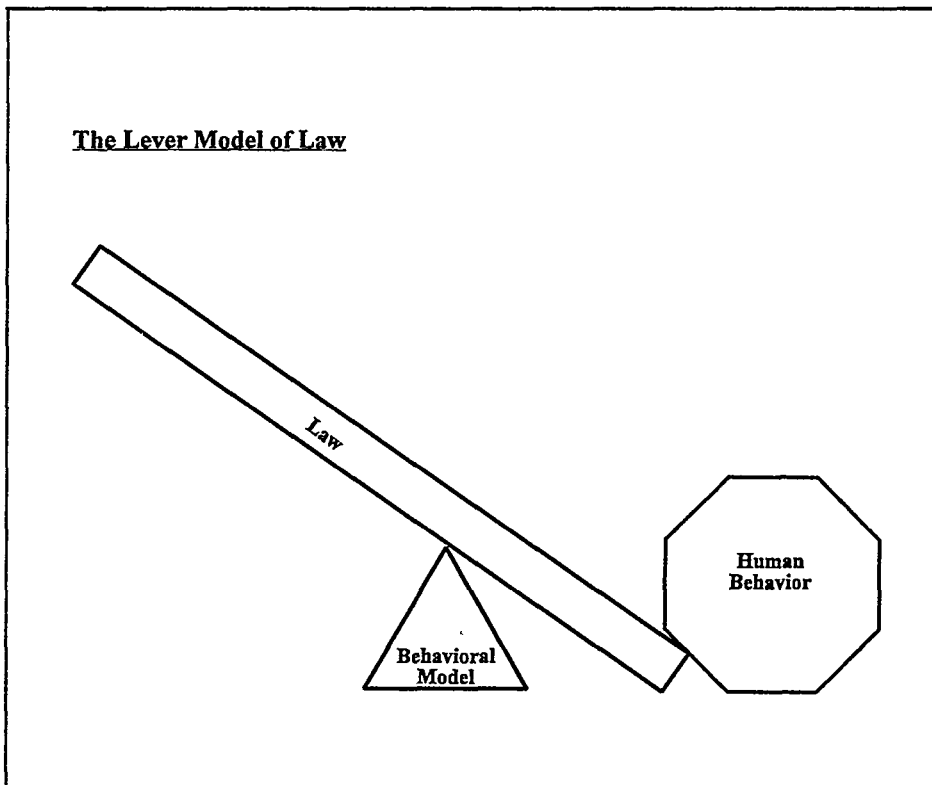
The law as lever metaphor, like all metaphors, is imperfect. I do not think it should be pushed too far. But it is nonetheless importantly useful, if only to focus our attention on an otherwise overlooked feature: the dependence of law on sound behavioral models.

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14. Of course, the difficulty could be represented by variations in mass, instead of shape. But mass is less visually accessible. Note that the resistance law encounters when moving various behaviors is analogous to, in economic terms, the elasticity of the demand curves for those behaviors.



Figure 3



Where do these behavioral models come from? As legal thinkers attempt to design effective methods for achieving goals that have percolated through the layers of our democratic society, they may rely on widely-shared but typically unexamined assumptions about how people will respond as law changes. Or they may rely on behavioral insights offered up by other disciplines, installing and replacing these in endless sequence according to the most unsystematic and impressionistic of criteria. When they do so, legal thinkers tend to display a glaringly obvious, though rarely acknowledged, over-reliance on social science sources of information about human behavior. Our rapt attention to these sources, perhaps reflecting the distribution of disciplinary backgrounds among legal policy-makers, is often useful. But our virtually exclusive and blinkered reliance upon them is importantly limited.

Here's why: 1) constructing a sound behavioral model to serve as the fulcrum of law depends on the depth of our understanding of behavioral phenomena generally; 2) all theories of behavior are ultimately theories about the brain; 3) the brain's design, function, and behavioral output are all products of gene-environment interactions; and 4) social sciences attend only to the environmental half of this genes-environment interaction. To put the magnitude of this oversight in perspective, this is like trying to understand the phenomenon of lemonade by studying only the sugar component, or trying to calculate the area of a rectangle by measuring length, but not width.

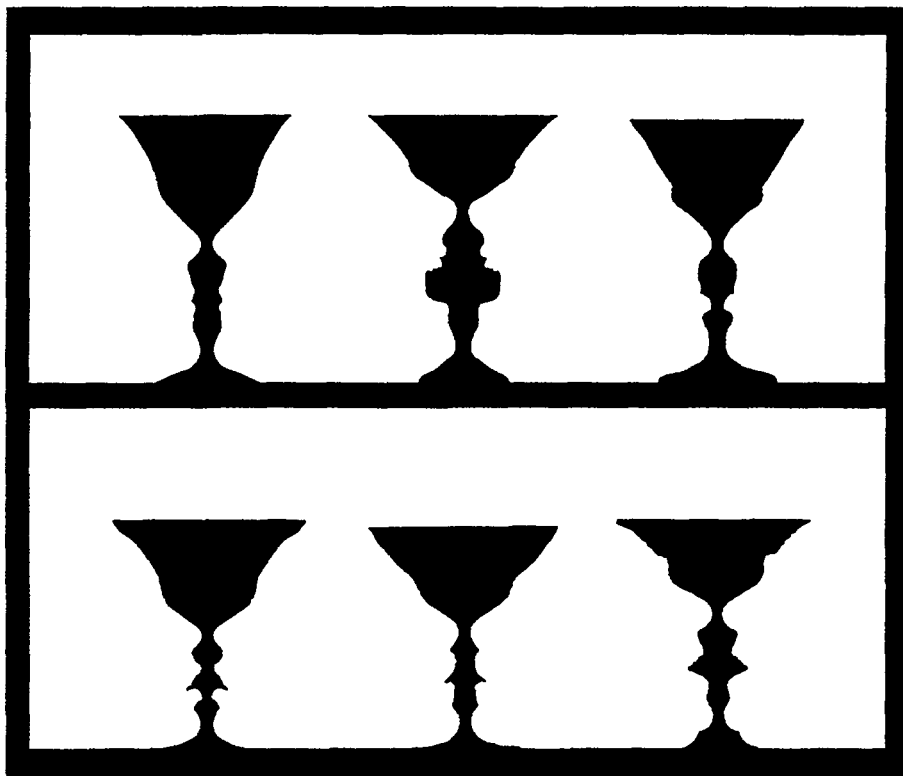
Put another way, any robust behavioral model includes not only a rigorous understanding of the environmental influences on behavior, but also a rigorous understanding of the species-typical genetic influences on behavior, as a result of ever-present evolutionary processes. Studying either environmental influences or species-typical genetic influences to the exclusion of the other is necessarily both incomplete and obsolete. Environmental determinism is as incoherent as would be genetic determinism. More accurate and robust behavioral models inevitably require integrating social science insights about behavior with insights of the life sciences, such as behavioral biology, into a seamless whole lacking internal, cross-disciplinary inconsistencies, such as those that now often exist.

#### IV. THE FORM OF LAW

To this point, we have considered the role behavioral biology plays in developing and enhancing a sense of law's function, pursuant to the ultimate goal of developing a proprioceptive sense of law. Proprioception also requires, as mentioned earlier, a clear sense of form. Gaining a proprioceptive sense of law therefore requires a close examination of the form of law. One useful way to consider law's form is to think of law in engineering terms. That is, we can step back and re-examine the architectural structure of law, paying particular attention to the constraints of both process and design space under which legal regimes are constructed.

As a preliminary exercise, the utility of which justifies a short digression, briefly consider the six different wineglasses in Figure 4. Most people challenged to describe or to reproduce the variations in the forms of the wineglasses can make a serviceable attempt. Importantly, however, that attempt generally depends on a holistic estimate of the various wineglass forms that is impressionistic, unsystematic, and based primarily on attention to the black space—the silhouette of the glasses themselves.

Figure 4



Used with permission. By Zeke Berman © Exploratorium, [www.exploratorium.edu](http://www.exploratorium.edu).

Now look at Figure 4 again, focusing on the inverse image—the white space that surrounds the black. Focusing on the non-wineglass design space not only reveals something about that space, it also reveals something wholly different and important *about the contours of the glasses themselves*. By focusing on the non-wineglass design space one immediately discerns a new coherence, a single organizing principle, and a new understandability to the contours of the glasses. That is, the contour of each glass outlines a different human head, in profile and mirror image. This inverse perspective interrelates the various crenelations of each glass. It provides thematic consonance among the wineglasses and reveals similarities and differences among the wineglass features that one would be far less capable of noticing or describing absent attention to the non-glass space.

