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# The Criminal Law Implications of the Human Genome Project: Reimagining a Genetically Oriented Criminal Justice System

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# The Criminal Law Implications of the Human Genome Project: Reimagining a Genetically Oriented Criminal Justice System\*

BY STEVEN I. FRIEDLAND\*\*

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I. INTRODUCTION

“[T]he long term is where we ought to focus, . . . the long-term risks and benefits of doing and not doing genetic research.” – Michael Smith, Ph.D.<sup>1</sup>

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<sup>1</sup> Alex Robinson, *Genome Projects: Bridging into the Future*, 150 CANADIAN MED. ASS’N J. 1119, 1121 (1994).

In Aldous Huxley's novel, *Brave New World*, the director of a human "hatchery" described to listeners the benefits of a reproduction system called "bokanovskification." This system permitted the "budding" or cloning of up to ninety-six people with identical genes. The director proudly noted that the process produced:

"Standard men and women; in uniform batches. The whole of a small factory staffed with the products of a single bokanovskified [cloned] egg. Ninety-six identical twins working ninety-six identical machines!" The voice was almost tremulous with enthusiasm. "You really know where you are. For the first time in history." He quoted the planetary motto. "Community, Identity, Stability." Grand words. "If we could bokanovskify indefinitely the whole problem would be solved."<sup>2</sup>

Until recently, statements like these would have been understood strictly as science fiction. With the advent of the Human Genome Initiative<sup>3</sup> and the announcement that a sheep named Dolly has been cloned,<sup>4</sup> however, much has changed. The age of biotechnology, especially in the area of genetics research, has grown up to become a "First Order" revolution.<sup>5</sup>

The Human Genome Initiative, also called the Human Genome Project, commenced in 1988 with an announcement by Nobel-laureate scientist James D. Watson.<sup>6</sup> It was intended simply as a science project, albeit one on a grand scale. Indeed, the concerted effort to map and sequence the approximately 100,000 genes of human DNA has become "the largest biology project in the history of science."<sup>7</sup> The project was expected to last

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<sup>2</sup> ALDOUS HUXLEY, *BRAVE NEW WORLD* 5, 6 (1932) (Harper Perennial 1989).

<sup>3</sup> This initiative is funded by various organizations, including the United States Department of Energy and the National Institutes of Health. See Eliot Marshall, *The Genome's Program's Conscience*, 274 *SCIENCE* 488, 488 (1996).

<sup>4</sup> See, e.g., Robert Langreth, *Cloning Has Fascinating, Disturbing Potential*, *WALL ST. J.*, Feb. 24, 1997, at B1.

<sup>5</sup> See Vincent M. Brannigan, *Biotechnology: A First Order Technico-Legal Revolution*, 16 *HOFSTRA L. REV.* 545, 551 (1988) (describing a "First Order" revolution as "a technico-legal revolution which involves more than one" of the following categories: Proprietary Rights; Personal Injury Risk; Risk to Other Protected Interests; Evidence).

<sup>6</sup> See Marshall, *supra* note 3, at 488.

<sup>7</sup> Rochelle Cooper Dreyfuss & Dorothy Nelkin, *The Jurisprudence of Genetics*, 45 *VAND. L. REV.* 313, 314 (1992).

up to two decades, involve scientists from many countries, and cost approximately three billion dollars.<sup>8</sup> While the focus of the initiative is to identify, record, and sequence genes, the objectives of the project extend well beyond scientific curiosity. The advancement of genetic knowledge could be used to combat disease, effect human physiology, manipulate psychology, and much more. Some scientists have gone so far as to claim that the project is "the ultimate answer to the commandment 'Know thyself.'"<sup>9</sup>

Despite an inability to predict the course of the human genome project, tremors from its discoveries are already being felt in the legal system, particularly in the area of criminal law. In some ways, the seeds of a "geneticized" criminal law system already have been sown. For example, many jurisdictions permit the utilization of DNA "fingerprinting" at trial, and genetic disorders are increasingly being offered as defenses in criminal cases.<sup>10</sup> Believing that some people are born with criminal tendencies and therefore cannot be rehabilitated, many jurisdictions have adopted a "three strikes, you're out" approach to sentencing. Laws requiring the detention of sexual predators are grounded on similar beliefs.<sup>11</sup> Indirect genetic links between crime and conditions such as alcoholism<sup>12</sup> and antisocial behaviors<sup>13</sup> have been established, and genetic explanations already have been offered to exculpate the accused at trial.<sup>14</sup> Some knowledgeable observers believe the real question "is not whether genetic evidence will ever be admitted into court, but when and under what kinds of circumstances."<sup>15</sup>

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<sup>8</sup> See *id.* at 314 (citing ROBERT N. PROCTOR, *VALUE-FREE SCIENCE?* 5 (1991)).

<sup>9</sup> *Id.* (citing JERRY E. BISHOP & MICHAEL WALDHOZ, *GENOME* 218 (1990) (quoting Walter Gilbert, Professor of Biology at Harvard University)).

<sup>10</sup> The insanity defense can be seen as a precursor to more developed genetic defenses such as predispositions to violence and other genetically derived traits.

<sup>11</sup> See, e.g., *Kansas v. Hendricks*, 117 S. Ct. 2072 (1997).

