

Journal of Contemporary Health Law & Policy (1985-2015)

Volume 10 | Issue 1

Article 18

1994

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Recommended Citation

Owen D. Jones, *Law and Evolutionary Biology: Obstacles and Opportunities*, 10 J. Contemp. Health L. & Pol'y 265 (1994).

Available at: <https://scholarship.law.edu/jchlp/vol10/iss1/18>

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LAW AND EVOLUTIONARY BIOLOGY: OBSTACLES AND OPPORTUNITIES

Owen D. Jones*

Modern evolutionary biology increasingly offers powerful insights into possible origins and functions of human social behavior. Thus far, however, evolutionary biology has rarely been applied as a tool of legal analysis.¹ Contrast its invocation, for example, with that of economics.²

Perhaps part of the disproportion between the use in law of economics and of biology is attributable to the phenomenon that many lawyers seem to choose their profession more from aversion to science than from love of law.³ The fundamentals of economic reasoning seem somehow less foreign to legal reasoning than does a scientific avenue of inquiry.

Yet few areas of law have been untouched by developments in biology,

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1. The Gruter Institute for Law and Behavioral Research, however, continues to make significant progress in encouraging the integration of social sciences and evolutionary perspectives. See, e.g., MARGARET GRUTER, *LAW AND THE MIND: BIOLOGICAL ORIGINS OF HUMAN BEHAVIOR* (1991); LAW, BIOLOGY & CULTURE: THE EVOLUTION OF LAW (Margaret Gruter & Paul Bohannon eds., 1983). See also JOHN H. BECKSTROM, *EVOLUTIONARY JURISPRUDENCE: PROSPECTS AND LIMITATIONS ON THE USE OF MODERN DARWINISM THROUGHOUT THE LEGAL PROCESS* 28-47 (1989) [hereinafter *EVOLUTIONARY JURISPRUDENCE*]; JOHN H. BECKSTROM, *DARWINISM APPLIED: EVOLUTIONARY PATHS TO SOCIAL GOALS* 1-21 (1993) [hereinafter *DARWINISM APPLIED*]; Richard D. Alexander, *Biology and Law*, 7 *ETHOLOGY & SOCIOBIOLOGY* 167 (1986); Owen D. Jones, *Reproductive Autonomy and Evolutionary Biology: A Regulatory Framework For Trait-Selection Technologies*, 19 *AM. J.L. & MED.* 187 (1993).

2. Dean Calabresi, of course, is a prominent figure in law and economics. See, e.g., GUIDO CALABRESI, *THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS* (1970); Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 *HARV. L. REV.* 1089 (1972). Economic analysis of law and policy has extended to everything from property to sex. See, e.g., RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* (3d ed. 1986); RICHARD A. POSNER, *SEX AND REASON* (1992).

3. Science, after all, often requires math.

and it is unlikely that many lawyers will be able to avoid familiarizing themselves with some of the relevant facts, technologies, and theories emerging from the field. Criminal law, for example, has been forever changed by the new forensic techniques of DNA fingerprinting. Tort law increasingly involves complex questions of toxicity and causation, and employment law could soon find corporations discriminating among applicants on the basis of negative genetic profiles. In addition, the law of contracts has been considerably agitated by the advent of surrogacy, the law of property now grapples with ownership of human embryos, and new technologies, such as the recent cloning of human embryos, present a whole new thicket of legal, ethical, social, and religious issues.

Although biology multiplies such new challenges, it can also provide illumination. The field of evolutionary biology, in particular, explores biological bases of (as well as relations between) physical structures and behaviors. An explosive growth in empirical research, the sustained and refining pressure of cross-disciplinary critiques, and the theoretical advances to which such pressures contribute, provide insights worth careful study for their potential contribution to the increasingly complex analyses of contemporary social and legal issues.⁴

This article begins by outlining the most basic principles of evolutionary biology of which lawyers and lawmakers should be aware. It then briefly discusses, and finds generally unjustifiable, four reasons why evolutionary perspectives are often excluded from the theater of human behavioral analysis. Finally, the article highlights three of the numerous ways evolutionary biology can prove useful to socio-legal inquiry and policymaking. With specific examples, it demonstrates how evolutionary biology can assist in predicting contexts in which undesirable behavior (such as child abuse) may arise, in clarifying the contours of articulated values (such as the relationship between reproductive autonomy and the opportunity to select for specific characteristics in children), and in suggesting methods for reducing the incidence of certain undesirable behaviors (such as incest). These examples illustrate the utility of evolutionary

4. The contribution of evolutionary biology should not be confused with that offered by the study of bioethics. The latter uses ethics to illuminate what should be done about issues directly implicating biology, such as euthanasia or abortion. In sharp contrast, a law and evolutionary biology approach uses evolutionary biology *itself* as a source to illuminate what might be done about issues that may be classically biological, such as trait-selection technologies used to influence offspring characteristics, or only remotely so, such as crime reduction. See, e.g., Jones, *supra* note 1; DARWINISM APPLIED, *supra* note 1.

perspectives on human social behavior to social analysts, as well as to lawmakers in the role of social governors.

I. THE EVOLUTIONARY BIOLOGY PERSPECTIVE

In order to understand the origins of certain misperceptions about evolutionary analysis of human affairs (which will be explored in Part II), and to recognize the specific ways in which such analysis may serve social and legal goals (taken up in Part III), it is important first to review briefly three basic principles of evolutionary biology.⁵ For evolutionary biologists, these principles govern the increase or decrease over time in the percentage of a population that shares any particular genetically influenced trait.