In similar fashion, I believe, examining the empty design space around existing law can provide a new and different sense of the structure and

form of law, in furtherance of a usefully proprioceptive sense. I will refer to this empty design space as “non-law” or “inverse law.”<sup>15</sup> And my argument is this: to have the clearest proprioceptive sense of where law is, and where it may be going at any time, it is very important to have a clear sense of where law isn’t, and why. As with the wineglasses, discovering any patterns in non-law will make the patterns in law more easily discernible. Thus, an essential principle of a theory of non-law is this: to understand the law we have, we must more rigorously consider why we don’t have the law we don’t have.<sup>16</sup>

### A. Design Space and Decision Trees

Why don’t we have the law we don’t have? This is not a question one sees frequently addressed in today’s panoply of law reviews. But a fair extrapolation from existing scholarship on contemporary legal systems suggests that the body of law a culture displays is typically considered to reflect a complex amalgam of culture-specific norms, culture-specific religions, culture-specific morals, culture-specific politics, and general economic efficiencies. One might therefore conclude that the laws we do not have are largely path-dependent non-products of cultural developments, no less arbitrary than the cultural variations themselves. But I think there is far more to it than this. And I think that a study of non-law, in light of what behavioral biology reveals about the effects of evolutionary processes on human brain design, can illuminate it.

The temptation, when beginning to think about law and non-law, as with any  $x$  and  $non-x$ , is to polarize them into the dichotomies we seem to love so well. Thus the sequence: Nature & Nurture; Right & Wrong; Good & Bad; For & Against; Law & Non-Law. Such dichotomizing is

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15. The term “non-law” is not novel, although I believe that the way I use it here is. Natural law theorists have used “non-law” as a synonym for “illegitimate law,” which encompasses any law without moral foundation. See, e.g., Neil MacCormick, *Natural Law and the Separation of Law and Morals*, in *NATURAL LAW THEORY: CONTEMPORARY ESSAYS* 105-10 (Robert P. George ed., 1992). That notion is often attributed to St. Thomas Aquinas. Norman Kretzmann, *Lex Iniusta Non Est Lex: Laws on Trial in Aquinas’ Court of Conscience*, 33 *AM. J. JURIS.* 99, 99-106 (1988). Positivists have used “non-law” adjectivally, to refer to non-legal sources of influence on legal decisions, such as an adjudicator’s moral sense. See generally Brian Bix, *On the Dividing Line Between Natural Law Theory and Legal Positivism*, 75 *NOTRE DAME L. REV.* 1613 (2000); Frederick Schauer & Virginia J. Wise, *Legal Positivism as Legal Information*, 82 *CORNELL L. REV.* 1080 (1997). I am not using the term in either of these senses. Nor am I referring to “alternate” law, in the way that currently fashionable “alternate history” explores different histories that would have transpired but for some historical event (such as Hitler losing the war).

16. This reasoning, though unfamiliar, should be uncontroversial. It is akin to suggesting that in order to understand the necessary conditions of life, it is useful to study not only the environments in which life thrives, but also those in which it does not. Sometimes only the absence of some feature makes the necessity of that feature obvious.

misleading, of course, for at least three reasons. First, it tends falsely to separate things that are inseparably intertwined, such as nature and nurture. Second, it polarizes things, such as right and wrong, that are often best considered as endpoints of a continuum. Third, and most importantly, such dichotomizing often creates the illusion of symmetry and balance, suggesting, perhaps, that the relationship between law and non-law is meaningfully similar to the relationship between yin and yang. This is, of course, often wholly inconsistent with the facts, as the engineering perspective on design space makes clear. The design space available for an opposite of a thing (or a non-thing) totally overwhelms the design space for the thing itself. And an important initial step in exploring non-law is therefore to let go of any intuition of symmetry, complementarity, or even proportionality.

To begin to consider more systematically the overall design space of law (or, put another way, the set of all possible legal variations), it strikes me that we might usefully divide matters this way. The design space for the body of law can be represented (and simplified) as an extensive decision tree consisting of four principal elements: Topics, Content, Tools, and Effort. These four elements can be defined as follows. *Topics* is the set of all the general subjects we might conceivably care about. *Content* reflects the full variety of normative preferences for how we might care about those things. *Tools* is a set that includes all the methods available to legal thinkers by which we might attempt to effect positive change, in order to bring reality into line with our normative preferences. And *Effort* reflects all potential variations in how hard it may be to effect such change using any particular tool of law. See Figure 5.

Figure 5

Topics:	The set of all possible subject matters that we could potentially care about.
Content:	The set of all possible normative preferences (goals) regarding each subject matter.
Tools:	The set of all possible legal methods by which we might attempt to achieve those goals.
Effort:	The set of all possible variations in the amount of effort necessary to achieve the goals using a particular method.

To clarify, *Topics*—which includes everything from violence to silverware patterns—is clearly the most diverse element, encompassing all potential subject matter within the human experience. *Content*, which reflects our attitude about behaviors relevant to each Topic, may vary along a spectrum from pro to neutral to con, indicating our normative preference to have more or less—or at least standardized—behavior. Preferences may arise from, among other things, our moral judgments, religious prescriptions, emotional realities, and sense of economic efficiencies. (For example, we may conclude that theft is bad, not good; false imprisonment is bad, not good; and slander and libel are bad, not good.) *Tools* for altering behavior come in many promising and unpromising forms, from tax incentives, regulation, and incarceration to those myriad things law might undertake to no effect whatsoever. And *Effort* spans the spectrum from trivially easy to insurmountably difficult.

These four elements of the design space fit together in a particular, chronological way. A simplified illustration of a small fraction of the overall design space just described appears as Figure 6. For purposes of the figure, the *Content*, *Tools*, and *Effort* components of merely four possible *Topics* are each considered susceptible of only three alternatives, represented by branches (in reality, of course, there are many more possibilities than the figure describes). As each of these four principal elements is represented horizontally in a vertical hierarchy, I will in what follows sometimes refer to each element as a “level” of that decision tree.

A moment’s reflection demonstrates that every legal system, at every moment, looks more like Figure 7 than Figure 6. Solid lines in Figure 7 indicate features of the legal system. Dotted lines indicate non-law. That is, there are some topics we care about and many we do not. And, for each topic we care about, the legal system tends to reflect, in its content, one normative preference (or relatively narrow set of preferences) rather than others, and one or more types of tools, from among many, with each tool confronting an effort—a degree of difficulty corresponding to resistance-appropriate to the topic-specific disjunction between normatively preferred behavior and existing behavior.

Viewed from this perspective, the overall design space of law is, like the galaxy, more interstitial emptiness than substance. And rather than painting a vision of Law’s Empire, stretching from horizon to horizon,