<sup>12</sup> See, e.g., *Powell v. Texas*, 392 U.S. 514, 533-35 (1968); *Robinson v. California*, 370 U.S. 660, 667 (1962).

<sup>13</sup> See C.R. Cloninger & I.I. Gottesman, *Genetic and Environmental Factors in Antisocial Behavior Disorders*, in *THE CAUSES OF CRIME IX-X*, 92 (Sarnoff A. Mednick et al. eds., 1987).

<sup>14</sup> See, e.g., *Mobley v. State*, 455 S.E.2d 61, 65 (Ga.) (denying defendant funds for genetic tests that allegedly would demonstrate a genetic basis for defendant's criminal behavior), *cert. denied*, 116 S. Ct. 377 (1995).

<sup>15</sup> Deborah W. Denno, *Legal Implications of Genetics and Crime Research*, in *GENETICS OF CRIMINAL AND ANTISOCIAL BEHAVIOUR* 249 (Gregory R. Bock &

A genetically based system might have the following features. The new system would shift the focus from a normative, psychological imperative, which determines culpability largely based on an individual's mental state, to a genetic, physiological orientation. Genes would play a larger role in determining the propensities of behavior and the scope of criminal responsibility. For example, people with "aggressiveness genes"<sup>16</sup> might be expected to act more aggressively and therefore would be treated differently than those who do not have such genetic abnormalities.<sup>17</sup> Genetics would be offered as a defense to criminal charges and create forensic work for expert witnesses in the field.<sup>18</sup> Genetic information might serve to predict the future dangerousness of an accused.<sup>19</sup> Finally, genetics would be offered as an exculpatory factor in sentencing decisions and gene therapy would become an option in the rehabilitation of convicted criminals.

The utilization of genetics in the criminal law has considerable appeal. Genetics and science have perceived objectivity and precision that arguably would increase the accuracy of jury decision-making. This enhanced accuracy would increase the predictability of outcomes and, in turn, increase public confidence in the judicial system. There would be clearer lines between those who deserve punishment and those who do not. It also

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Jamie A. Goode eds., 1996) [hereinafter Denno, *Legal Implications of Genetics and Crime Research*].

<sup>16</sup> A now famous study of a large Dutch family concluded that genetic abnormalities may have contributed to the aggressive and antisocial behavior exhibited by family members. See Virginia Morell, *Evidence Found for a Possible "Aggression Gene"*, 260 SCIENCE 1722, 1722 (1993).

<sup>17</sup> Psychological syndromes will no longer be relevant terms of diagnosis, since the behavior will be described by its genetic origin or not at all.

<sup>18</sup> Another question raised by the genome initiative is when and under what circumstances expert testimony based on genetic research should be permitted. This question affects not only individual trials but the integrity of the judicial system and its coexistence with science. For example, how will genetic explanations of behavior affect juries and what affect will the Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), have on such admissibility? See *infra* note 195 and accompanying text.

<sup>19</sup> Discoveries about the human genome may significantly affect predictions of dangerousness. The criminal justice areas most likely to be impacted are pre-trial and post-trial release considerations, parole decisions, and criminal commitment proceedings. If the criminal justice imperative shifts to focus on an individual's genetic composition, genetics-related defenses to criminal charges may be raised at trial.

would be easier to simply believe that genes provide the final and most complete explanation of human behavior<sup>20</sup> and that genes hold the key not only to controlling future behavior, but also to explaining past conduct.<sup>21</sup> This genetic mythology appears to be a natural progression of attempts to create a unified philosophy about how humans operate in the world – even if the hard data may not support such a position.

A genetically based criminal law system, however, may produce turbulent and troublesome consequences.<sup>22</sup> The traditional formulation of the criminal law has been based on the concept of free will, which presumes that behavior is volitional.<sup>23</sup> People are generally thought to be autonomous and responsible for their own conduct. The notion of free will lies at the core of any criminal “blameworthiness” decision. However, genetic discoveries will impact the presumption of free will. Such discoveries will affect not only general issues of culpability, but also the use of genetics as a defense at trial, the relevance of genetics in predicting dangerousness in pre-trial or post-trial release decisions, and the use of genetics as a mitigating factor in sentencing decisions.<sup>24</sup>

Perhaps the most significant product of a system reordered on the basis of genetics would be the resurrection of biological determinism, a theory that attributes much, if not all, of a person’s behavior to external causation.<sup>25</sup> This shift in paradigm from free will to some form of determinism – either a “weak” determinism, in which genes play only a factor in behavior, or a “strong” determinism, in which genes are a causal agent of behavior – would create pressure to reinvent the current

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<sup>20</sup> See TED PETERS, *PLAYING GOD? GENETIC DETERMINISM AND HUMAN FREEDOM* (1997).

<sup>21</sup> This controversial contention, at least in part, was advanced in the book *The Bell Curve*. RICHARD J. HERRNSTEIN & CHARLES MURRAY, *THE BELL CURVE: INTELLIGENCE AND CLASS STRUCTURE IN AMERICAN LIFE* (1994).

<sup>22</sup> For example, “[a]lthough diagnostic tests may be put to many beneficial uses, their application in certain contexts may seriously impinge upon individual freedoms.” Jennifer DuFault, Book Note, 25 HARV C.R.-C.L. L. REV 241, 241 (1990) (reviewing DOROTHY NELKIN & LAURENCE TANCREDI, *DANGEROUS DIAGNOSTICS: THE SOCIAL POWER OF BIOLOGICAL INFORMATION* (1989)).