A. *The Basic Mechanism of Evolution Is Natural Selection, Operating at the Level of the Gene*

Assume a single individual exhibits a particular genetically influenced physical or behavioral trait. If the trait renders that individual more likely to survive to reproductive age and/or to produce more offspring than individuals without the trait, then the gene coding for the trait is commensurately more likely to be replicated into the next generation than genes coding for alternative traits.⁶ "Natural selection" is the process by which, if the trait remains advantageous over time, the percentage of individuals within that population bearing the trait will increase.⁷ Therefore (and to oversimplify slightly), natural selection effects relentless pressure upon each organism to maximize its "inclusive fitness," which is essentially the proportion of a population, in a given future generation, that will carry copies of the organism's various genes after its death.⁸

5. For a basic introduction to evolutionary biology and mechanisms of natural selection, see ROBERT TRIVERS, *SOCIAL EVOLUTION* (1985); RICHARD DAWKINS, *THE SELFISH GENE* (1976); RICHARD DAWKINS, *THE BLIND WATCHMAKER* (1986); MARTIN DALY & MARGO WILSON, *HOMICIDE 2-5* (1988).

6. This is, of course, a simplification. More specifically, since "continual generation of random variation is continually followed by differential survival and proliferation that is nonrandom, the more adaptive forms persist . . . while their alternatives perish." DALY & WILSON, *supra* note 5, at 3 (summarizing Darwin).

7. Such randomly-arising physical traits (like the long necks on a few early giraffes) can be so much more successful than competing traits (like short necks) that many generations hence they may be exhibited by the vast majority of the population. The same can be true for certain genetically influenced behavioral traits, such as migratory patterns.

8. One's own inclusive fitness calculus includes not only one's own reproductive success (the number of direct descendants) but also the reproductive success of genetic rela-

While early evolutionary theorists, in particular, argued that natural selection may operate at the level of the group, rather than at the level of the gene, this debate has been largely resolved in favor of the gene-selectionists.⁹ Gene-selectionist models of the development of apparently altruistic behavior, for example, such as animal alarm calls, far more accurately predict observed behavior within a species, such as selective infanticide and cannibalism, than do group-selectionist models.¹⁰ This means that no genetically influenced behavior can evolve simply because it is good for the group; it must also (in fact, primarily) confer an advantage to an individual in the sense of promoting that organism's inclusive fitness.

B. Natural Selection Affects Both Genetically Influenced Physical and Behavioral Traits

Most of the traits that define the majority of living organisms are genetically influenced. While people tend to think of genes as merely the

tives, devalued by the degree of genetic relatedness. For a useful summary of the mechanism of natural selection, see DALY & WILSON, *supra* note 5, at 2-5. The inclusive fitness theory developed during the early 1960s. See, e.g., W.D. Hamilton, *The Genetical Evolution of Social Behaviour*, 7 J. THEORETICAL BIOL. 1 (1964).

9. See, e.g., TRIVERS, *supra* note 5, at 67-85 (discussing "The Group Selection Fallacy") and recent sources cited at 433-55.

10. *Id.* People used to cite as evidence of group selection the fact that in some insect species individuals devote all their energies to servicing offspring of the queen. Insects, however, have a haplo-diploid rather than diploid chromosomal structure. See generally Robert L. Trivers & Hope Hare, *Haplodiploidy and the Evolution of the Social Insects*, 191 SCIENCE 249 (1976); TRIVERS, *supra* note 5, at 169-202; RANDY THORNHILL & JOHN ALCOCK, *THE EVOLUTION OF INSECT MATING SYSTEMS* (1983). Consequently, since a haplo-diploid individual is more related to its own sibling than it would be to its own offspring, such insect behavior is not only consistent with gene selection, but collateral support for it. Similarly, many group selectionists pointed to the apparently altruistic warning calls of ground squirrels as supposed evidence of behavior that evolves for the good of the group, at a high cost to an individual. Later study revealed that the behavior of ground squirrels, too, fits the gene selection model. See, e.g., Warren G. Holmes & Paul W. Sherman, *Kin Recognition in Animals*, 71 AM. SCIENTIST 46 (1983); Warren G. Holmes & Paul W. Sherman, *The Ontogeny of Kin Recognition in Two Species of Ground Squirrels*, 22 AM. ZOOLOGIST 491 (1982); Robert L. Trivers, *The Evolution of Reciprocal Altruism*, 46 Q. REV. BIOL. 35 (1971) [hereinafter *The Evolution of Reciprocal Altruism*]; TRIVERS, *supra* note 5, at 109-44. The propensity to call is directly correlated to the local concentration of relatives. Ground squirrels, moreover, are notoriously cannibalistic, primarily of unrelated pups. See generally Paul W. Sherman, *Nepotism and the Evolution of Alarm Calls*, 197 SCIENCE 1246 (1977); Paul W. Sherman, *Kinship, Demography, and Belding's Ground Squirrel Nepotism*, 8 BEHAVIORAL ECOLOGY & SOCIOBIOLOGY 251 (1981); Paul W. Sherman, *Reproductive Competition and Infanticide in Belding's Ground Squirrels and Other Animals*, in NATURAL SELECTION AND SOCIAL BEHAVIOR: RECENT RESEARCH AND NEW THEORY 311 (Richard D. Alexander & Donald W. Tinkle eds., 1981).

architects of the body, genes also play a direct and significant role in the behavior of each organism.¹¹ Were this not true, complex mating rituals in non-sentient creatures would be impossible. And web-spinning spiders would be incapable of spinning webs (notably similar among members of a single species) despite their physical ability to do so. Often such behaviors are characterized as "instinctive," but such a description fails to convey the range of behaviors that are influenced to a greater or lesser extent by genetic factors.