Figure 6

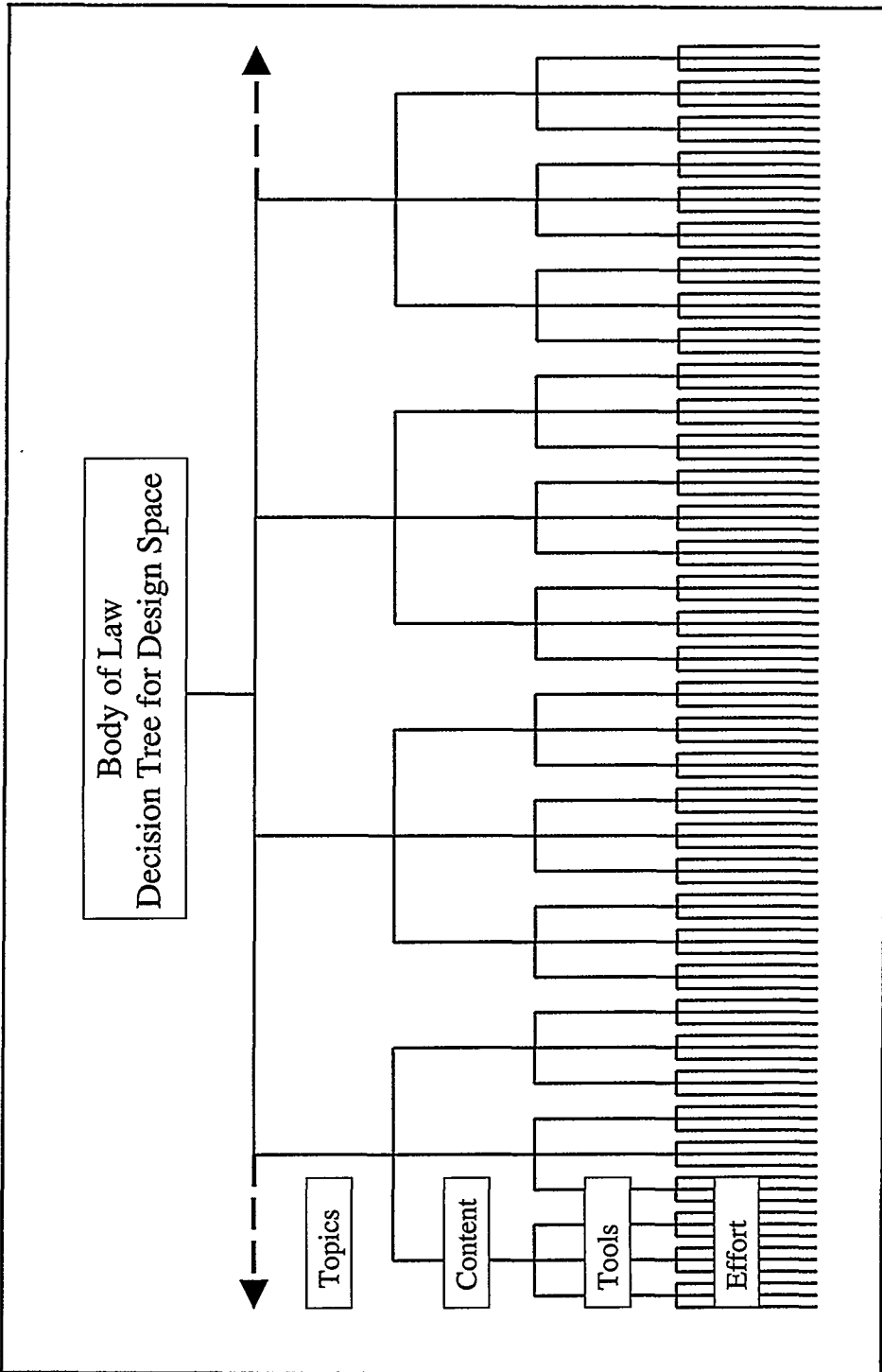
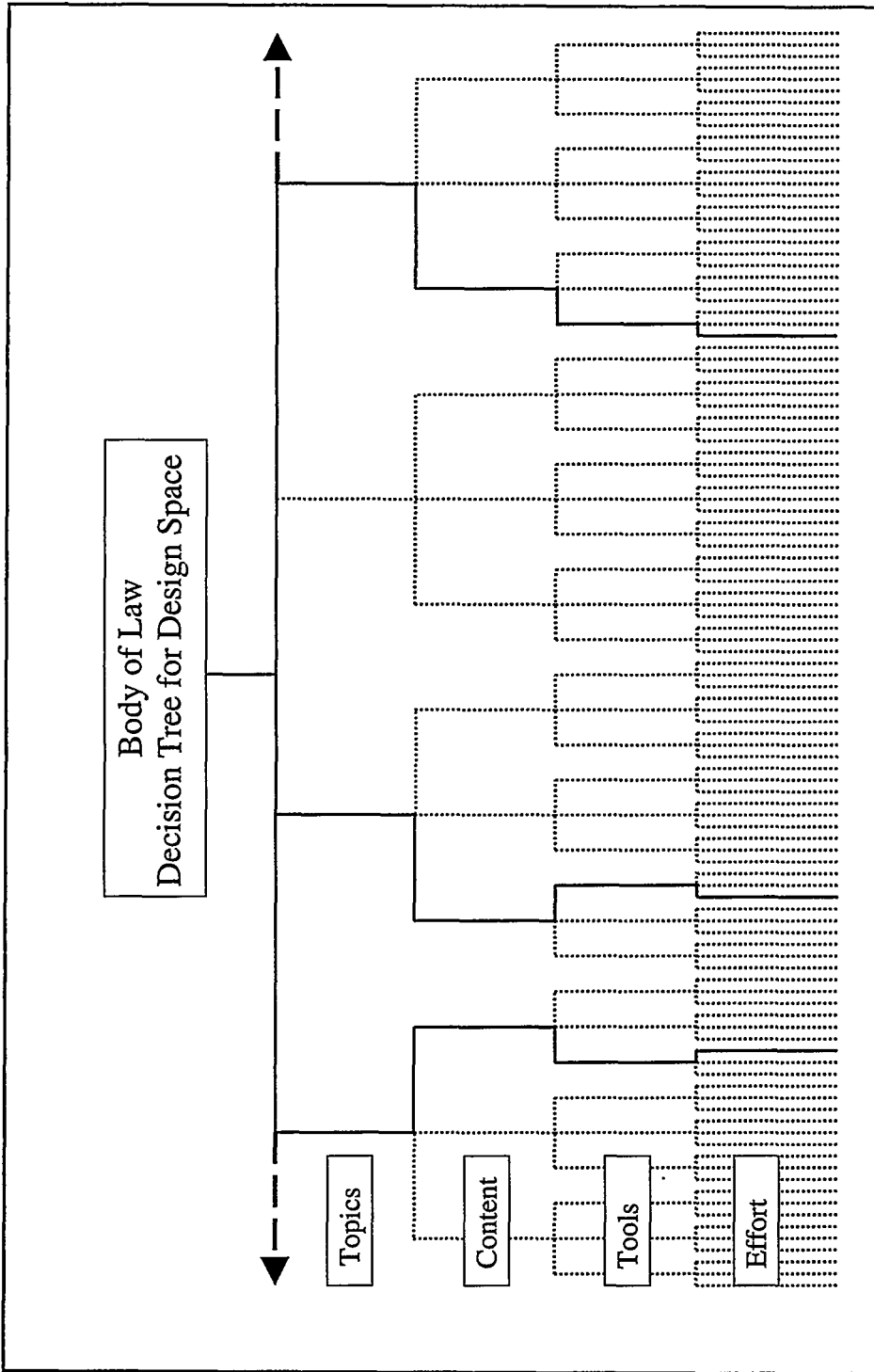


Figure 7





after the famous image of Ronald Dworkin's,<sup>17</sup> what we see instead is a graphic illustration of law's delicate, crenellated, lace-like filigree, floating wisply within a massive design space, mostly unused.

What bears explaining, then, is not only why the law is the way it is, but why it isn't more like the many other ways it could have been. Although this latter question is related to the first, it is nonetheless analytically separate. Its principal utility is that it directs our attention to probability. What is the prior probability that a legal system would ultimately reflect the specific form it has taken, manifested by the features it actually displays, from among the nearly infinite possible combinations of topics, content, tools, and effort? We already know that there are some obvious constraints—political, cultural, economic, and even geographic—on probability. But as we attempt to sharpen our deep-structure, proprioceptive sense of the form of law, we must ask whether there are other forces at work, as yet unstudied, that can help us to better understand patterns and probabilities in non-law, and thus to better discern the patterns in law itself. I believe that there are such forces at work, and that behavioral biology is one of several disciplines that can help to reveal them.

### B. *Non-Law*

Before turning to consider that, however, I must first elaborate on the approach just described. This requires the brief presentation of several additional definitions, necessary to the discussions that follow.

In my view, there are a variety of different components to non-law that intersect the four major elements of the overall design space mentioned in the last section. I will call these components of non-law *pointless law*, *needless law*, *toothless law*, and *useless law*. See Figure 8. Each of these components operates to effectively prune and remove various branches from the decision tree of law's design space. They do not, thereby, make each resultant legal regime inevitable. But by incrementally and consistently constraining the design space, they do inevitably make resultant legal features somewhat more probable than they were previously.

Pointless law describes the set of all possible legal features that could address things we do not care about. We consider there to be no point to such legal intervention. Pointless law therefore prunes otherwise possible legal features from the *Topics* level of the decision tree. It separates those topics as to which other people's behaviors tend not to materially interest us, such as their house-cleaning and file-cabinet organization methods, from those topics as to which other people's behaviors indeed affect us, such as topics relating to safety, property, and family.

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17. See RONALD DWORIN, *LAW'S EMPIRE* (1986).

Figure 8

<b>Non-Law</b>		<u>Relevant at the Level of:</u>
<u>Type of Non-Law</u>	<u>Scope</u>	
Pointless Law	There are some subjects we do not care enough about to address with law. We consider them comparatively unimportant. There is no point.	Topics
Needless Law	There are some subjects we care about, as to which our normative preferences are generally matched by human behavior, absent legal intervention. There is no need.	Content
Toothless Law	There are some methods for attempting to influence behavior that are ineffective. They have no teeth.	Tools
Useless Law	There are some subjects we care about, as to which our normative preferences may not be matched by human behavior. But legal intervention is likely ineffective. There is no use.	Effort

*Needless law* describes the set of all possible legal features that could address topics we *do* care about, but as to which existing behaviors already tend, even in the absence of legal intervention, to match our normative preferences. We consider there to be no need for such legal intervention. Needless law therefore prunes otherwise possible legal features from the *Content* level of the decision tree. It separates those normative preferences that align with existing behavior, such as the preference for people to engage in trade, from those that do not, such as the preference that people not engage in robbery or fraud.<sup>18</sup> The existence of needless law depends on the fact that some beneficial features of modern society are self-generating and self-organizing, despite the absence of (or even due to the absence of) top-down behavioral proscriptions.