<sup>23</sup> While both heredity and environment are often considered to influence a person’s conduct, neither factor is deemed to block a person’s free will. Scientific discoveries would change this presumption.

<sup>24</sup> Other areas that will be impacted include the collection, control, and disbursement of genetic information, and the identification of perpetrators.

<sup>25</sup> See Maureen P Coffey, Note, *The Genetic Defense: Excuse or Explanation?*, 35 WM. & MARY L. REV 353, 358 (1993).

understanding of criminal responsibility. For example, defendants may claim their genes "caused them" to commit the crime and "blame" would be attributed to unthinking, unknowing cellular DNA. The trend would be exacerbated as public zest for genetics increased.<sup>26</sup>

Genetic determinism could lead to the conviction or acquittal of people based on their physiological status rather than on their actions. Genetic information could be used to classify individuals based on the type of genetic risks they pose, particularly their level of dangerousness.<sup>27</sup> In addition, a new type of discrimination may result from the creation of genetic "minorities" as people are grouped by their genetic propensities. On a broader scale, the emphasis on genetics may serve to diminish traditional functions of the criminal law, especially the provision of a moral baseline of behavior for the community.<sup>28</sup>

This Article explores what might happen if the criminal justice system were to be redrawn in light of continuing genetic discoveries. It imagines a genetics-based system, even if such a system is not a realistic probability in the near future. The purpose is to examine the likely result of such a system and the evolution of notions of individual responsibility, particularly the potential reemergence of biological determinism and the impact of determinism on sentencing decisions and trial defenses.

The construct of a genetic reordering demonstrates that a transfer of power over the criminal law from lay determinations of moral blameworthiness to the genetics-based framework of the scientific community, if it occurs at all, would likely be short-lived. The public would reject broadly framed genetic excuses for behavior, although a watered down version of determinism probably would survive. Even if a weaker version of determinism survived, a moral baseline for behavior

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<sup>26</sup> Genetics discoveries undoubtedly will be introduced to the criminal justice system almost as soon as they occur. While the benefits may be instantly and intuitively appealing, there likely will be significant costs as well. For example, the use of statistical probabilities has been frowned upon as an evidentiary matter, and genetic propensities should not be treated any differently. Generalizations derived from statistics that summarize genetics discoveries should not be determinative of how individuals are prosecuted, sentenced, or evaluated for release.

<sup>27</sup> The problems inherent in this type of classification were pointed out by the drafters of the Federal Rules of Evidence in discussing the exclusion of character evidence generally. *See* FED. R. EVID. 404(a).

<sup>28</sup> This moral baseline has been viewed as essential for effective functioning of the criminal law. A system based on genetics, however, appears to be removed from the normative evaluation of the public, minimizing the community's relevance. These moral issues will surface most often in the area of sentencing.



would be socially reconstructed. The complexity of behavior, the influence of culture, and the opportunity for thought and therefore choice—reinforced by the societal mandate that human beings have autonomy—all support the continued social construction of the criminal law. The probable public backlash after high-profile trials, much like the public verdict against the insanity defense after the trial of John Hinckley, also would play a role in minimizing a shift towards a deterministic system. Furthermore, the differences between the operation of the criminal law and the scientific method would weigh against transformation of the system.<sup>29</sup>

To circumvent a messy and delegitimizing infiltration of genetics, this Article suggests that the legislators and judges who control the creation and implementation of the criminal law should avoid classifications and categories based on genetic propensities. If and when genetics evidence is permitted in criminal trials, the inclusion should not constitute an attempt to short-circuit requirements of proof or the presumption of free will. In other words, shortcuts to evaluating criminal responsibility are costly in the long run and deflect the focus of the law from the hard questions that assessments of complex behaviors require.

Instead, the Article offers a theory of causation to determine how genetics should be treated in the criminal justice process—whether genetics should be admitted as evidence of causation, admitted as a lesser “factor” influencing behavior, or excluded from the trier of fact’s attention altogether. This theory of causation requires a demonstrable relationship between genes and behavior as determined by a judge pursuant to the Federal Rules of Evidence. This relationship essentially demands a certain level of predictability between cause and effect, or more appropriately, between genes and behavior. Such a relationship will not be easy to establish. The phrase used almost axiomatically in torts cases, *post hoc proctor ergo hoc* (just because a thing precedes another does not mean it

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<sup>29</sup> The scientific approach produces “value-free” analysis and experimentation in isolation; it maintains objectivity by screening out possible environmental variables like morals and culture. On the other hand, the criminal justice system is predicated on morality and the power of the community to condemn the conduct of one of its members as blameworthy. This moral evaluation is more discretionary, flexible, and contextual than the objective “isolation and replication” approach of genetics. The methodology, expectations, and advances of science, however, have not sufficiently bridged the gap between law and science. Consequently, the conceptualization of criminal behavior as socially based—including historical, economic, cultural, and other influences—would reject a takeover by a system that is entirely biologically oriented. Emphasizing genetics in the criminal law, therefore, would lead to considerable disutility.

causes the subsequent action), governs once again. Without confidence in prognostication – which obviously can be established only over a long time frame – a genetically caused propensity to act in a particular way would be insufficient to make out a case of determinism. In fact, the Federal Rules of Evidence would exclude evidence, as unfairly prejudicial under Rule 403, that does not have the requisite predictive relationship.