Importantly, genetically influenced structural and behavioral traits are necessarily interdependent. It is generally the unique combination of physical structure and behavior that determines an individual's likelihood of survival, reproductive success relative to its contemporaries, and, ultimately, its inclusive fitness. Natural selection thus operates on the *combination* of structures and behavior. It tests whether a given organism with one type of structure, when behaving in a particular way, is more or less likely to survive and reproduce in a single environment than is a different organism, possessing a different combination of structures and behaviors, in the same environment.

C. *Natural Selection Operates Inexorably Upon Things That Reproduce*

Evolution remains a constant process, so long as there is reproduction and the potential for genetic variation. All living things are constantly subject to selective pressures that make them more or less likely to reproduce more successfully than their neighbors. Because the human species is as much engaged in this process of continual development as is any other, we may expect that common genetically influenced physical and behavioral traits are in a constant state of flux, to the extent that random mutation may introduce competitive traits, or that environmental conditions may render historically adaptive traits maladaptive (and vice versa).

11. The material supporting this proposition is voluminous, exploring, in part, how genes design the neural circuits that underlie behavior through the controlled developmental interactions of nerve cells. See generally sources compiled in TRIVERS, *supra* note 5, at 433-55; DALY & WILSON, *supra* note 5, at 299-321; RICHARD D. ALEXANDER, *THE BIOLOGY OF MORAL SYSTEMS* 265-80 (1987); *HUMAN REPRODUCTIVE BEHAVIOUR: A DARWINIAN PERSPECTIVE* (Laura Betzig et al. eds., 1988); see also MARTIN DALY & MARGO WILSON, *SEX, EVOLUTION, AND BEHAVIOR* (1983).

II. OBSTACLES TO INTEGRATING EVOLUTIONARY BIOLOGY IN SOCIO-LEGAL ANALYSIS

Historically, there have been a number of obstacles to invoking evolutionary biology as relevant to any analysis of human affairs. Four deserve particular mention.

A. *Inertia in Public Perception: Anchoring Evolutionary Biology to Only Its Early Formulations*

Darwin popularized the notion that inherited physical traits are subject to the evolutionary pressures of natural selection. Although some of Darwin's work also addresses the evolution of certain behavioral characteristics, it was not until E.O. Wilson's publication of *Sociobiology: The New Synthesis* in 1975 that the general public was presented with a methodical argument that the selective forces affecting physical traits also affect inherited behavioral traits in all animals, including humans.¹² This is an uncomfortable vision, to be sure, and it has posed a significant obstacle to the incorporation of evolutionary perspectives in socio-legal analyses.

But modern evolutionary biology is *not* about Wilson's book. Wilson's efforts were undeniably farsighted and groundbreaking. Yet, as in many an ambitious and pioneering endeavor, the theoretical system Wilson outlined appears to have included, along with the main premises, a number of more problematic and controversial starts. Unfortunately, many of the latter have continued vitality in the public mind. They are improperly associated with the core and surviving tenets of evolutionary biology, despite their nearly universal rejection by modern evolutionary biologists who have simply and systematically moved on.

The early formulations, therefore, remain a fertile source of once accurate, but now outdated and often moot, criticism.¹³ Part of this phenome-

12. EDWARD O. WILSON, *SOCIOBIOLOGY: THE NEW SYNTHESIS* (1975). This built, in part, upon the significant and prior works of Hamilton, Williams, and Trivers, among others. See, e.g., Hamilton, *supra* note 8; GEORGE C. WILLIAMS, *ADAPTATION AND NATURAL SELECTION: A CRITIQUE OF SOME CURRENT EVOLUTIONARY THOUGHT* (1966); *The Evolution of Reciprocal Altruism*, *supra* note 10.

13. It is in part due to this anchoring effect, and the public association of the field with the school of thought of E.O. Wilson and Charles Lumsden, that many sharing an evolutionary (that is Darwinian or adaptationist) perspective refrain from using the term "sociobiology." Jerome H. Barkow, *Overview*, 10 *ETHOLOGY & SOCIOBIOLOGY* 1, 8-9 (1989). While other terms have been considered, such as human ethology, behavioral socio-ecology, evolutionary psychology, or biocultural anthropology, no general agreement has emerged. This is due, in part, to a shared sense that Darwinian perspectives should be

non, of course, may be attributed to cycles inherent in academic research, analysis, writing, publishing, and critiquing. Each stage takes time, and it is inevitable that by the time a thoughtful critique has been published it will, in part, be obsolete. Yet a large part is also and independently attributable to the rate of growth. The explosive increase of evolutionary perspectives in a wide variety of fields has resulted in unusually rapid accumulations of empirical data (supporting some theories and challenging others), as well as in rigorous intellectual ferment. For while the learning curve in evolutionary theory has been unusually steep, befitting its recent application to human behavior, the time lag between new advances in theory and public perception of the same remains as constant as it does in older and more slowly evolving disciplines. The disparity, therefore, between those theories that are current and those theories that are critiqued remains frustratingly large.¹⁴

This would be less troublesome were people less dismissive. But the popular response to sociobiology is itself a cultural artifact worthy of serious study. There is something Galilean in it. Because of some weaknesses in the details of the original theory, people have tended to dismiss the *entire* theoretical system, even in its later iterations. This makes about as much sense as concluding that the earth does *not* revolve around the sun simply because the idea's first proponent posited a perfectly circular orbit and later evidence revealed non-circularity.¹⁵

The combination of early, incompletely refined ideas, and gross misdescription of evolutionary theory in the public press, has afforded many casual observers the luxury of confident complacency in their dismissal of

integrated with existing disciplines, rather than the basis for a separate field. *Id.*; see also *EVOLUTIONARY JURISPRUDENCE*, *supra* note 1, at 1.