*Toothless law* describes the set of all the possible legal methods for attempting change, in an effort to bring behavior on certain topics into line with our normative preferences, that are wholly unpromising. We do not, for example, threaten a transgressor with a meticulously compiled but confidential tally of transgressions. We consider there to be no teeth (or bite) to such possible techniques of legal intervention. Toothless law therefore prunes otherwise possible legal features from the *Tools* level of the decision tree. It separates those methods that are more effective from those that are less effective or ineffective.

*Useless law* describes the set of all possible legal features that could address things we care about, and as to which behaviors do not already match our normative preferences, but as to which we are virtually powerless to effect change with the methods of law. We consider there to be no use to such legal intervention. Useless law therefore prunes otherwise possible legal features from the *Effort* level of the decision tree. It separates legal interventions that would require less effort from those that would either require extraordinary effort, or as to which even extraordinary effort is likely to be ineffective. For example, consider that no statute requiring an adult, in a situation of peril to a group of children, to save the most economically promising or socially useful children before his or her own would have much effect—regardless of the legal consequences for failure to do so, and even assuming that the statutorily preferred children were immediately recognizable.

I submit that there are three ultimate points to this non-law approach. First, the entire body of law, large as it is, is but a fraction of what the body of law might be. Second, that fraction is defined, in part, by the silhouette of what we either will not, need not, or cannot do. Third, that what we will not, need not, and cannot do is both common, in its major features, to

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18. The fact that there may be no need to force people to engage in a behavior, such as trade, does not mean, of course, that there are no benefits to *facilitating* such behaviors through legal methods. But that is a separate matter.

people around the world, and non-randomly generated by the functional design of the human brain.

### C. *Biolegal History*

The design space of law, just described, consists of four principal elements or levels: Topics, Content, Tools, and Effort. Because no legal system could simultaneously reflect all possible law, each element must be winnowed, in a process that separates law from non-law. Consistent with my suggestion that there is something meaningful to be learned about law from the study of non-law, I have proposed recognizing at least four general categories of non-law, each corresponding to one of the four principal elements. Comprising those categories are aspects of legal regimes that are pointless, needless, toothless, and useless.<sup>19</sup>

At this point, I propose that one way in which behavioral biology may help us to identify patterns in non-law, and thus in law, is to help us see patterns in these four categories of non-law. There are three things to note, preliminarily. First, note that I am not claiming that patterns in existing law are not also directly susceptible of identification with methods of evolutionary analysis, applied directly. They are. I am instead claiming that it may be easier to see some of the patterns (as with the wineglasses) by focusing first on the inverse image of non-law. Second, note that I am not claiming that the distinction between law and non-law is incapable of being clarified from the perspectives of, among other things, economics, sociology, and the like. It has been. I am instead claiming that it is also historically accurate and parsimonious to explain some aspects of that distinction with reference to behavioral biology. And I focus attention there, in part, because it provides a new perspective, capable of offering new insights. Third, note that I am not speaking, of course, about self-evident biology, or what we might call “First Order Effects” of biology on law, such as law’s taking account of the human need for air, food, and sleep, or dealing with the fact that people can in fact be biologically poisoned by chemicals or wounded by speeding projectiles. I am speaking, instead, of “Second Order Effects” of biology on law: the effects of evolved neural algorithms on such law-relevant features of human experience as patterns in emotions, resource acquisition, mating, status competitions, moralistic aggression, and the like. Let me explore this approach a bit further, providing a brief overview that may sketch the general contours of the idea.

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19. I do not mean to suggest that these four categories comprise all of non-law. Doubtless, there are others. For example, some potential tools of law (such as torture) may be excluded not because they are ineffective, but because their use would be shocking to the conscience.

What I am trying to convey is the idea that one can see evolutionary influences in law just as one can see evolutionary influences in organisms generally.<sup>20</sup> True, we have already grown accustomed to the idea that law “evolves,” and that, for example, inefficient rules are more selectively relitigated than efficient ones.<sup>21</sup> But this common reference to the role of evolution in law is analogical. And it is a different use of evolutionary reasoning than I intend here. I am arguing, in contrast, that many features of law are results of the ways in which evolutionary processes built the human brain. Thus, these legal features have not arisen solely because of cultural and economic processes that are *like* biological evolution (though those processes obviously have strong influence), they have arisen in material part because of processes that *are* biological evolution. To say this another way, the legal features of any legal system will reflect not only the sifting and sorting of social and economic processes that lead to legal change, but will also reflect specific features of evolved, species-typical, human brain design. What I am suggesting is, in effect, the possibility of developing a broad and systematic bio-legal history.<sup>22</sup>

What this perspective leads to is a subtle but important reorientation of the way we think about law. A comparison may make this clear. When we think of the way evolutionary processes yield species, it is common to refer to this as a process of design. And yet we know that, in reality, evolutionary processes do not create or design. They relentlessly strip away heritable traits that contribute less toward reproductive success than do contemporaneously existing alternative traits. This makes what was left behind *look* as if it has been designed. In the same way, evolutionary processes, through their influence on human brain design, have not so much built law as they have stripped away a great deal of possible features of legal systems. That is, a great deal of what we consider to be pointless, needless, toothless, and useless has been effectively foreclosed by the historical biological pathways that have left the brain designed as it is. This is not to say that the human brain, or its features, was inevitable. But it is to say that the brain and its features inevitably reflect evolutionary processes. It is also not to say that humans, as a uniquely analytic species,

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20. For additional arguments on this subject, see sources cited *supra* note 4.

21. See generally Mark J. Roe, *Chaos and Evolution in Law and Economics*, 109 HARV. L. REV. 641 (1996); Jeffrey Stake, *Status and Incentive Aspects of Judicial Decisions*, 79 GEO. L.J. 1447, 1477-93 (1991); E. Donald Elliott, *The Evolutionary Tradition in Jurisprudence*, 85 COLUM. L. REV. 38 (1985); Paul H. Rubin, *Why Is the Common Law Efficient?*, 6 J. LEGAL STUD. 51 (1977).

22. Margo Wilson and Martin Daly, for example, have made some intriguing and instructive steps in this direction, in the context of family law. See, e.g., Margo Wilson & Martin Daly, *The Man Who Mistook His Wife for a Chattel*, in *THE ADAPTED MIND: EVOLUTIONARY PSYCHOLOGY AND THE GENERATION OF CULTURE* 289 (Jerome H. Barkow, et al., eds. 1992); Margo Wilson, *Impact of the Uncertainty of Paternity on Family Law*, 45 U. TORONTO FAC. L. REV. 217, 223 (1987).

are incapable of affirmatively building and creating and designing legal features. They do all of those things. But it is to say that these legal features exist within the somewhat flexible but nonetheless constraining boundaries that biological evolution has wrought. And it is to say that any assumption that law reflects only social, political, religious, and economic developments is both overly narrow and archaic.

#### D. *Behavioral Biology and the Form of Law*

Consider the *Topics* level of the decision tree. The pointless law component of non-law traces the contour between topics that evolutionary processes have left the brain designed to care about and those that it has not. Behavioral biology reveals a pattern in non-law that helps us look at the pattern in law topics in a new way. We can consider that the origins of the major features of law were not so much affirmatively constructed by humanity, as they were revealed as what was left over after the non-law was stripped away. As a result, the main topics and subject matters of law parallel, rather remarkably, the main features of evolved human brain functioning that science is gradually uncovering. By way of partial illustration, see Figure 9. Given the species-typical and finite capacities of our brains, we tend (on average, of course) not to care as much about things that were irrelevant in evolutionary history as we care about things that were relevant. For instance, for reasons that cannot be completely understood without a biobehavioral perspective, we care about resources: acquiring resources, holding resources, and using resources. Whence, in part, the law of Property. Similarly, we care about increasing our resources through beneficial exchange. Whence, in part, the law of Contracts. We seek to be secure in both our property and in our bodies. Whence, in part, Criminal Law and Tort Law. We seek mating autonomy and essential reproductive autonomy. Whence, in part, Family Law.

