

THE GENOME AND THE LAW: SHOULD INCREASED GENETIC KNOWLEDGE CHANGE THE LAW?

E. DONALD ELLIOTT*

Nature, to be commanded, must be obeyed.

—Francis Bacon¹

The title of this symposium asks: “Does scientific knowledge change the law?” On one level, the answer is obvious: of course, science and technology are always changing the law.² As a matter of positive description, law is an integral part of a culture, and as cultural knowledge and beliefs about human nature change, law inevitably changes with them. But the more interesting and important question is the normative one: how *should* our law change in light of increasing knowledge of the human genome? That will be a central question occupying legal thought in coming decades as progress in genetics changes not only our understanding of human nature, but also our ability to manipulate human nature. Just as legal scholars in prior decades struggled to incorporate the Freudian view of human nature into law,³ in the coming decades we will

* Professor (Adjunct) of Law, Yale Law School and Georgetown University Law Center. Partner, Paul, Hastings, Janofsky & Walker, Washington, DC. Formerly, Julien and Virginia Cornell Professor of Environmental Law and Litigation, Yale Law School, and Assistant Administrator and General Counsel, U.S. Environmental Protection Agency. J.D., Yale Law School 1974. B.A., Yale University 1970. Email: edonaldelliott@paulhastings.com. This essay is a revised version of remarks delivered at the Federalist Society Twentieth Annual Student Symposium on “Is Technology Changing the Law?” at Boalt Hall School of Law, March 9-10, 2001.

1. NOVUM ORGANUM (1620).

2. See, e.g., Guido Calabresi, *Concerning Cause and the Law of Torts: An Essay for Harry Kalven, Jr.*, 43 U. CHI. L. REV. 69, 105 (1975) (“[T]he ‘cause’ of a disease would depend on how, at any given time, it could be most easily controlled.”).

3. See, e.g., JEROME FRANK, *LAW AND THE MODERN MIND* (Anchor Books 1970) (1930). Frank’s version of “Legal Realism” can be thought of as the consequence in jurisprudence of the Freudian revolution in the way our culture views human nature.

struggle to incorporate a genetic and evolutionary conception of human nature into law. Today, I do not purport to have the answers, but I can identify a few important legal questions that the genetic and evolutionary revolution in human understanding presents.

I. TWO DIFFERENT VISIONS OF THE MISUSE OF GOVERNMENT POWER

The potential for human beings to manipulate their own evolution by applying genetic engineering to the human genome generates a number of frightening hypotheticals: What if parents use new genetic knowledge to design taller, or smarter, or more attractive children?⁴ There is also the potential for a new kind of "genetic profiling," in which knowledge of genetic susceptibility is used to exclude persons from exposure to chemicals in the workplace.⁵ While these threats are real and must be regulated, they have long been foreseen and discussed in the legal literature. My own view is that governmental reinforcement of prevailing scientific orthodoxy and regulatory impediments to the development of useful technologies is the greater danger.⁶ We already see politicians lining up to denounce human cloning and stem cell research.⁷ The future is alarming for many people because of its uncertainty. At many points in human history, the politically popular course has been to try to use law to stem the rising tide of progress to preserve "the good old days." While there are indeed legitimate fears that new technologies may be abused, these concerns should be balanced against the benefits these new technologies may bring. We must always be careful that we are not fearfully opposed to something merely because it is new.⁸

4. See, e.g., Linus Pauling, *Reflections on the New Biology*, 15 UCLA L. REV. 267, 271-72 (1968) (discussing legal and ethical issues surrounding negative and positive eugenics).

5. Cf. *UAW v. Johnson Controls, Inc.*, 499 U.S. 187, 211 (1991) (holding that exclusion of a woman from a workplace to protect against reproductively harmful toxins is actionable as sex discrimination).

6. See E. Donald Elliott, *Against Ludditism: An Essay on the Perils of the (Mis)use of Historical Analogies in Technology Assessment*, 65 S. CAL. L. REV. 279, 281-82 (1991).

7. See Amy Goldstein & Mike Allen, *Bush Backs Partial Stem Cell Funding*, WASH. POST, Aug. 10, 2001, at A1; Sheryl Gay Stolberg, *House Backs Ban on Human Cloning for Any Objective*, N.Y. TIMES, Aug. 1, 2001, at A1.