14. For example, Philip Kitcher's thought-provoking, insightful, and rigorous 1985 book on sociobiology purports to eviscerate certain aspects of the field but in fact devotes much of its effort to criticizing theories from the late 60's and 70's that were pre-formative, and in some cases already abandoned. See PHILIP KITCHER, *VAULTING AMBITION: SOCIOBIOLOGY AND THE QUEST FOR HUMAN NATURE* (1985).

15. Some dismissiveness, it seems, may derive from an anti-bio bias, rooted in certain perceived but illusory distinctions between the life and physical sciences. Biology seems more accessible, as people tend, for example, to have a more intuitive understanding of the fundamental interaction of egg and sperm than they do of electromagnetic fields, dark matter, pulsars, quarks, and fusion reactions. The effects are profound. People are more likely to expect the frontiers of a physical science (like astronomy) to be advancing continually — offering significant new theories, subject to continued and rigorous efforts at falsification and refinement — than they are to expect new insights on the same order of magnitude from a life science (like biology). This unfortunate misperception makes many more resistant (albeit unintentionally so) to evaluating, accepting, and validating significant movement on the frontiers of biological theory.

the application of evolutionary theory to humankind. This is entirely premature, regrettable, and intellectually sloppy.

News of the death of sociobiology, biocultural anthropology, evolutionary psychology (or whatever else it may be called¹⁶) is greatly exaggerated.¹⁷ Academics, of all audiences, should know that ideas, especially new ideas, often develop through an endless cycle of thesis, antithesis, and synthesis. Chaff is discarded, surely, but the wheat is saved. Many of the most important principles central to sociobiological theory have not only survived, but have in fact flourished in (and been improved by) the harsh, challenging light of rigorous empirical and theoretical study.

B. The Misperception that Evolutionary Biology Analysis Reasons from "Is" to "Ought"

A second obstacle to incorporating evolutionary perspectives in analyses of human affairs has been dubbed "The Naturalistic Fallacy," which is committed whenever one attempts to reason directly from an "is" to an "ought."¹⁸ Such a step is illegitimate, of course, because there is no direct logical path from description to normative conclusion. Cognizant of this, some critics of the use of evolutionary biology in human affairs point out that the mere observation that some behavior is evolutionarily adaptive cannot alone yield the conclusion that our political, religious, or legal systems should allow or encourage that behavior. A normative conclusion of this kind can only be derived from outside the facts provided by natural sciences.

Any invocation of evolutionary biology as relevant to human socio-legal affairs should be scrutinized for the naturalistic fallacy, for history

16. See *supra* note 13.

17. See, e.g., *So Darwin Was Right After All, Once He Had Evolved a Bit*, *ECONOMIST*, April 4, 1992, at 107 (referring to "sociobiology's brief flourish a decade ago"); Leon Kamin's book-jacket review of *VAULTING AMBITION*, *supra* note 14 ("There are not many books that really deserve to be called 'definitive' — but anybody who has been waiting for a definitive critique of the burgeoning field of sociobiology need wait no longer. . . . This makes it possible for Kitcher to salvage what is or may be useful in the work of individual animal sociobiologists, without sparing the cant, pretentiousness, and just plain errors that abound in sociobiological speculations applied to humankind"). But see, e.g., Richard D. Alexander, *Evolutionary Approaches to Human Behavior: What Does the Future Hold?*, in *HUMAN REPRODUCTIVE BEHAVIOUR: A DARWINIAN PERSPECTIVE* 317 (Laura Betzig et al. eds., 1988).

18. See generally *EVOLUTIONARY JURISPRUDENCE*, *supra* note 1, at 28-45; *DARWINISM APPLIED*, *supra* note 1, at 1-21. For an overview of philosophical thought on the naturalistic fallacy, see M. RUSE, *TAKING DARWIN SERIOUSLY: A NATURALISTIC APPROACH TO PHILOSOPHY* 86-93 (1986).

teaches its folly. Herbert Spencer, for example, coined the woefully inaccurate (though catchy) slogan "survival of the fittest" to justify a laissez-faire social system he articulated in the mid-eighteen-hundreds.¹⁹ He rationalized preservation of the economic and political status quo with observations about the way things simply "are" (he thought) in nature.

Yet those who would now invoke evolutionary biology in a broad-based and inclusive legal analysis generally admit the illegitimacy of such rationalizing, and "naturalistic fallacy" objections to each invocation of biology would seem anachronistically misplaced.²⁰ Although theories of evolutionary biology remain rather useless without reference to articulated values, biology should not be ignored simply because it is not dispositive by itself. It is no less a tool simply because outside forces must supply its purpose and direction.

Law and economics analysis, for example, may identify an optimally efficient transaction without purporting to argue that such a transaction must be implemented *without* reference to other social values. Similarly, a law and biology analysis may identify evolutionarily adaptive behavior, without in any way suggesting that it must be allowed or encouraged.

C. *The Misperception that Evolutionary Biology Analysis Is Genetically Deterministic, Ultimately Negating Free Will*

Some see any recognition of biological bases of human behavior as an outright negation of free will, as if genes always "hard-wired" a person for certain behavior that he or she would be powerless to prevent.²¹ If that were the case, such a fear would be understandable, and concomitant concern for the vitality of concepts central to our legal system (such as intent) would be justified.

Instead, this third obstacle to the invocation of biology in law and policy analysis seems to be a function of two things: (1) an essentially narcissistic fiction that mind may be entirely divorced from matter, and (2) misperception of the biological mechanisms by which certain behavioral patterns may be influenced and genetically inherited.