True, one could tell a story that these features of many legal systems were created solely from the conscious mind of humankind, as if some ancestral human invented the idea of property, or the idea of exchange. But one would be wrong. And while it is obviously true that some features of a legal system (such as Entertainment Law, for example) are much farther from biological influence than others, it is also true that a wide variety of the other main areas of law, such as Employment Law, Business Law, Environmental Law, Intellectual Property Law, International Law, Consumer Law, and the like, can easily be seen as epiphenomenal to the basic legal curriculum—a curriculum that is basic, in part, because of the way it maps onto the fundamental, evolved, human needs and desires. To put it bluntly, the main topics of law reflect the main features of the evolved human psychology.

Figure 9

<b>Evolutionarily-Influenced Sentiments</b>	<b>Legal Features (Topics)</b>
Private Resources Exchanges Security Non-Injury Reproduction Conflict Resolution Conflict Resolution Health Relatives Age Statuses Coalitions	Property Law Contracts Law Criminal Law Torts Law Family Law Family Law Procedural Law International Law Environmental Law Estates Law Juvenile & Elder Law Freedom of Association & Speech
(Goods; Territory) (Goods; Services) (Body; Family; Resources) (Body; Resources; Reputation) (Sexual Behavior; Mating; Childcare) (Domestic) (Intra-Group) (Inter-Group) (Body; Environment) (Provisioning) (Children; Elders) (Shifting Power Bases and Influence)	

Consider the *Content* level. As with pointless law, the needless law component of non-law ultimately reveals a pattern in law. Behavioral biology helps to connect norms, preferences, moral foundations, and emotions.<sup>23</sup> Those predispositions that were needless were, by and large, stripped away—particularly when they yielded behavior that imposed net costs to organisms bearing them. The biobehavioral perspective ultimately provides explanation for why the directionality of most major norms and preferences is so remarkably non-random across human populations. The directionality reflects not only culture, but also the way in which evolutionary processes built the human brain to care about things that had important effects on reproductive success in ancestral environments. If one of the main insights of the economic approach to law was to redescribe legal sanctions as prices, then one of the main insights of behavioral biology is to redescribe emotions as evolved information-processing pathways that tend to create internal states of the nervous system that tended, in turn, to yield behaviors that were adaptive in the environment of evolutionary adaptation.<sup>24</sup> Am I saying that emotions are preference-forming, behavior-biasing algorithms, resulting from evolutionary processes? Of course I am.<sup>25</sup> Emotions are also more than that, of course. But no comprehensive thinking about emotions can be complete without the perspective that behavioral biology affords.<sup>26</sup>

This leads me to one hypothesis central to any biolegal history: that the normative content of legal systems will, all over the globe, tend to reflect the behavioral biology of species-typical emotions, even as the details of

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23. This point is explored in Owen D. Jones, *On the Nature of Norms: Biology, Morality, and the Disruption of Order*, 98 MICH. L. REV. 2072 (2000) [hereinafter Jones, *On the Nature of Norms*].

24. This is not, of course, to suggest that the emotions always or even generally yield adaptive behaviors in *present* environments. Potential mismatch between evolved psychological mechanisms and novel features of current environments, what I refer to as time-shifted rationality, is explored in Jones, *Time-Shifted Rationality*, *supra* note 11.

25. For more on this point, see Owen D. Jones, *Law, Emotions, and Behavioral Biology*, 39 JURIMETRICS J. 283, 288 (1999).

26. There are three different ways that the nervous system (of which the brain is the principal component) can bias behavior. First, it can bias behavior autonomically, for those non-optional, necessary functions that ensure breathing, heart pumping, reflexive recoil from dangerous conditions like extreme heat, and the like. Second, it can bias behavior through emotions, which are, in essence, preference-forming algorithms—heuristics and shortcuts to historically adaptive behavior. Third, it can bias behavior through procedurally rational calculation, reflection, deliberation, and analysis.

Although we tend to consider these three avenues of behavior generation to be categorically distinct, from a biological perspective these exist on a continuum. They simply correlate the amount of discretion an organism has to the severity of the environmental conditions, and the extremity of consequences for inappropriate behavior. Thus, for example, we have no capacity to stop our own hearts through force of decision, little capacity to ignore infidelities of our sex partners, and rather generous capacity to decide between voting democrat or republican.



those legal systems will inevitably vary in many particulars. This is a strong claim. To clarify, I am not suggesting that all legal systems will be identical. There is ample room for cultural variation, random variation, and historical accident. What I am suggesting is that evolutionary processes have operated much like a gravitational force, so that the design *even of legal systems that vary* can be coherently analyzed in light of that force, just as the varying designs of fish, mammals, and birds are nonetheless all fully consistent with the operating constraints of gravity. That is, the main features of different legal systems will be intelligible in light of behavioral biology in the same way that the features of the world's flora and fauna are intelligible in light of gravity.

Two brief examples. First, this perspective predicts that almost everywhere crimes of passion will generally be treated differently than premeditated crimes. This is expected to reflect a shared sense of how the reasonable person behaves, consistent with each person's projection onto others of his or her own subjective experience of grappling with powerful behavior-influencing emotions (such as jealousy, anger, and panic) that are less easily controlled than are many other behavior-influencing phenomena. Relatedly, this perspective also suggests that there is a biobehavioral underpinning not only to the history of law's treatment of so-called crimes of passion, but also to the entire legal notion of the "reasonable person" in the United States, which I suggest largely codifies our implicit understanding of evolved, species-typical psychology.<sup>27</sup>

Second, this perspective predicts that virtually nowhere will law treat forced copulation as inconsequential, or as a minor physical injury. We would not, of course, expect that random cultural variation would consistently yield the circumstance, all over the globe, that forced copulation is a uniquely heinous offense. We would, however, expect such homogeneity from a biobehavioral perspective. As a consequence of the evolutionary significance of lost mate choice to females in internally fertilizing species, natural selection would favor with widespread distribution any heritable psychological predisposition toward extreme revulsion at either being raped or having female relatives or intimates raped.<sup>28</sup>

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27. It also offers, incidentally, both theoretical and empirical support for the notion that there will be some limited contexts in which the reasonable man and the reasonable woman will differ. See generally DAVID C. GEARY, *MALE, FEMALE: THE EVOLUTION OF HUMAN SEX DIFFERENCES* (1998); BOBBI S. LOW, *WHY SEX MATTERS: A DARWINIAN LOOK AT HUMAN BEHAVIOR* (2000); LINDA MEALEY, *SEX DIFFERENCES: DEVELOPMENTAL AND EVOLUTIONARY STRATEGIES* (2000); and sources cited *supra* note 4.

28. This prediction appears to be strongly supported by the patterns of sexual aggression in all the many species, including humans, in which forced copulation occurs. For an overview of these, and other matters concerning biological influences on patterns of sexual aggression, see generally Jones, *Biology of Rape*, *supra* note 3; Owen D. Jones, *Realities of Rape: Of Science and*

Consider the *Tools* level of the decision tree. The toothless law component of non-law strips away much of what will not work. And what will not work would fail, in part, because of the biological underpinnings of human brains. If it were anywhere obvious where law and behavioral biology meet, it would be in the methods we use to push or lure people into behaving differently. We consider these tools so obvious, today, that it is at first difficult to consider the non-law design space for tools of law. It is vast. And yet we are accustomed to the idea that if you want to get someone to behave differently, one of the best ways to do this is to provide economic incentives. People can be financially rewarded for doing things we like. For example, we can offer rewards for information leading to convictions, or offer tax breaks for donations to particular causes, rather than others. Or we can financially penalize those who behave in ways we do not like—by imposing fines on environmental transgressors, for example, or imposing punitive damages on the grossly negligent. Another way to deter bad behavior is through incarceration.

But notice how, whether through financial mechanisms or jail time (which also imposes the financial costs of foregone income), we have settled on methods that are coherent from a biological perspective. We avoid those things that organisms have not evolved to care about, and instead target and restrict precisely those things human beings are designed to care about most. Civil fines impede the acquisition and free use of resources. Criminal penalties limit physical freedoms, coalitional and political (associational) freedom, access to children and other relatives, reputation and status, and sexual opportunity. At times of imposed isolation, criminal penalties even deny social, physical, and emotional access to any other human being at all. The contours of these aspects of legal tools can be clarified in light of non-law because the overwhelming number of things we do not attempt, in order to influence human behavior, so neatly reflect the commonality of human brain functioning, the shared strength of feelings people have about these particular activities, and the near inevitability that legal tools would ultimately center on these handful of activities of paramount importance to the evolved human brain. We would never expect that the average person would react as strongly to the removal of other aspects from among life's riches, such as a particular sport, music, or leather recliner, as they would to the restriction of these central elements. And the seeming triviality of this observation, when one thinks only of America, is powerfully belied by this: this perspective, and not others, predicts that these same tools will be central features of legal systems in virtually every human culture, all over the globe, at all recent times, whether those cultures had previous contact with one another or not.