The Article has six parts. After this introduction, Part II explores the definitions, terminology, and substance of genetics and the results of biomedical advances. Part III imagines a genetics-based criminal law, first by explaining the traditional social roots of the criminal justice system – through the lens of social constructivist theory – and then by substituting genetic theories for the concept of free will. Part IV examines the various effects of the revised system and predicts that a social construction of the system would soon reemerge. Part V offers some ways to respond to the infiltration of genetics into criminal law, such as applying the categorical exclusion of the Federal Rules of Evidence to propensity character evidence.<sup>30</sup> Part VI considers how to prevent good genetics information from being put to bad uses.

## II. BACKGROUND

### A. Genetics

The field of human genetics, from which the genome project springs, has been defined as a “[t]wentieth-century science synthesized from traditional physical and biological sciences and molded toward understanding how biologic information is transmitted from generation to generation.”<sup>31</sup> In 1860, the monk Gregor Mendel became the first person to study genetics.<sup>32</sup> Over a period of eight years, he grew peas (*Pisum Sativum*) in a monastery garden to study how traits were passed. Many others in the same era, however, had an inkling that human behavior was controlled by some substance or substances.<sup>33</sup> For example, Charles Darwin described hereditary particles as gemmules, stating: “Gemmules are supposed to be thrown off by every cell or unit, not only during the adult stage, but during all the stages of development. [I]t is not the

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<sup>30</sup> See FED. R. EVID. 404(a) (excluding propensity character evidence generally in civil cases and permitting it in criminal cases only when the defense offers it first).

<sup>31</sup> Louis J. Elsas II, *A Clinical Approach to Legal and Ethical Problems in Human Genetics*, 39 EMORY L.J. 811, 811 (1990).

<sup>32</sup> See *id.*

<sup>33</sup> See *id.*

reproductive elements, nor the buds which generate new organisms, but the cells themselves throughout the body<sup>34</sup>

After Mendel's initial experiments, the evolution of genetics was marked by several milestones, including the discovery of the double helix of deoxyribonucleic acid ("DNA") by Watson and Crick in 1953<sup>35</sup> and the 1961 discovery by Nirenberg, Matthaei, and others of the genetic code of DNA.<sup>36</sup> These discoveries helped propel biomedical research into the industrial era and into the age of human genome research. This evolutionary spiral has been as mesmerizing and uncertain as the DNA double helix itself.

After years of research, much has been learned about human genetics and the process of inheriting traits, characteristics, or conditions. Genes carry the inherited factors of an individual, including such traits as height, weight, hair and eye color, body shape, and disease propensities.<sup>37</sup> Genes can be found in the individual's DNA. Double-helix DNA is a part of every cell's chromosomes, which, in a normal human, number twenty-three pairs per cell.<sup>38</sup> The genes contain the hereditary "blueprint" that results in the structure and composition of the body's cellular material. Altered or mutated genes may cause or contribute to disease.<sup>39</sup> Genes exist in pairs of alleles, which are alternative forms of a gene at a given site in DNA. One of the alleles is inherited from a chromosome of the mother and the other from a chromosome of the father.<sup>40</sup>

The human genome has an estimated 50,000-100,000 genes.<sup>41</sup> Each gene consists of base pairs of DNA. While some genes consist of several

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<sup>34</sup> Conway Zirkle, *Mendel and His Era*, in MENDEL CENTENARY: GENETICS, DEVELOPMENT AND EVOLUTION 122, 126 (Roland M. Nardone ed., 1968).

<sup>35</sup> See J.D. Watson & F.H.C. Crick, *Genetic Implications of the Structure of Deoxyribonucleic Acid*, 171 NATURE 964 (1953).

<sup>36</sup> See Marshall W. Nirenberg & J. Heinrich Matthaei, *The Dependence of Cell-Free Protein Synthesis in E. Coli Upon Naturally Occurring or Synthetic Polyribonucleotides*, 47 PROC. NAT'L ACAD. SCI. 1588 (1961).

<sup>37</sup> See, e.g., Jon Beckwith, *The Human Genome Initiative: Genetics' Lightning Rod*, 17 AM. J.L. & MED. 1, 2 (1991).

<sup>38</sup> There are 22 autosomes, or nonsex pairs of chromosomes, and one pair of sex chromosomes. See, e.g., Thomas J. Hudson et al., *An STS-Based Map of the Human Genome*, SCIENCE, Dec. 22, 1995, at 1945.

<sup>39</sup> See, e.g., Beckwith, *supra* note 37, at 2.

<sup>40</sup> See Yale H. Yee, Note, *Criminal DNA Data Banks: Revolution for Law Enforcement or Threat to Individual Privacy?*, 22 AM. J. CRIM. L. 461, 463 (1995), for a concise discussion of genetics.