19. The phrase is often misattributed to Darwin. See generally Richard Hofstadter, *The Vogue of Spencer*, in *DARWIN* 489, 490 (Philip Appleman ed., 1970). The phrase is inaccurate because success is measured in reproduction, not survival. In many species, the most "successful" individuals are those that sacrifice their lives in the course of mating, not those who survive the longest.

20. See, e.g., *EVOLUTIONARY JURISPRUDENCE*, *supra* note 1, at 28-45; *DARWINISM APPLIED*, *supra* note 1, at 1-21; Jones, *supra* note 1.

21. For a discussion of this misperception of evolutionary biology premises, see generally *EVOLUTIONARY JURISPRUDENCE*, *supra* note 1, at 30-33.

First, we have no problem extrapolating from mice to humans when ordinary chemicals are at issue. That a mouse may develop cancer after ingesting specific quantities of substance X often and rightly raises concerns about the effect of the same substance on humans. In these contexts, we recognize our biological similarity to mice.

We have grave problems, however, extrapolating from mice to humans when behavior is involved. After all, we *think* — and we use this fact as itself a justification for the belief that learning and culture somehow decouple individuals from their evolved adaptations.²² To argue otherwise challenges traditional notions of human social behavior and renders humankind typical and non-unique (as did the revelation that the earth orbits the sun and not vice versa).

Yet while it is theoretically possible that humans may somehow have evolved to the point where there is no biological basis for any human behavior, there is no reason — none at all — to establish this self-serving presumption. Deviation from the norm, not conformance with the norm, bears explanation and justification. In light of currently prevailing and generally accepted theories of evolution, therefore, those arguing that the behavior of humans is, alone in the animal kingdom, entirely independent of genes should properly bear the burden of explaining how this could come to pass.

For extremely complex, genetically influenced behavior *predated* and evolved entirely without human consciousness. No link at all, therefore, must be forged between the mere fact of consciousness and capacity to reason, on the one hand, and the existence of complex behavior, on the other. The obvious effects of higher reasoning upon human behavior in no way rebuts the presumption, derived from observations of all other living species on this planet, that much of any organism's behavior can be traced to genetic factors.²³

Second, evolutionary biology *in no way suggests* that individual humans are incapable of choosing how to act. While it is true that certain behavioral responses (such as blinking) are effectively hard-wired, evolutionary biology in fact suggests that human behavior is generally and necessarily

22. For an elaboration of this point, see generally Paul W. Turke, *Which Humans Behave Adaptively, And Why Does It Matter?*, 11 ETHOLOGY & SOCIOBIOLOGY 305, 312 (1990).

23. See, e.g., *Researchers Find Addicts' Gene Pattern: Drug Abuse May Be Mostly Hereditary*, WASH. POST, Dec. 29, 1993, at A6 (describing gene patterns common to severe alcoholics and cocaine addicts as being more than three times more prevalent in addicts than in non-addicted control subjects).

a mixture of self-actualizing decisionmaking (by virtue of our capacity for higher reasoning) *and* genetically influenced behavioral “predispositions.”

It bears extreme emphasis that these predispositions are neither commands nor dictates. They are instead tendencies, on the margin, to act a certain way — all else being equal.²⁴ Genetically influenced behavioral predispositions have evolved in many creatures to be more susceptible to variation or negation than have physical structures, because behavioral flexibility becomes increasingly adaptive in proportion to the complexity and responsiveness of an organism’s environment, especially its social environment. While genes may determine a tendency to behave in a certain way, the more advanced an individual’s capacity for context recognition, analysis, and learning, the more external conditions may affect the manifestation or repression of a genetically coded behavioral predisposition. It is in no way necessary to believe that free-will is negated in order to believe that genetic factors may influence human behavior.

D. Fear of Evil Uses

There are, of course, a number of historical instances in which the attempt to invoke biology as relevant to human affairs was misguided and disastrous. Adolf Hitler, for example, pursued a centralized, authoritarian, selective killing and breeding regime purportedly designed to purify the Aryan race. Together, such instances present a significant, popular, and fourth obstacle to incorporating evolutionary biology perspectives, raising prudent suspicion in those to whom evolutionary biologists might laud the virtues of biological perspectives on socio-legal issues.

But perverted uses of the past should not forever dictate reflexive revulsion to intimations of genetic bases of human behavior. Such reflexes, for example, recently prevented a conference that would have addressed the biological component of a Department of Health and Human Services (HHS) initiative for identifying social, psychological, and biological factors contributing to violence. The National Institutes of Health (NIH) had planned to sponsor the conference, entitled “Genetic Factors in Crime: Findings, Uses and Implications,” but in April of 1993 froze and ultimately withdrew financing due to public protests that the conference

24. The propensity may simply reflect that the behavior is more likely to occur than not to occur, in the absence of extrinsic factors. In humans, for example, conscious analysis or cultural influences may easily overcome many predispositions. See generally John H. Beckstrom, *The Potential Dangers and Benefits of Introducing Sociobiology to Lawyers*, 79 Nw. U. L. Rev. 1279 (1984-85).

was inherently racist.²⁵ One prominent critic described his opposition to the conference as "trying to stop another Holocaust."²⁶

The offending phrase in the brochure advertising the conference stated that "genetic research holds out the prospect of identifying individuals who may be predisposed to certain kinds of criminal conduct, of isolating environmental features which trigger those predispositions, and of treating some predispositions with drugs and unintrusive therapies."²⁷ Concerned that the conference participants might present research suggesting that such genetic predispositions might appear more frequently in individuals of particular races, vocal opposition charged that the meeting could legitimize racist views.