8. Clayton Gillette and James Krier divide the world into "technological

Our collective ambivalence about growing genetic knowledge is illustrated by two stories that appeared in the same issue of *USA Today* on February 13, 2001. On the front page of the Money section, the headline was "Investors Bet on Biotechnology Stocks, Map of Human Genome."⁹ In the first section of the newspaper, however, there was a story about the EEOC suing to prevent DNA tests that identify people who are particularly susceptible to carpal tunnel syndrome.¹⁰ We are excited by the promise of genetic technologies, but we also fear they will be used to unfairly discriminate.

To date, most of the writing in law about genetic technologies has been about how to manage, control, and prevent misuse of these technologies. That focus is not surprising, because we live in an age of environmentalism, characterized by legal concerns about how to deal with the adverse consequences of past technological revolutions. But as important as managing and controlling the new genetic technologies through law may be, I believe that the major effect of the new knowledge of the human genome on law will be to transform our understanding of human nature. This transformation will then have profound consequences for the law.

II. THE GENOME AS AN EVOLUTIONARY RECORD

The human genome is a biochemical fossil that records our evolutionary history.¹¹ While the genome is the proximate cause of many human traits, the ultimate cause that shapes our nature is the evolutionary process itself.¹² Therefore, as we

optimists" and "technological pessimists;" they rank me among the optimists. James E. Krier & Clayton P. Gillette, *The Uneasy Case for Technological Optimism*, 84 MICH. L. REV. 405, 406-13 (1985); see also Clayton P. Gillette & James E. Krier, *Risk, Courts and Agencies*, 138 U. PA. L. REV. 1027, 1032-33 (1990) (addressing differing attitudes about public risk).

9. Julie Appleby, *Investors Bet on Biotechnology Stocks, Map of Human Genome*, USA TODAY, Feb. 13, 2001, at 1B.

10. *Gene Map Brings Rare Promise—and Real Risk*, USA TODAY, Feb. 13, 2001, at 12A. See also Press Release, EEOC, EEOC Petitions Court To Ban Genetic Testing Of Railroad Workers In First EEOC Case Challenging Genetic Testing Under Americans With Disabilities Act (Feb. 9, 2001). The EEOC's broad rationale would seem to ban any type of testing for genetic propensities: "Any test which purports to predict future disabilities, whether or not it is accurate, is unlikely to be relevant to the employee's present ability to perform his or her job." *Id.*

11. See MATT RIDLEY, *GENOME: THE AUTOBIOGRAPHY OF A SPECIES* IN 23 CHAPTERS 35 (1999).

12. There is an enormous and growing literature on the evolutionary roots

continue to learn more about the human genome, we will better comprehend our evolutionary history. Interpreting and evaluating human nature through this evolutionary perspective will, again, profoundly change our legal system.¹³

Genetic science is still a relatively young field. Gregory Mendel, the mid-19th century Austrian monk, conducted the first studies, but most scientists did not fully appreciate his work until 1900.¹⁴ For example, Charles Darwin, the founder of modern evolutionary theory, was unfamiliar with Mendel's work and did not understand the underlying genetic mechanisms producing the fruits of natural selection.¹⁵ Not until 1918 did scientists begin making the connections between their findings,¹⁶ and even then they did not understand the processes at the molecular level. This phenomenon was unearthed in February of 1953, when Francis Crick entered the Eagle pub and announced to all those present, "We've discovered the secret of life."¹⁷ He was referring to the structure of DNA, the double helix molecular structure by which genetic information is conveyed. It was not until this generation, then, that we really began to understand the processes of how heredity works at a molecular level.

Finally, of course, the human genome itself was mapped for the first time last year.¹⁸ Even now, however, we do not understand how all the different pieces of information are

of human nature. For accessible surveys of the field, see TIMOTHY H. GOLDSMITH & WILLIAM F. ZIMMERMAN, *BIOLOGY, EVOLUTION, AND HUMAN NATURE* (2001); JARED DIAMOND, *GUNS, GERMS, AND STEEL: THE FATES OF HUMAN SOCIETIES* (1997); ROBERT WRIGHT, *THE MORAL ANIMAL* (1994); TIMOTHY H. GOLDSMITH, *THE BIOLOGICAL ROOTS OF HUMAN NATURE: FORGING LINKS BETWEEN EVOLUTION AND BEHAVIOR* (1991).