Finally, consider the *Effort* level. The useless law component of non-law ultimately highlights patterns in human behavioral resistance. An understanding of how evolutionary processes affect human behavioral predispositions subsequently leads, as I have elsewhere argued, to a theory of human resistance to legal intervention.<sup>29</sup> That theory has, at its core, a principal I have termed “The Law of Law’s Leverage,”<sup>30</sup> which provides some general guidance into predicting the comparative slopes of the demand curves for various behaviors we seek to influence with the tools of law.<sup>31</sup>

Here is what I mean. From the valuable insights of economics, we already know that, as a general rule, the demand for any given behavior will tend to decrease as the cost of that behavior increases. See Figure 10. For example, we typically expect that there will be fewer incidents of robbery as the number of years in jail one receives for a robbery conviction increases (holding constant the probability of apprehension). But at present we have precious little guidance, other than intuition and empirical experience (trial and error), for understanding the mathematical *relationship* between increased penalties and decreased robbery. That is, by how *much* will we have to increase penalties in order to achieve an x% reduction in robbery? Similarly, how will the relationship between penalties and robbery compare to the relationship between penalties and drug abuse, on one hand, and jaywalking, on the other? The answers to these questions depend on the slopes of the demand curves for these different behaviors, which we have no reason to believe are identical. See Figure 11.

Yet, and this bears emphasis, we simply have no systematic theory for anticipating the relative steepness of the slopes of demand curves for different behaviors. This is borne out, for example, in the obvious puzzlement legal and economic thinkers encounter in deterring a statistically common form of homicide: homicides consequent to seemingly trivial altercations, such as obscene hand gestures.<sup>32</sup> Surely, we

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29. Jones, *Time-Shifted Rationality*, *supra* note 11.

30. *See id.* Part IV; *see also* Jones, *On the Nature of Norms*, *supra* note 23, at 2100-01.

31. I will adopt the common but imprecise convention of using variations in slope to capture the idea of variations in elasticity by, for example, describing inelastic demand with a steeply sloped demand curve. Technically, the elasticity of a demand curve, and the curve’s slope, are not the same. Slope depends on the rate of change in price and quantity, while elasticity depends on percentage changes. On every straight-line demand curve, elasticity varies from infinity, at the vertical axis intercept when quantity demanded is zero, to zero, at the horizontal axis when price per unit is zero. The curve below the midpoint (at which elasticity is precisely one) is therefore inelastic while the curve above the midpoint is elastic. However, it is common to refer to the flatter or steeper slopes as reflecting elasticity or inelasticity, respectively, because in the former case we tend to focus on the upper half of the curve, and in the latter case on the lower half.

32. On the prevalence and patterns of trivial altercation homicide, see MARTIN DALY & MARGO WILSON, *HOMICIDE* 124-26 (1988).

Figure 10

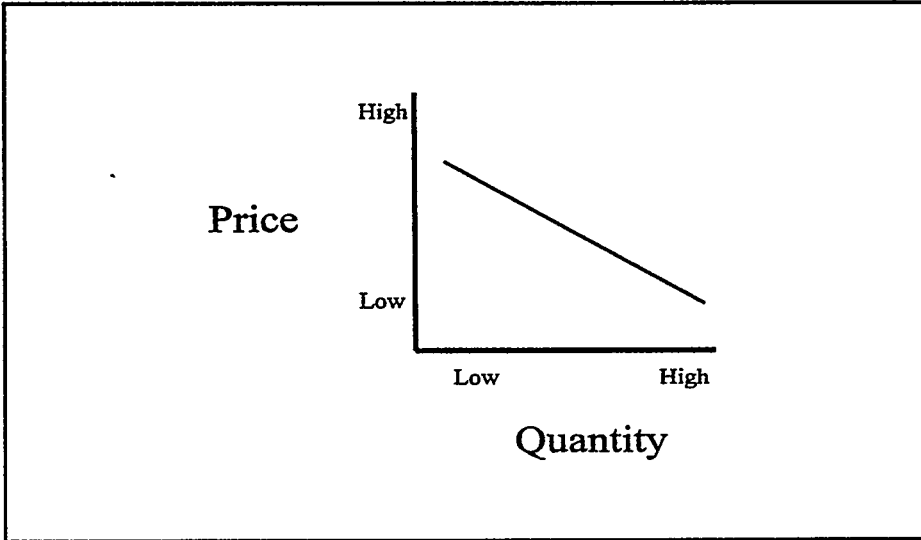
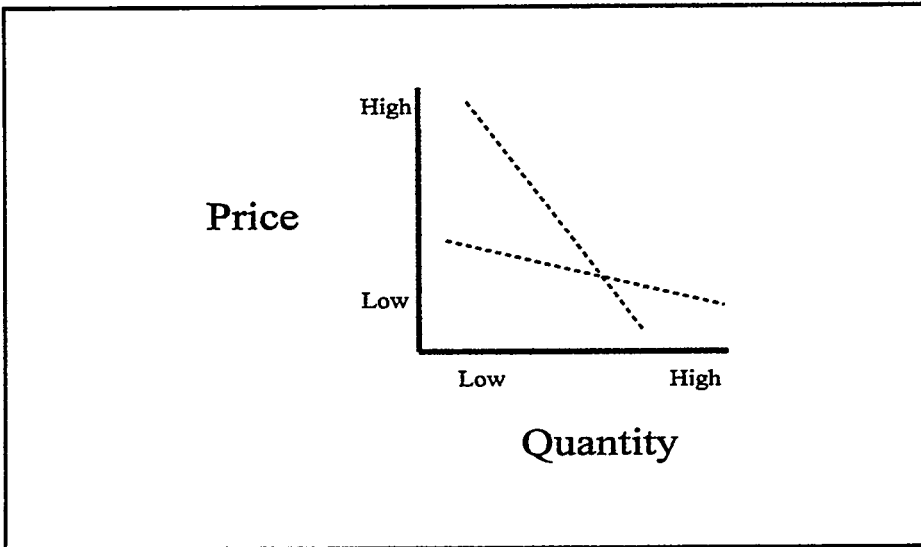


Figure 11



have a great deal of empirical evidence indicating that some behaviors, such as these, are less easily influenced by legal interventions than others. But we have no robust theory of *why* some behaviors are less easily influenced by legal interventions.

The Law of Law's Leverage predicts that:

*The magnitude of legal intervention necessary to reduce or to increase the incidence of any human behavior will correlate positively or negatively, respectively, with the extent to which a predisposition contributing to that behavior was adaptive for its bearers, on average, in past environments.*<sup>33</sup>

The biobehavioral perspective on variations in human resistance to legal interventions helps to explain how much law we are likely to have on a given topic, how hard we are likely to have to push to move behavior consistent with the content of our normative preferences, and how difficult (and, typically, expensive) it will be to move some behaviors as compared with others. To illustrate, the biobehavioral perspective offers a systematic reason why the slope of the demand curve for aggression following public threats to status, such as obscene hand gestures, is generally steeper than the curve for many other behaviors bearing similar penalties.<sup>34</sup> Similarly, the biobehavioral perspective offers a coherent reason why the slope of the demand curve for manslaughter, in contexts of discovering a spouse in bed with a lover, is comparatively more vertical (less sensitive to increases in penalties) than is the demand curve for jaywalking (again, holding the probability of apprehension constant).<sup>35</sup> It helps to explain and predict why separation and divorce rates are, in fact, so much less affected by legal changes than we commonly think.<sup>36</sup> Relatedly, it helps to explain why

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33. The many component terms of this formulation are defined and elaborated, in greater detail and space than this article affords, in Jones, *Time-Shifted Rationality*, *supra* note 11, Part IV. An alternative phrasing, which puts this principle more accurately, if much more clumsily, is this: the law of law's leverage states that the magnitude of legal intervention necessary to reduce or to increase the incidence of any human behavior will correlate positively or negatively, respectively, with the extent to which a behavior-biasing, information-processing predisposition underlying that behavior (a) increased the inclusive fitness of those bearing the predisposition, on average, more than it decreased it, across all those bearing the predisposition, in the environment in which it evolved and (b) increased the inclusive fitness of those bearing the predisposition more, on average, than did any other alternative predisposition that happened to appear in the environment during the same period.