<sup>41</sup> See John C. Fletcher & Dorothy C. Wertz, *Ethics, Law, and Medical Genetics: After the Human Genome is Mapped*, 39 EMORY L.J. 747, 754 (1990).

thousand base pairs, others may contain more than one million.<sup>42</sup> The gene-mapping process relies on studies of family history and on biochemical analysis to discover where a gene is located on a particular chromosome.<sup>43</sup> With the exception of identical twins, each person has a unique genome. Even in twins, however, mutation of genes occurs, causing unique differences over time.<sup>44</sup> Between unrelated individuals, there are approximately six million differences.<sup>45</sup> Most of the distinctions have no great impact on people, yet a large majority of these distinctions can be detected through new advanced techniques.<sup>46</sup> Even newer techniques have sped up the mapping process, allowing scientists to go from "chromosome walking," as it was called, to "chromosome jumping" techniques.<sup>47</sup> By using a jumping technique, for example, the gene for cystic fibrosis was mapped in four years, as compared to the eighteen years it would have taken had a walking technique been used.<sup>48</sup> As of 1996, the mapping of genes was near completion and scientists had begun to focus their attention on the final phase of the project, the sequencing, or ordering, of genes.<sup>49</sup> In 1996, for example, the United States launched six pilot programs on the sequencing of genes.<sup>50</sup> When the sequencing is complete, scientists will have a chart of the human genome that can be thought of as a genetics periodic table, providing a "human genetic blueprint."<sup>51</sup> Although only one percent of human genes have been sequenced so far,<sup>52</sup> the ordering is expected to be complete in the year 2005.<sup>53</sup>

In the past decade, the Human Genome Project has propelled the wave of genetics research to new heights. Numerous independent advances in

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<sup>42</sup> See generally Michael Kirby, *The Human Genome Project - Promise and Problems*, 11 J. CONTEMP. HEALTH L. & POL'Y 1, 8 (1994) (written by the President of the Court of Appeal of New South Wales).

<sup>43</sup> See Fletcher & Wertz, *supra* note 41, at 754.

<sup>44</sup> See CHRISTOPHER WILLS, EXONS, INTRONS, AND TALKING GENES 164 (1991).

<sup>45</sup> See *id.*

<sup>46</sup> See *id.*

<sup>47</sup> See Fletcher & Wertz, *supra* note 41, at 754; Johanna M. Rommens et al., *Identification of the Cystic Fibrosis Gene: Chromosome Walking and Jumping*, 245 SCIENCE 1059, 1059 (1989).

<sup>48</sup> See Fletcher & Wertz, *supra* note 41, at 754.

<sup>49</sup> See Eric S. Lander, *The New Genomics: Global Views of Biology*, 274 SCIENCE 536 (1996).

<sup>50</sup> See Eliot Marshall & Elizabeth Pennisi, *NIH Launches the Final Push to Sequence the Genome*, 272 SCIENCE 188, 188 (1996).

<sup>51</sup> Marshall, *supra* note 3, at 488.

<sup>52</sup> See Lander, *supra* note 49, at 536.

<sup>53</sup> See \$60 Million for Genome Sequencing, 380 NATURE 471, 471 (1996).

molecular genetics technology have occurred. These advances include refinements in the prognostication of diseases, such as sickle cell anemia, cystic fibrosis, and Duchennes muscular dystrophy,<sup>54</sup> and in the determination of which genes trigger a disease or cause a predisposition to succumb to a disease. Scientists have discovered flawed genes that cause obesity.<sup>55</sup> Scientists have also developed new tests for diseases,<sup>56</sup> such as the one used to identify carriers and victims of "fragile X syndrome,"<sup>57</sup> which is "the most common inherited form of mental retardation."<sup>58</sup> The possibility of gene therapy to prevent or even cure these diseases has raised hopes that eradication of these diseases will someday become a reality. Some of the more significant applications of genetic discoveries follow

## B. Potential Applications of the Genetic Discoveries

### 1. Gene Therapy

Gene therapy is "the medical replacement or repair of defective genes in living human cells."<sup>59</sup> Gene therapy comprises many different techniques, including gene insertion, in which healthy genes are inserted into cells with defective genes; gene modification, in which a defective gene or gene sequence in DNA is modified to re-code the genetic material; and gene surgery, in which a defective gene is actually replaced by a

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<sup>54</sup> As Lewis J. Elsas II, has stated: "[A]n explosion in molecular genetic technology has enabled professional geneticists to provide a wide array of diagnostic approaches to predicting the presence of relatively rare and serious diseases such as sickle cell disease in blacks (1/600), cystic fibrosis in caucasians (1/2,500), and Duchennes muscular dystrophy in males (1/5,000)." Elsas, *supra* note 31, at 812.

<sup>55</sup> See Malcolm Ritter, *Genetic Flaw for Obesity Found*, ATLANTA J.-CONST., June 24, 1997, at C1.

<sup>56</sup> In addition, advances have also been made regarding the efficiency of these new tests. For example, a new nonradioactive PCR test "is more convenient, less expensive, and faster than alternatives" W Ted Brown et al., *Rapid Fragile X Carrier Screening and Prenatal Diagnosis Using a Nonradioactive PCR Test*, 270 JAMA 1569, 1573 (1993).

<sup>57</sup> "[O]ne in 1,250 males and one in 2,000 females" are affected by fragile X syndrome and may be carriers as well. *Test Can Detect Retardation Risk*, SUN SENTINEL (Ft. Lauderdale, Fla.), Oct. 6, 1993, at 4A.