13. On the relationships between an evolutionary account of human nature and law, see generally E. Donald Elliott, *Law and Biology: The New Synthesis?*, 41 ST. LOUIS. U. L.J. 595 (1997); E. Donald Elliott, *The Tragic-Comedy of the Commons: Evolutionary Biology, Economics and Environmental Law*, 20 VA. ENVTL. L.J. 17 (2001); Owen D. Jones, *Evolutionary Analysis in Law: An Introduction and Application to Child Abuse*, 75 N.C. L. REV. 1117 (1997); 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). The literature linking law and evolutionary biology is available through the Gruter Institute, at <http://www.gruterinstitute.org> (last visited Dec. 30, 2001), and the Society for Evolutionary Analysis in Law, at <http://www.sealsite.org> (last visited Dec. 30, 2001).

14. See GOLDSMITH & ZIMMERMAN, *supra* note 12, at 86; RIDLEY, *supra* note 11, at 41-44.

15. RIDLEY, *supra* note 11, at 44-45.

16. *Id.* at 46.

17. *Id.* at 49.

18. See *Gene Map Brings Rare Promise—and Real Risk*, *supra* note 10.

stored in the genome. We have merely begun to describe them and decode how a small percentage of the individual genes work, but it remains to be seen how they all are used and what traits they produce. The 21st century will be the century of biotechnology and genetics because over the next few decades we will inevitably develop additional information about genetic coding, thereby creating novel understandings of the many human traits and behaviors that have a genetic component.¹⁹ In addition, we will increasingly be able to alter the genetic make-up of our species. This will profoundly change the way that we conceive of human nature, with consequences for law that are only now beginning to be understood. As biologist Edward O. Wilson puts it:

[G]enetic evolution is about to become conscious and volitional, and usher in a new epoch in the history of life. . . . The prospect of this "volitional evolution"—a species deciding what to do about its own heredity—will present the most profound intellectual and ethical choices humanity has ever faced.²⁰

Human beings tend to understand something new through the use of what is called the "anchor and adjust" heuristic.²¹ We anchor our thinking by starting from a past model that resembles the new thing we are trying to understand, then we adjust the past model over time to fit the new data.²² An illustration of this process at work is the debate on proprietary rights in intellectual property, namely, whether we should "anchor" our understanding of internet access to websites to property law or copyright law. The same process of trying to find an appropriate anchor, or analogy to the past, is occurring today in the field of human genetics. The prevailing metaphors that are being used in law to try to understand the new world

19. It is exceedingly rare that complex human behaviors such as those that are of concern to the law result from a single gene or genetic defect. It is much more common that multiple genes, as well as environmental factors, all contribute in complex ways to what we identify as a "behavior." For example, approximately 3,175 different genes supply the code for the structure of the human brain. See EDWARD O. WILSON, *CONSILIENCE: THE UNITY OF KNOWLEDGE* 97 (1998).

20. *Id.* at 270-73. See also ROBERT ORNSTEIN & PAUL EHRLICH, *NEW WORLD NEW MIND: MOVING TOWARD CONSCIOUS EVOLUTION* (1989).

21. See Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, in *JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 3* (Daniel Kahneman et al. eds., 1982).

22. See *id.*

of the genome are “discrimination” and “privacy.”²³ Both of these are legal tools that we have used in the past to deal with problems that in some sense look like the problems that the new genetic information tends to create. A third metaphor for thinking about genetic information is “property”: do you “own” the information in your DNA in the same way that you can own Blackacre?²⁴

One reason that developing genetic knowledge makes us feel so uncomfortable is that it challenges the fundamental legal fiction that underlies our democracy, that “all men are created equal,” as stated in the Declaration of Independence.²⁵ Increasingly, scientific information makes clear that people are not all created equal by nature. For example, after reviewing the many dueling studies on the subject, science writer Matt Ridley concludes that about one-half of what we call intelligence is genetic and about one-half comes from environmental factors.²⁶ There is enormous controversy, of course, about whether “intelligence” is a meaningful characteristic and, if so, what percentage of it is genetic as opposed to environmental in origin. But perhaps one reason controversy in this area is so passionate is that science increasingly challenges the cherished political premise that we are all created equal. But should we be? If it were possible to ensure that everyone was born with an equal genetic endowment, would that really be desirable? I share the view that “[w]e are not compelled to believe in biological uniformity in order to affirm human freedom and dignity,”²⁷ but we are going to have to develop new political justifications for equality before the law and, perhaps even more importantly, a

23. See, e.g., S. REP. NO. 107-84, at 178 (2001); H.R. REP. NO. 107-229, at 89 (2001).

24. For an overview of the continuing controversy over whether “property” is an appropriate way to conceptualize a person’s right to control her genetic information, see Erik B. Seoney, *Moore 10 Years Later—Still Trying to Fill the Gap: Creating a Personal Property Right in Genetic Material*, 32 NEW ENG. L. REV. 1131 (1998).