34. See, e.g., DALY & WILSON, *supra* note 32.

35. See, e.g., DAVID M. BUSS, *THE DANGEROUS PASSION: WHY JEALOUSY IS AS NECESSARY AS LOVE AND SEX* (2000); David M. Buss, et al., *Sex Differences in Jealousy: Evolution, Physiology, and Psychology*, 3 PSYCHOL. SCI. 251 (1992).

36. For a recent study on the relative insensitivity of divorce rates to divorce laws, see Ira M. Ellman & Sharon Lohr, *Dissolving the Relationship Between Divorce Laws and Divorce Rates*, 18

certain non-market behavior is, in fact, non-market behavior rather than market behavior.

This biobehavioral perspective on non-law and law suggests that the underlying architecture of law is at least as likely to be influenced by behavioral biology as it is to be, as commonly considered, path-dependent and socioculturally contingent, within the obvious limits of economic efficiency. By that I mean that some law-relevant puzzles that are *not* explicable in terms of efficiency or randomly arising cultural artifacts preserved by path dependence *are* explicable in terms of behavioral biology. In addition to those mentioned thus far, these include intertemporal choice anomalies, hyperbolic discounting, inconsistent preferences, and perhaps even endowment effects, as I have argued separately.<sup>37</sup> This suggests that traditional approaches to understanding law and human behavior could benefit from supplementation with biobehavioral perspectives.

The biobehavioral perspective on law's form also suggests that the underlying architecture of law is likely to be common through the vast majority of human societies. Put another way, I am arguing that this approach provides a partial groundwork for a biolegal history—a biobehavioral lens on worldwide legal history.<sup>38</sup> This is considerably easier to assert than to demonstrate. But here I am attempting only to raise the issue, not to prove it. For the sound study of behavioral biology, including study of the relentless effects of evolutionary processes on species-typical patterns of predispositions, provides ample support for believing that biolegal histories can be developed—even while there is ample room for variation and for free will. This may prove to be a promising area for future work.

## V. SUMMARY AND ATTENDANT ISSUES

### A. Summary

I am attempting to show how a great number of different legal features can be connected and usefully illuminated by an evolutionary analysis in law. In sum, I am proposing that a proprioceptive perspective on law is useful, and that developing it requires heightening our awareness of both

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INT'L REV. L. & ECON. 341 (1988). For an overview of explanations for this, see generally HELEN E. FISHER, ANATOMY OF LOVE: THE NATURAL HISTORY OF MONOGAMY, ADULTERY, AND DIVORCE (1992).

37. Jones, *Time-Shifted Rationality*, *supra* note 11.

38. I speculated on this possibility earlier in Jones, *Biology of Rape*, *supra* note 3, at 930-33; Jones, *Time-Shifted Rationality*, *supra* note 11, Part IV.B; Owen D. Jones, *The Evolution of Irrationality*, 41 JURIMETRICS J. 289, 317-18 (2001).

the function and form of law. The image of law as lever, with its emphasis on the behavioral model fulcrum, and the consequent attention to the combined effects of both environment and genes on law-relevant brain design, can help to heighten the awareness of function. The images of the design space and the decision tree for law can help to heighten awareness of the form. One of the ways to achieve this new view on the form of law, I have suggested, is to focus on non-law, or inverse law. And one of the ways to do that, in turn, is to think about the ways in which an evolutionary analysis, with its biobehavioral perspective, clarifies which branches of the decision tree have been pruned away by evolutionary processes, leaving us with non-random patterns of non-law that are pointless, needless, toothless, or useless. The crenulations in these patterns of non-law offer a greater clarity to the patterns in law that we do have, and suggest the possibility of developing biological histories for a variety of law's features. We gain a more accurate and contextualized view of the smallness of law, reconsidering empire as filigree. And we gain a better sense of the probabilities that modern legal systems would exhibit the features they do, rather than entirely different features that are supposedly more susceptible (even infinitely susceptible) of arbitrary cultural variation.

One of the things I am suggesting, inherent in all this, is a fundamental reorientation in the way we think about the relationship between law and biology. At present, we in law tend to display what might be called a *buffet model* mentality. See Figure 12. Law is the center of attention, in this party we have thrown ourselves, and we reach out to sample the culinary dishes of different disciplines, according to either our subjective interest in them, some perceived need, or the force with which they are thrust upon us by the chefs of each domain. In this view, biology is merely one dish among many, functionally similar and exchangeable.

What I am proposing, instead, is that we conceptualize the relationship between law and biology in the way indicated by the *pyramidal model* of Figure 13.<sup>39</sup> Biological processes are, like physical and chemical processes, wholly and irreducibly foundational. Each of the remaining domains of knowledge integrates with the human experience at a different, more lateral and contemporaneous level. To be clear, I am not suggesting that biology is somehow the Queen of all disciplines, more important or more useful than any other. That is clearly not the case. What I am suggesting, instead, is that the relationship between law and biology is wholly different than the relationship between law and literature, or law and politics, or law and sociology, or law and economics. Biological processes operate, inexorably and unavoidably, on a vastly different time scale. And a

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39. This image was inspired, in part, by conference slides developed by Timothy Goldsmith, most recently appearing in GOLDSMITH & ZIMMERMAN, *supra* note 3, at 8.

competent understanding of them requires different considerations and methods.

The use of biology (as one discipline of several) to sharpen a proprioceptive sense of law represents one of these methods. This raises several issues and, lest my argument be misunderstood, the need for several clarifications.

Figure 12

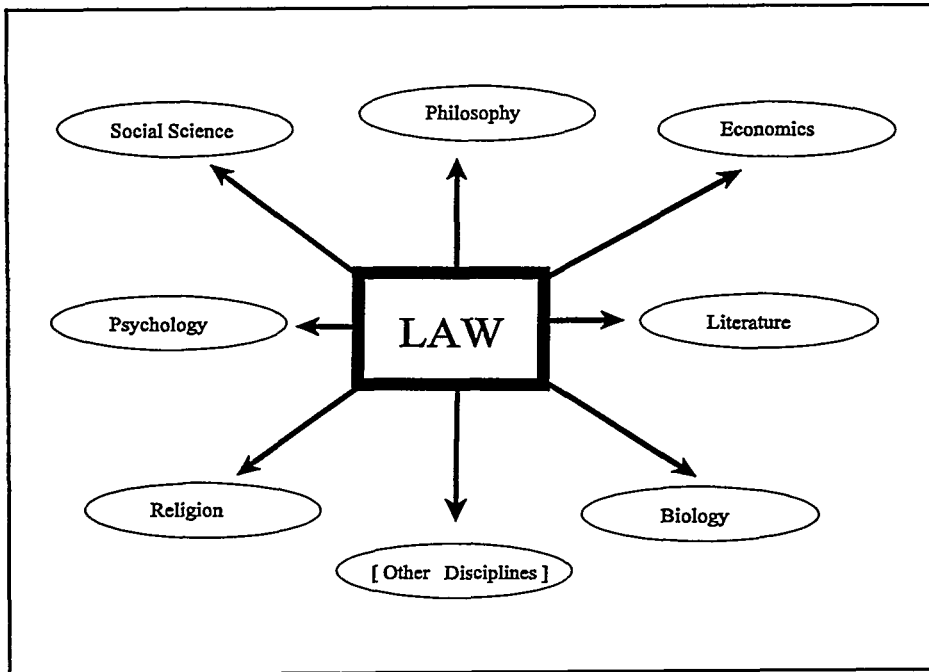
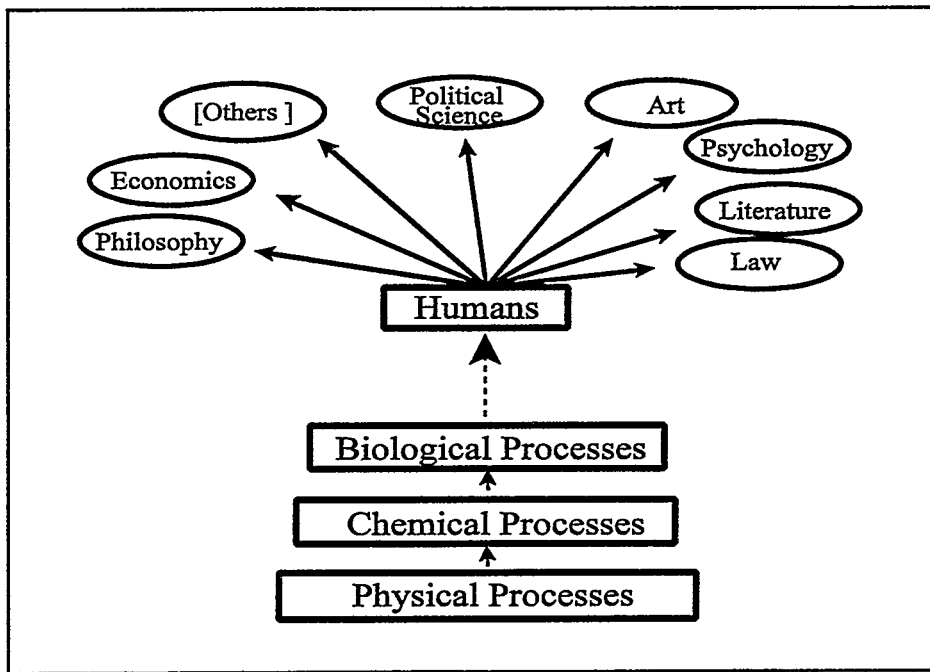