<sup>58</sup> Brown et al., *supra* note 56, at 1569; see also *Test Can Detect Retardation Risk*, *supra* note 57, at 4A.

<sup>59</sup> DAVID SUZUKI & PETER KNUDTSON, *GENETHICS: THE CLASH BETWEEN THE NEW GENETICS AND HUMAN VALUES* 183 (1989).

healthy one.<sup>60</sup> Gene therapy may be possible for sickle-cell anemia, a genetic illness discovered only in the twentieth century<sup>61</sup>

## 2. *Gene Transfers*

Another area in which genetic research offers considerable promise is interspecies organ transplants.<sup>62</sup> Most interspecies organ transplants result in tissue rejection, rendering the transplant a failure. The rejection occurs when the body makes proteins that pierce the cell walls of the transplanted organ, killing it.<sup>63</sup> Recently, two groups in London reported they successfully implanted human genes into the organs of pigs.<sup>64</sup> This report is of considerable importance, since pig organs are approximately the same size as those of humans and may be readily used as transplant organs.

Human gene transfers could help to overcome transplant rejection by creating genetic suppressors.<sup>65</sup> These suppressors would work to prevent

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<sup>60</sup> *See id.* at 184-85.

<sup>61</sup> *See id.* at 187 ("In 1910, while examining a blood smear from a black West Indian medical student, Chicago physician James B. Herrick first observed the clusters of irregularly shaped red blood cells that are the hallmark of sickle-cell anemia.").

<sup>62</sup> The transplantation of animal organs into humans was first attempted in 1905, and has become increasingly feasible over time. "The roughly 20,000 transplants performed annually in the United States constitute no more than a quarter of those that would occur if enough healthy organs were available." Philip J. Hilts, *Gene Transfers Offer New Hope for Interspecies Organ Transplants*, N.Y. TIMES, Oct. 19, 1993, at C3. It is estimated that approximately 60,000-80,000 human lives could be saved each year if such transplants were not rejected. *See id.* Thus, overcoming hyperacute rejection would be a significant breakthrough. In describing the hyperacute rejection,

Dr. Platt [of Duke University] explained that the body's hyperacute rejection is brought about by the presence in the blood and on the body's organs of a number of "signal" proteins. These proteins latch onto foreign tissue, triggering the production of a second protein, which in turn triggers a third protein and so on. By the third round, the body has produced enough "complement" proteins to start killing the transplanted tissue. The proteins stimulate the production of the body's killer cells and actually punch holes in the organ's cell walls. The transplanted tissue begins to die within minutes.

*Id.*

<sup>63</sup> *See id.*

<sup>64</sup> *See id.*

<sup>65</sup> *See id.*

hyperacute rejection, in which the donor's immune system defends against the invading tissue.<sup>66</sup> Without this rejection, the transplantation of a pig's liver, heart, and kidneys into humans would be viable.<sup>67</sup>

### 3. Genetic Screening

Genetic screening examines the genetic makeup of an individual to determine the likelihood of that individual developing a hereditary disease.<sup>68</sup> In the 1990's, the identification of persons carrying defective genes occurs on a regular basis.<sup>69</sup> Approximately 800 to 900 genes linked to human diseases already have been identified.<sup>70</sup> Most of the genetic testing that occurs involves predicting who might be at risk for disease.<sup>71</sup> Recently, for example, scientists reported that a new test can detect the presence of a genetic defect that may cause hemophilia A, a common form of hemophilia that affects approximately one in 5000 males.<sup>72</sup> The test indicates whether a female is a carrier of the defective gene.<sup>73</sup> In addition, "[g]enetic tests for diseases such as cystic fibrosis, breast cancer, colon cancer, and sickle cell anemia are being developed or are already in use."<sup>74</sup>

Genetic screening is becoming increasingly viable in many different contexts, from prenatal screening to workplace exams. Prenatal screening, which detects genetic defects, is primarily done using amniocentesis, an examination usually performed between the fourteenth and sixteenth weeks of a woman's pregnancy<sup>75</sup> and also performed on embryos produced by in-

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<sup>66</sup> See *id.*

<sup>67</sup> See *id.*

<sup>68</sup> See SUZUKI & KNUDTSON, *supra* note 59, at 162.

<sup>69</sup> Cancer is among the diseases that researchers believe have a genetic origin. According to *The Journal of the American Medical Association* ("JAMA"), "[r]ecent advances in the genetics of cancer have raised the possibility of widespread DNA testing for the detection of predisposition to cancer." National Advisory Council for Human Genome Research, *Statement on Use of DNA Testing for Presymptomatic Identification of Cancer Risk*, 271 JAMA 785, 785 (1994).

<sup>70</sup> See Ronald Kotulak, *Dr Francis Collins, Director of the Human Genome Project*, CHI. TRIB., Jan. 19, 1997, at C3.

<sup>71</sup> See *id.*

<sup>72</sup> See Anita Manning, *New Test Detects Hemophilia Defect*, USA TODAY, Nov. 1, 1993, at D1, see also Gina Kolata, *Inversion in a Gene is Key to a Disease*, N.Y. TIMES, Nov. 2, 1993, at C8.

<sup>73</sup> See Manning, *supra* note 72, at D1.