Doubtless, studies that might have correlated race and undesirable characteristics or predispositions should be subject to heightened and rigorous public and academic scrutiny. For labeling a finding or theory "scientific" (accurately or inaccurately) may collaterally lend legitimacy to political views, regardless of whether the underlying science has been misperceived or misappropriated. Yet the principle of precluding studies into averting behavior deemed socially undesirable (particularly behavior, such as violence, that is quite broadly and inter-racially deemed so) on the basis that conclusions that *might* be reached *might also* be used in nefarious and pernicious ways is improperly censorial and counter-productive.²⁸ It is speculative, and it deprives the marketplace of ideas.

First, in this case, race is just one of thousands of genetically influenced characteristics that, as a matter of thorough inquiry, may or *may not* correlate in any significant way to predispositions to any given behavior. Second, one must not lose sight of the fact that behavioral predispositions are almost invariably defined in reference to specific patterns of environ-

25. The title of the conference was perhaps unfortunate, since "crime" is a social not biological construct. Note, however, that an NIH appeals board subsequently determined that the conference had been improperly aborted, and has opened the way to continue funding and expand study of any biological bases of violence. See Eliot Marshall, *NIH Told to Reconsider Crime Meeting*, 262 *SCIENCE* 23, 23-24 (1993). In the meantime, evidence of genetic influences on violence continues to accumulate. See, e.g., Natalie Angier, *Gene Tie to Male Violence Is Studied*, *N.Y. TIMES*, Oct. 22, 1993, at A21 (describing study of Dutch family members correlating shared gene with propensity towards aggressive behavior).

26. Richard Stone, *HHS 'Violence Initiative' Caught in a Crossfire*, 258 *SCIENCE* 212 (1992).

27. *NIH Cancels University of Maryland Conference on Genetics Factors in Crime*, *HEALTH NEWS DAILY*, Apr. 23, 1993, at 3.

28. This is not meant to suggest that the government must undertake to fund studies without regard to their nature. Rather, having so funded, the potential unpopularity of views expressed should not alone be cause to silence them.

mental stimuli. It is therefore as likely that many humans (regardless of race) share a predisposition to act certain ways in given contexts as it is that certain populations of the species share a less common predisposition to exhibit a specific behavior in response to a broader spectrum of environmental stimuli.

While it is true that ideas, once formulated and articulated, can rarely be externally controlled, it is also true that new ideas cannot be fully evaluated until they are articulated. Attempts at prior control, therefore, (like those exercised to cancel the NIH conference) must typically antedate a reasoned critique of ideas, and may thus preclude the potential benefit as easily as the potential danger. There are few ideas that could not be turned to evil purposes by those bent upon doing so. That the manifestations of biological analyses of human affairs have been rather protean, and sometimes repugnant, however, is more a function of disparate human motivations than it is of the intrinsic evil of the inquiry.

III. ROLES FOR EVOLUTIONARY BIOLOGY IN SOCIO-LEGAL ANALYSIS

These obstacles to the use of evolutionary analysis in human affairs have generally obscured recognition of its utility. Yet there are at least three ways in which evolutionary biology can illuminate socio-legal analysis.

A. Predicting Patterns of Behavior

By studying the effects of natural selection on genetically influenced traits, evolutionary biology predicts that behavioral responses tending to increase an individual's inclusive fitness will generally be more widespread in a population than specific, genetically influenced, and contemporaneously appearing alternative behaviors tending to decrease inclusive fitness, or to increase it in smaller increments. Consequently, evolutionary biology can contribute to the prediction of large scale patterns of human behavior. This may prove useful in the identification of contexts in which behavior deemed socially undesirable, such as child abuse, may likely occur.

For example, Martin Daly and Margo Wilson, who have written extensively on the evolutionary perspectives on homicide, recently reported that infants in Canada and Great Britain were sixty to seventy times more likely to die at the hand of a stepparent than a natural parent.²⁹ While

29. Margo Wilson & Martin Daly, *Evolutionists Take the Long View on Sex and Violence*, 261 *SCIENCE* 987 (1993). Although efforts were made to correlate the death of in-

this was surprising to some, and troubling to all, few evolutionary biologists were unprepared for this revelation. In fact, an evolutionary biology analysis would predict that stepparents are more likely to kill stepchildren than are natural parents.³⁰ Such a pattern of selective infanticide is sufficiently adaptive that it has evolved independently in creatures as diverse as insects, birds, fish, and both primate and non-primate mammals.³¹

To see why such behavior tends to increase in a population (until otherwise checked), imagine a local population of monkeys. At the risk of oversimplification, suppose half the males of the population bear a genetic predisposition to behave a certain way if and when they achieve dominant status within the group: they are predisposed to treat unrelated dependent infants sired by a previously dominant male as their own. Suppose the other half of the males carry an alternative, randomly-arising, genetic predisposition in the identical circumstance: to kill unrelated dependant infants.

The latter, infanticidal behavior has two advantages, each of which makes it more likely to be replicated in successive generations than the former, adoptive behavior. First, the loss of an infant tends to bring a female back into estrus more quickly, enabling the selectively infanticidal new leader to commence his own gene replication more quickly. Second, and independently, the selective infanticide terminates the diversion of resources to young non-relatives, ultimately increasing those available to relatives, who may translate such resources into greater reproductive success, thereby increasing the inclusive fitness of the infanticidal male.³²

Over scores of generations, the ancestral monkey who simply happened to carry a gene combination coding for selectively infanticidal behavior would obviously leave more descendants than would a monkey whose genes coded for alternative measures. Given time, the former's

fants to a factor other than the presence in the home of a stepparent, such as poverty, no other factor was found to correlate to the deaths in a statistically significant way. For additional background, see Margo Wilson & Martin Daly, *Risk of Maltreatment of Children Living With Stepparents*, in CHILD ABUSE AND NEGLECT: BIOSOCIAL DIMENSIONS 215 (Richard J. Gelles & Jane B. Lancaster eds., 1987); Martin Daly & Margo Wilson, *A Sociobiological Analysis of Human Infanticide*, in INFANTICIDE: COMPARATIVE AND EVOLUTIONARY PERSPECTIVES 487 (Glenn Hausfater & Sarah Blaffer Hrdy eds., 1984) [hereinafter *Infanticide*]; DALY & WILSON, *supra* note 5, at 83-93.