Figure 13



### B. *Issues and Clarifications*

First, my argument that legal systems tend to reflect biobehavioral predispositions says precisely nothing about whether or not they should. That is, the approach is descriptive, and itself supplies no normative value to behaviors or goals. What it does do, however, is provide information that may be valuable to us as we attempt to achieve goals that have already been set by independent processes of norm formation. To the extent that there is a “should” resident anywhere in this, it is that: a) we should avail ourselves of potentially useful knowledge systems if we are serious about achieving our goals; and b) behavioral biology should be recognized as a knowledge system useful to that enterprise.

Second, to say that legal systems will tend to reflect biobehavioral predispositions is not to say that those predispositions will determine every feature. But that very admission in no way grants that everything is up for grabs and that we cannot know anything about what legal features are likely to emerge. Evolutionary processes are complex, and so are the humans to which they have given rise. The process of evolution includes within it aspects of accident and randomness, at the same time that the decidedly non-random processes of natural and sexual selection preserve or eliminate anatomical features and behavioral predispositions that are

heritable and have differential effects on reproductive success, no matter how those features or predispositions have arisen.

Consequently, the constraints of evolutionary processes on human brain design, and thence on legal system, can be very real and yet non-narrow, at the same time. At the very least, we would expect, for example, that environmental variations among different human populations would contribute not only to cultural variation, but also to legal variation. To use a simple example, populations living in particularly dry areas are likely to have more law concerning water rights than those living in areas where the supply of rainfall greatly exceeds the demand. Similarly, we would expect that the analytic power of the brain that evolution has afforded us would not be wasted in the face of entirely novel realizations and circumstances, which could and will result in major shifts in law. The threat of global climate change, and the possibility of international cooperation to combat it, is an example, as is the discovery of the connection between the ingestion of various chemicals and decreased fertility. What evolutionary analysis does suggest, however, is that all novel circumstances will be processed through a corporeal brain, equipped with predispositions to care about things in certain patterned ways, such that the kinds of circumstances that will lead to major changes in law, and to variation among legal systems, will be consistent with the features of that evolved brain, rather than inconsistent, and therefore amenable to a coherent understanding in light of those evolutionary processes. For example, we may expect that truly major changes in law may follow encounters with circumstances that threaten health, property, resources, political coalitions, the exercise of power, and the like, and not (except in the most attenuated hypotheticals) with circumstances affecting color preferences, tastes in ice-cream, penmanship, musical inclinations, and the names of household pets.

Third, the argument that behavioral biology can help to explain central features of the architecture of law could be easily misunderstood to be more disciplinarily imperialistic than it is in fact. It is therefore important to remember that the predictive and explanatory power of evolutionary analysis depends on probabilities, not certainties. This in no way renders the analysis useless, any more than the probabilistic nature of meteorology and seismology renders those disciplines useless. This simply means, in the end, that while some features of most legal systems—such as their general preoccupation with property—were very highly likely, they were not necessarily inevitable. Nor should it be casually assumed that every specific feature of the law is directly traceable to some adaptive feature of the human psychology.

Fourth, the approach outlined earlier can, at best, only describe the macroscopic features of legal systems. For example, while it may ultimately provide a useful window into legal patterns of property, cooperation, and conflict, it offers nothing to the question of why someone

should have ten days to file a reply brief in one jurisdiction, and only five days in another. Nor, to give another example, does it provide either normative guidance or explanation concerning particular risk tolerances a government will display, such as the amount of mercury that is legally permissible in food for human consumption. This does not trouble me. One need not have a theory of everything in order to explain some things. And increasing our understanding of the constraints on and patterns of macroscopic superstructures of legal systems is more than sufficient to demonstrate utility of evolutionary analysis in law.

Finally, this non-law approach as yet affords no clear role to, or descriptive explanation for, symbolic law. We know, for example, that legal policy-makers throughout history have sometimes taken stands on the undesirability of behavior that is excessively difficult to prevent with the tools of law. They may do so because their intent is truly aspirational, regardless of the unlikelihood of any state enforcement, or they may do so because of the signaling value of moral posturing. In either case, the phenomenon exists. Rarely enforced proscriptions against adultery come to mind. So any model that predicts that few legal features will attend behaviors that are extremely difficult to affect with the tools of law will remain incomplete without making appropriate accommodation for this obvious feature of many modern legal systems. This strikes me as an important, though not insurmountable, shortcoming that future work may usefully address. It may be the case that meaningful patterns in such laws are amenable to evolutionary analysis. For example, it is possible that many of law's symbolic stands are more a reflection of the extreme acuteness of some evolved emotional realities (such as jealousy concerning potential adultery), that bubble up cathartically despite comparative legal fruitlessness, than they are a reflection of a genuine belief that symbolic stands are materially effective in actually changing people's behavior.

## VI. CONCLUSION

I have been leaping, of course, over large landscapes of detail in an effort to provide a broad view of one possible implication of our entering an era of broader integration of law and science. In particular, I have attempted to reflect briefly on what the effects of brain design on human behavior may mean for law. As we may consider the two paradoxes with which I opened—law's lack of an independent behavioral model and the historical disinterest in brain design—I would impress upon us three main themes.

First, behavioral biology is essential to any firm grasp on human behavior relevant to law. Law depends on a solid behavioral model. And solid behavioral models must integrate social science perspectives, from sociology, economics, and the like, with life science perspectives, such as

those offered by behavioral biology. For it is as coherent to have a theory of human behavior that lacks a sound biological foundation as it is to have a theory of gymnastics lacking a sound foundation in physics. It cannot be done. If law is fundamentally about regulating behavior, and behavior is a product of both genes and environment, and the brain is an organ designed by evolutionary processes to associate appropriate behavioral outcomes with specific patterns of environmental stimuli, then it follows that behavioral biology, and what it can teach us about brain design, is highly important to law. The study of behavioral biology helps us to increase the solidity of the behavioral model fulcrum on which law so vulnerably relies. Put another way, we cannot achieve maximum effectiveness of legal policy without a modern understanding of behavior. We cannot understand behavior without understanding the brain. We cannot understand the brain without understanding biology. And we cannot understand biology without understanding evolutionary processes. Consequently, maximum effectiveness of law requires (among many other things, obviously) the study of evolutionary processes and their effects on the biology of human behavior. As a consequence we may see, in coming years, increasing use of evolutionary analysis in law, and increasing integration of biology with other law-relevant disciplines, such as psychology and economics.

Second, it is useful to gain a proprioceptive, deep-structure sense of law. To have a sense of where our law is, how it got here, and where it's going, we need to have a better sense of the processes that led law here, and the constraints those processes impose upon the future. We can acquire and sharpen that proprioceptive sense through the study of behavioral biology, which affords a broader, richer, and more historically accurate context for understanding law. Behavioral biology helps to reveal a coherent sense of the deep structure in human legal systems, in part, by providing a window on non-law—a window on the ways in which evolutionary processes have importantly contributed to constraining and winnowing the design space of law. And behavioral biology does this by providing information about human brain design that is useful to understanding both the function and the form of law, and which may enable useful biolegal histories.

Third, what we see in the design of law is the product of a specialized information processor—an organ far more akin to a swiss army knife than it is to an empty beaker, a general-purpose computer, or a blank slate.<sup>40</sup> While the features of human law are not strictly inevitable, nor should they be thought to be the product of infinitely variable culture, combined with

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40. For more on this subject, see STEVEN PINKER, *THE BLANK SLATE: THE DENIAL OF HUMAN NATURE IN MODERN INTELLECTUAL LIFE* (forthcoming) (manuscript on file with author).

culturally contingent norms, mixed with accident, constrained by economics, and preserved through either path-dependence or efficiency. What we see when we look at the architecture of law, in the silhouette that attention to non-law provides, is the unique brain signature of the human animal, written by evolutionary processes and elaborated within the sometimes generous dimensions of the design space that evolutionary processes have not narrowly constricted.