<sup>74</sup> Marshall, *supra* note 3, at 488.

<sup>75</sup> See SUZUKI & KNUDTSON, *supra* note 59, at 166.

vitro fertilization.<sup>76</sup> In the workplace, laboratory techniques detecting abnormalities in even the smallest of DNA sequences<sup>77</sup> have permitted the screening of job applicants and workers in order to identify people who might be particularly vulnerable to occupational hazards or illnesses.<sup>78</sup> Some employers already have begun to question applicants about genetic diseases before deciding whom to hire.<sup>79</sup>

In addition to identifying individuals with potential susceptibility to disease, genetic screening also can be used to confirm the diagnosis of some diseases. For example, genetic confirmation has been used for Marfan's Syndrome, which affects tall, thin athletes, as well as other diseases.<sup>80</sup> Ironically, most doctors are "genetically illiterate" when it comes to understanding these genetic breakthroughs and have no training in how to perform genetics tests and procedures.<sup>81</sup>

### C. *The Ethical and Social Implications of the Human Genome Initiative*

The impact of the project has gone far beyond creating a catalogue of identifiable genes for use in the scientific domain.<sup>82</sup> Ripples from the project have infiltrated politics, popular culture, and the law. The initiative is raising the public's consciousness about genetics as a whole.<sup>83</sup> While the genome project is a new undertaking, the field of genetics often has been surrounded by controversial and emotionally charged ethical issues.

#### 1. *New Frontiers*

The new frontier of genetics has been the subject of widespread and heated ethical debate. The potential for abuse of Human Genome Initiative

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<sup>76</sup> If the embryo appears free from serious genetic defects, it is then implanted in the uterus. See Elizabeth J. Thompson, *Ethical, Legal and Social Implications of the Human Genome Project*, 3 DICK. J. ENVTL. L. & POL'Y 55, 58-59 (1994).

<sup>77</sup> See SUZUKI & KNUDTSON, *supra* note 59, at 162.

<sup>78</sup> See *id.*

<sup>79</sup> See E. Virginia Lapham et al., *Genetic Discrimination: Perspectives of Consumers*, 274 SCIENCE 621, 623 (1996). The lawfulness of this practice is questionable, since the Americans with Disabilities Act prohibits an employer from asking a job applicant if he or she has a disability. See 42 U.S.C. § 12112(d)(2).

<sup>80</sup> See Thompson, *supra* note 76, at 59.

<sup>81</sup> See *id.*

<sup>82</sup> See generally Robinson, *supra* note 1, at 1121.

<sup>83</sup> See John A. Robertson, *Genetic Selection of Offspring Characteristics*, 76 B.U. L. REV. 421, 421 (1996).



discoveries, from discrimination to stigmatization to incarceration, led to the creation of a \$150 million fund for research into the ethical, legal, and social issues associated with the project.<sup>84</sup> Issues such as confidentiality, exploitation of known genetic information, and the classification of people by genetic propensities are just some of the topics being studied.<sup>85</sup> Tracy Sonneborn, in his introductory essay in *Ethical Issues in Human Genetics*, states:

“We agree that it is right and good to reduce misery and improve the quality of life for all those who live, by using environmental and social means. We now debate whether it is right and good to use genetic means. Our conceptions of what is ethical, right, and good change in the light of new knowledge and new conditions. What we lack is neither flexibility of mind nor adventurous spirits, but knowledge and experience. If the future can be judged by the present and the past, we shall get that knowledge and experience and eventually authorize the ethics that permits doing what is believed to be right and good for man [sic].

[W]e have no basis for being cocky. We are still full of ignorance in spite of the spectacular increase of knowledge. It would be both unwise and foolish [sic – “foolish” was “inhumane” in the quoted source] to proceed without the utmost humility and compassion.”<sup>86</sup>

The questions posed by Sonnenborn were the subject of a symposium of scientists sponsored by the Ciba Foundation in February of 1995.<sup>87</sup> At the symposium, scientists studied the relationship between genetics and antisocial behavior as well as the social and ethical implications of the genetic discoveries.<sup>88</sup> These implications included the potential for new

<sup>84</sup> The amount set-aside is equal to only a small percentage of the total funding for the project, which is expected to top \$3 billion, but still reflects the concern about the misuse of the information. See Leslie Roberts, *Taking Stock of the Genome Project*, 262 SCIENCE 20 (1993).

<sup>85</sup> See generally Kirby, *supra* note 42.

<sup>86</sup> JOEL DAVIS, MAPPING THE CODE: THE HUMAN GENOME PROJECT AND THE CHOICES OF MODERN SCIENCE 266-67 (1990) (quoting Tracy M. Sonneborn, *Ethical Issues Arising From the Possible Uses of Genetic Knowledge*, in ETHICAL ISSUES IN HUMAN GENETICS 1, 5-6 (Bruce Hilton et al. eds., 1973).

<sup>87</sup> The symposium, officially entitled *Symposium on Genetics of Criminal and Antisocial Behaviour*, was held at the Ciba Foundation, London, February 14-16, 1995.