25. THE DECLARATION OF INDEPENDENCE para. 2 (U.S. 1776). The idea that political liberty is founded on the notion that all people are created equal is at least 250 years older than the American Declaration of Independence and goes back at least to a peasant rebellion led by Thomas Münzer in the early 1550’s. See JACQUES BARZUN, *FROM DAWN TO DECADENCE: 500 YEARS OF WESTERN CULTURAL LIFE, 1500 TO THE PRESENT*, at 15 (2000).

26. RIDLEY, *supra* note 11, at 84.

27. EDWARD O. WILSON, *ON HUMAN NATURE* 50 (1978).

new way of thinking about what equal rights before the law really mean for people who are born with different abilities and disabilities. There may even need to be an “unequal protection” right to be treated *differently* in light of our biological differences.

III. EVOLUTIONARY BIOLOGY AND HUMAN NATURE

The human genome did not suddenly descend on us from outer space, but rather is the product of millions of years of evolutionary history. As we understand more about the genetic component in human nature and behavior, we must turn to evolutionary biology to understand human nature more fully. To affect human behavior through law, we must understand the raw material of human nature upon which the law operates.²⁸

Evolutionary biology is not fundamentally incompatible with many of the previous perspectives on human nature, whether they are drawn from psychology, sociology, anthropology, or, for that matter, economics. All these perspectives provide complementary models of human behavior that bring some features into focus at the cost of suppressing others.²⁹ In many different areas of scholarship, however, findings from evolutionary biology are changing the way we think about human nature.

For example, some argue that history has not changed a great deal since Herodotus. These people assert that history is fundamentally a collection of stories about human beings, with perhaps a layer of economic or some other causal explanation added to attempt to explain why events happened as they did.³⁰ Recently, however, there have been a number of attempts to re-conceptualize human history from the standpoint of evolutionary biology. Jared Diamond’s *Guns, Germs, and Steel: The Fates of Human Societies* provides an outstanding example of this approach.³¹ Significantly, Diamond titles his epilogue

28. See Jones, *Time-Shifted Rationality and the Law of Law’s Leverage: Behavioral Economics Meets Behavioral Biology*, *supra* note 13.

29. See Elliott, *The Tragic-Comedy of the Commons: Evolutionary Biology, Economics and Environmental Law*, *supra* note 13, at 30.

30. CHARLES VAN DOREN, *A HISTORY OF KNOWLEDGE: PAST, PRESENT AND FUTURE* 53 (1991).

31. DIAMOND, *supra* note 12.

"The Future of Human History as a Science."³²

Medicine is also being re-evaluated from an evolutionary perspective. Randolph Nesse and George Williams have pointed out that many medical problems look very different when viewed from an evolutionary perspective.³³ For example, fever is an evolutionary mechanism to kill germs by increasing our body temperature, so when we take aspirin to reduce fever we may actually be prolonging our illness.³⁴ Another example involves the field of toxic torts and numerous lawsuits involving Bendectin, a drug marketed as preventing morning sickness in pregnant women.³⁵ Nesse and Williams speculate that during the early months of pregnancy women and fetuses are particularly sensitive to toxins and that morning sickness during that period is an evolutionary way of preventing exposure to mild toxins by curbing harmful dietary choices.³⁶ When mothers use a drug such as Bendectin, it may have increased adverse effects during pregnancy, not because of the direct toxic effects of Bendectin itself, but because the Bendectin is suppressing the body's natural defense mechanisms.³⁷

Evolutionary biology also teaches us to think differently about certain genetic "disabilities." It points out that what may appear to be a *disability* in certain contexts persists because it actually provides an evolutionary *advantage* in other contexts. Politically-correct terminology claims that people are not "disabled," but merely "differently-abled." This sensitive adjustment is not always accurate. For example, the genetic features that cause sickle-cell anemia also improve resistance against malaria.³⁸ Many of the things that in the past we considered "disabilities," or flaws in human nature, can be seen in a different perspective when we understand their

32. *Id.* at 404-25.