30. Note that the prefix "step" evidently derives from an Old English word meaning "to deprive" or "to bereave." DALY & WILSON, *supra* note 5, at 85 (quoting Webster's Unabridged Dictionary).

31. See generally *Infanticide*, *supra* note 29.

32. See *supra* note 8 and accompanying text.

descendants may become sufficiently numerous that the behavior becomes rather typical of individuals within the species. Not surprisingly, therefore, such behavior has in fact evolved independently in a plethora of species, including langur monkeys.³³

This does not mean, of course, that a particular genetic profile is the *proximate* cause of any single step parent's neglect or murder of a particular dependant infant. The specific instance of the behavior may trace to such things as an unwillingness to invest in another person's child, jealousy focused on the child's natural parent, economic hardship, or prejudice. But evolutionary biology posits an ultimate explanation for the independent development of such behavior in virtually all lower and higher social animals: it is the result of selection favoring individuals that invest only in their genetic relatives, thus favoring the genes underlying that behavior in those relatives.

The prevalence of selectively infanticidal behavior in other social animals, from insects to our nearest relatives among the apes, demonstrates that it *can* develop and *has* developed (at least in some creatures) without any conscious thought whatever. It is therefore entirely plausible (although probability, admittedly, is a separate calculus) that humans retain a genetically influenced predisposition to selectively eliminate or neglect unrelated but dependent offspring. This may contribute to the relative prevalence of such behavior in a variety of human cultures.³⁴

If evolutionary biologists observe that stepparent abuse of stepchildren is often evolutionarily adaptive relative to certain competing behaviors, useful consequences might flow therefrom. Clearly, there is no reason to believe that in order to take notice of evolutionary biology we must, for example, make step-parentage a legal defense to infanticide, or even a mitigating circumstance at any post-conviction sentencing. There are many alternatives. If our society abhors murder, particularly of infants, we might instead incorporate evolutionary perspectives into social planning by taking extra social and legal precautions against the victimization of children living with stepparents.³⁵

33. For a detailed explanation of the evolutionary adaptiveness of infanticidal behavior, see TRIVERS, *supra* note 5, at 71-77. For an examination of infanticide in nonhuman primates, including langurs, see studies collected in *Infanticide*, *supra* note 29, at 145-319.

34. See generally *Infanticide*, *supra* note 29, at 145-319; DALY & WILSON, *supra* note 5, at 83-93.

35. We might, as but one example, tailor standard operating procedures within a watch-dog agency, such as a local social service administration, to scrutinize complaints of child-abuse more closely when adults not genetically related to an allegedly abused child are present in the home. The use of evolutionary perspectives in the public policy and

If, in the alternative, we determine that the potential stigmatization (and perhaps even legal consequences of constitutional proportions) that such safeguards might engender are themselves unacceptable, we may choose to do nothing and consider stepparents as biological parents, intentionally exalting legal fiction over predilection. But at least, in so choosing, we would by virtue of an evolutionary perspective more accurately perceive some of the potential costs of inaction, such as the lives of those infants whose deaths a policy informed by evolutionary biology might have prevented.

As they might in the context of child abuse, evolutionary perspectives may further inform our understanding of, and ability to anticipate the contextual prevalence of, other behaviors that have adaptive significance.

B. Clarifying the Contours of Socio-Legal Values

Evolutionary biology can also help clarify the contours of developing values as they face new challenges. To see why, suppose a lawmaker becomes concerned about the growth of trait-selection technologies (TSTs), which enable parents significantly to influence the likelihood that a child will bear certain traits they prefer.³⁶ She considers: to what extent, if any, should access to TSTs be protected from government intrusions? Beginning, of course, with an examination of existing values, she may turn to and evaluate the amalgam of voices one discerns in the religious, social, and ethical arenas. She might also fruitfully begin to explore this question from the perspective of the legal values recently articulated by the Supreme Court in *Planned Parenthood v. Casey*.³⁷

Casey, of course, addresses certain principles that define the rights of the woman and the legitimate authority of the State respecting abortion, not trait-selection procedures. Yet it is useful because it begins from the premise that the Constitution protects some realm of personal liberty that

regulatory contexts will be less problematic than their use in case-by-case adjudication. The latter raises, for example, concerns paralleling the controversies over the use of drug courier profiles to justify police stops, and over the use by prosecutors of statistical evidence in criminal cases.

36. For example, preconceptive sperm separation technology now enables parents to influence the gender of their next child. Developing gene-splicing techniques, using retroviral vectors to insert genetic material directly into a chromosome, are expected to offer more intrusive manipulation. For an analysis of the application of evolutionary biology to the regulation of such trait-selection technologies, see Jones, *supra* note 1. See also Owen D. Jones, *Sex Selection: Regulating Technology Enabling The Predetermination of a Child's Gender*, 6 HARV. J.L. & TECH. 1 (1992).