33. RANDOLPH M. NESSE & GEORGE C. WILLIAMS, *WHY WE GET SICK: THE NEW SCIENCE OF DARWINIAN MEDICINE* (1994). *See also* MICHAEL MCGUIRE & ALFONSO TROISI, *DARWINIAN PSYCHIATRY* 105-17 (1998) (discussing evolutionary theories' relationship to psychological responses).

34. *See* NESSE & WILLIAMS, *supra* note 33, at 51.

35. *See* *Richardson v. Richardson-Merrell, Inc.*, 857 F.2d 823 (D.C. Cir. 1988), *cert. denied*, 493 U.S. 882 (1989) (affirming judgment n.o.v. in favor of Merrell based on a "mature" epidemiological literature that doubted Bendectin as a cause of birth defects).

36. *See* NESSE & WILLIAMS, *supra* note 33, at 89.

37. *Id.*

38. GOLDSMITH & ZIMMERMAN, *supra* note 12, at 69.

evolutionary causes. Increasingly, we will need to observe people in terms of their biological differences as well as their similarities.

Unfortunately, there is a very disturbing history to thinking about biological and genetic differences in the law. The eugenics movement of the early the 20th century, in particular, illustrates the potential for mischief when human beings take it upon themselves to “improve” the human race. Recall also Justice Holmes’s (in)famous expression in *Buck v. Bell* that “[t]hree generations of imbeciles are enough,” as he upheld the involuntary sterilization of a mentally retarded person.³⁹

Some would argue that “[a]n idea isn’t responsible for the people who believe in it.”⁴⁰ This position is fundamentally wrong. Although it is literally true that an idea does not have moral responsibility, if certain ideas are particularly susceptible to government abuse, proponents of those views must be held to some degree of accountability. We should all attempt to learn from the history of past abuses and make sure that human efforts to “manage” evolution do not undermine human dignity and respect for the individual.⁴¹

The most disturbing aspect of the eugenics movement was the nature of the government intervention used to achieve the goal of redesigning the human race. When genetic information is used to empower people and increase their options through education, it is perhaps less bothersome. But even the gentlest of techniques, such as sharing information, can be problematic. Sometimes simply knowing one’s fate, but being unable to change it, is itself a fundamental tragedy. Take for example the knowledge that you or your child is fated to suffer from a dreaded disease. Today there are still relatively few diseases that have a clear, identifiable genetic cause. One of them is Huntington’s disease, or “Woody Guthrie’s disease,” which is inevitably fatal. The gene that causes Huntington’s disease is inherited, but recessive. Thus, sometimes you know that you’re at risk, but you don’t necessarily know whether you have the fatal gene. Now there are genetic tests by which you can find

39. 274 U.S. 200, 207 (1927).

40. ROBERT WRIGHT, *NONZERO: THE LOGIC OF HUMAN DESTINY* 13 (2000) (quoting Don Marquis).

41. See Elliott, *supra* note 6, at 280-81.

out whether or not in 20 years you're going to die of Huntington's disease, but there is still no cure. Only about 20 percent of people who can find out their fate choose to do so.⁴² These are the kinds of problems we will increasingly have to confront in the new world of law and the genome.

As the findings of the Human Genome Project continue to unfold over the next few decades, they are inevitably going to change our views about human nature in ways that will reshape the way that we think about law, just as the internet is today reshaping the way that we think about community.

I certainly do not mean to suggest that simply because something is built into our genetic make-up, it ought to be privileged and protected by the law. There is absolutely no reason to believe that the characteristics built into our species by evolution should necessarily be written into the law.⁴³ On the contrary, I have argued in my past work that we should think of law as a kind of "evolutionary prosthesis" that compensates for deficiencies that evolution has built into us.⁴⁴ If we were perfectly suited by our genetic make-up and our evolutionary history to live in our current situation, there would be no need for the law to influence our behavior.⁴⁵ But by helping us to understand human nature more accurately, the genome helps us better to design law and to compensate for our genetic and evolutionary shortcomings.

42. See RIDLEY, *supra* note 11, at 62-63.

43. See Elliott, *Law and Biology: The New Synthesis?*, *supra* note 13, at 606.

44. *Id.* at 610. Cf WILSON, *supra* note 19, at 270 ("Advanced technology has become the ultimate prosthesis.")

45. On this theme, see generally LIONEL TIGER, *THE MANUFACTURE OF EVIL: ETHICS, EVOLUTION, AND THE INDUSTRIAL SYSTEM* (1987).