37. 112 S. Ct. 2791 (1992).

the government may not enter. While the boundaries of that realm are unclear, *Casey* articulates a common and significant thread of logic in reproductive cases: "the Constitution places limits on a State's right to interfere with a person's *most basic decisions about family and parenthood*" — decisions "*central to personal dignity and autonomy.*"³⁸

In this example, evolutionary biology can help clarify the mechanisms and effects of procreation. These may increasingly be shown to involve entire "reproductive strategies,"³⁹ constituting far more than just conception, birth, and child-rearing. A reproductive strategy has both physiological aspects (such as gestation time and the mechanism of fertilization) and behavioral aspects (such as the process of attracting mates, number of offspring, sex ratio of offspring, and the duration, if any, of parental care).⁴⁰ Since natural selection operates inexorably upon variations of genetically passed traits, including reproductive strategies, offspring trait selection directly and powerfully influences each individual human's reproductive success and inclusive fitness. Its profound impact upon reproductive success suggests that if we in fact value reproductive autonomy in the ways the Supreme Court has articulated then, in order to be consistent, access to TSTs might be considered as protectable a liberty as is access to abortion procedures.⁴¹

38. *Id.* at 2806-07 (emphasis added).

39. "Strategy" is a term of art meaning a precise combination of structures and behaviors an individual exhibits in particular environmental situations. (Thus there are defensive strategies, food-acquisition strategies, reproductive strategies, etc.) The term "strategies," although it is used pervasively in the scientific literature, might be misleading to those unfamiliar with the specific context in which it is used. It does not imply consciousness or decisionmaking. Neither, for example, need be present in a reproductive strategy.

40. See generally REPRODUCTIVE SUCCESS: STUDIES OF INDIVIDUAL VARIATION IN CONTRASTING BREEDING SYSTEMS (T.H. Clutton-Brock ed., 1988).

41. This argument is more fully explored in Jones, *supra* note 1. It is, of course, not immediately obvious that scientific advances in biology should have any bearing on our legal system. Yet whenever values are framed in reference to biology, developments in biology will suggest re-examination and perhaps revision of social and legal conclusions rooted in those values. For example, today we know (or think we know) that men and women contribute equally to the genetic makeup of their child. But such an understanding is of extremely recent vintage. Early in the development of humankind, people did not understand that men contributed anything significant to creation of new life. Later, around Aristotle's time, people believed that men contributed the entire "blueprint" for a child, while a woman "merely" provided the physical building materials. The point here is that if you suppose, arguendo, that humans maintained a single value over time, say that parental responsibility for and control over offspring should be in direct proportion to biological contribution, women would have had sole control at one time in history, men primary control at another, and each equal control today. Developments in biology would help clarify the proper manifestation of prior and shared values.

C. *Suggesting Possible Means Toward Achieving Identified Social Goals*

Evolutionary biology might also help us formulate possible strategies for pursuing a small set of identified social goals.⁴² No claim could be made that these are the only mechanisms worthy of consideration, or the best from among those that other disciplines may also suggest. But evolutionary biology will serve a useful purpose if it does nothing more than expand options. Moreover, it will serve a practical purpose if it offers suggestions ultimately deemed worthy of implementation (whether alone, or in combination with others).

Using an example of Beckstrom's,⁴³ suppose that reducing sibling incest is a social goal. Because sex between siblings yields offspring that are, on average, more prone to birth defects than those not born of siblings,⁴⁴ evolutionary biology suggests that natural selection should favor any behavioral mechanism that would cause animals to avoid sex with siblings. Just such a behavioral mechanism appears to be present in humans; children raised in close, family-like proximity during pre-puberty years (particularly ages two to six) almost never select each other later as mates.⁴⁵ Thus, manipulation of the rearing environment might be used to discourage sexual relations between children and minors, whether they are genetically related or not.

IV. CONCLUSION

An evolutionary perspective on human behavior offers increasingly sophisticated and useful insights. By learning more about ourselves, we further our efforts at effective self-government. While many have been reluctant to use an evolutionary perspective as yet another tool of legal analysis and social planning, most reluctance apparently derives from

42. Beckstrom refers to evolutionary biology, used in this fashion, as a "facilitative guide." See *DARWINISM APPLIED*, *supra* note 1, at 1-5; *EVOLUTIONARY JURISPRUDENCE*, *supra* note 1, at 46-54.

43. See *DARWINISM APPLIED*, *supra* note 1, at 32-35.

44. As a technical matter, this is because siblings are more likely than non-siblings to bear the same recessive (non-dominant) gene (or, more precisely, "allele"). An offspring receiving two copies of a recessive gene (making it "homozygous") will often manifest the trait for which it codes. Since genes that adversely affect an organism are more likely to be recessive than dominant, a child homozygotic with respect to a recessive gene will, on average, be less fit than a child that is not.

45. See, e.g., Joseph Shepher, *Mate Selection Among Second-Generation Kibbutz Adolescents and Adults: Incest Avoidance and Negative Imprinting*, 1 *ARCHIVES SEXUAL BEHAV.* 293 (1971); see also *DARWINISM APPLIED*, *supra* note 1, at 31-35.

misperceptions of the empirical and theoretical underpinnings upon which such analysis and planning would build.

Current evolutionary theory, and its application to human social behavior, is not what it was twenty years ago, when initial public perceptions of it were formed. Nor does it attempt, as some fear, to dictate reflexive social or legal conclusions solely on the basis of observations of the natural world. It is neither genetically deterministic nor itself inherently invidious or destructive in its implications for humankind.

An evolutionary perspective is, instead, a valuable supplement to existing social, behavioral, and psychological sciences. Incorporating evolutionary perspectives into existing disciplines may assist predicting the prevalence of certain human behaviors. These perspectives can also help us clarify the contours of existing and developing socio-legal values, and may even (in more limited circumstances) offer possible mechanisms for pursuing separately identified social goals.