<sup>88</sup> See Michael Rutter, *Introduction: Concepts of Antisocial Behaviour, of Cause, and of Genetic Influences*, in GENETICS OF CRIMINAL AND ANTISOCIAL

forms of genetics-based racial and gender discrimination.<sup>89</sup> Yet even discussions about the relationship of genetics to discrimination and eugenics have been controversial, causing the cancellation of a proposed symposium sponsored by the National Institutes of Health in 1992.<sup>90</sup>

One area of great concern, for example, is human cloning. When the cloning of a human embryo in the laboratory was first reported by scientists at George Washington University, it set off a firestorm of controversy that included stories in *The New York Times*<sup>91</sup> and *Time* magazine.<sup>92</sup> In a poll conducted about the discovery, many people opined that they were against such human experimentation.<sup>93</sup> The cloning of an adult sheep named Dolly created an even greater controversy, leading President Clinton to ask the "National Bioethics Advisory Committee to study the legal and ethical ramifications of human cloning."<sup>94</sup> Questions about ethical standards and the limits of genetic research thus remain highly relevant.<sup>95</sup>

BEHAVIOUR, *supra* note 15, at 1, Cecilee Price-Huish, Comment, *Born to Kill? "Aggression Genes" and Their Potential Impact on Sentencing and the Criminal Justice System*, 50 SMU L. REV. 603, 605 (1997).

<sup>89</sup> See Joseph S. Alper & Marvin R. Natowicz, *The Allure of Genetic Explanations*, 305 BRIT. MED. J. 666, (1992); see also Price-Huish, *supra* note 88, at 605.

<sup>90</sup> The disputed symposium was eventually held in 1995 as *Research in Genetics and Criminal Behavior: Scientific Issues, Social and Political Implications*. The meeting, however, was not without controversy. See, e.g., Natalie Angier, *Disputed Meeting to Ask if Crime Has Genetic Roots*, N.Y. TIMES, Sept. 19, 1995, at C1.

<sup>91</sup> See Robert Pollack, *Beyond Cloning*, N.Y. TIMES, Nov. 17, 1993, at A27

<sup>92</sup> See Philip Elmer-Dewitt, *Cloning: Where Do We Draw the Line?*, TIME, Nov. 8, 1993, at 65.

<sup>93</sup> See *id.*

<sup>94</sup> Joyce Price, *Fund Ban for Cloning Humans Considered*, WASH. TIMES, July 29, 1997, at A8.

<sup>95</sup> The cloning of human embryos by scientists at George Washington University has raised ethical questions about genetic manipulation that neither science nor the government is ready to answer.

"The fact that there is a total moral vacuum in this whole area is now finally being realized," Cynthia Cohen, head of the National Advisory Board on Ethics and Reproduction, said on Monday.

Jeremy Rifkin, president of a biotechnology watchdog group, said human cloning represents a destructive type of genetic engineering.

Cohen and other experts said there are no clear, specific guidelines to control research on what some consider a slippery slope on the edge of human experimentation.

## 2. *The Eugenics Movement*

The current environment of distrust regarding genetics research can be traced in part to the early twentieth century "eugenics" movement, which utilized the classification of genetic inferiority as a rallying point.<sup>96</sup> The goal of this movement was to maintain and promote genetic superiority. The movement intended to accomplish this goal by sterilizing the "genetically inferior" to prevent further dilution of the gene pool, prohibiting interracial marriage, and limiting immigration.<sup>97</sup> This genetics-based superiority movement was widespread during the World War II era.<sup>98</sup>

While the worst form of eugenics was practiced by Adolph Hitler and the Nazi Party, a variety of eugenics-related movements have existed elsewhere. Even the United States Supreme Court at one time did not totally reject the idea of genetics-based classes of people. In 1927, the Court held in *Buck v. Bell*<sup>99</sup> that a Virginia law authorizing the sterilization of certain inmates with hereditary forms of insanity or imbecility<sup>100</sup> was constitutional.<sup>101</sup> Justice Oliver Wendell Holmes, writing for the Court, stated that "[t]hree generations of imbeciles are enough"<sup>102</sup> and legitimized the sterilization of Carrie Buck, an eighteen-year-old female. The Supreme Court was not alone in its view of sterilization. Twenty-nine states passed sterilization laws between 1907 and 1931.<sup>103</sup> By 1931, 12,000 individuals

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Some experts called for a moratorium on human embryo research until clear limits can be set. The leader of the George Washington University team said the group would await ethical guidelines before applying the research to normal human embryos.

*Cloning Limits Sought: Scientists Grow Human Embryos*, SUN-SENTINEL (Ft. Lauderdale, Fla.), Oct. 26, 1993, at 3a.

<sup>96</sup> See Vickie G. Norton, Comment, *Unnatural Selection: Nontherapeutic Pre-implantation Genetic Screening and Proposed Regulation*, 41 UCLAL.REV 1581, 1586 (1994).

<sup>97</sup> *Id.* at 1587

<sup>98</sup> Even in this context, the United States was not immune to its own transgressions. California was at the forefront of the American eugenics movement and "subjected more people to eugenic sterilization" than all other states combined. DANIEL J. KELVES & LEROY HOOD, *THE CODE OF CODES* 10 (1992).

<sup>99</sup> *Buck v. Bell*, 274 U.S. 200 (1927).

<sup>100</sup> Virginia continued to use that law to authorize "involuntary sterilizations until 1972." LAURENCE H. TRIBE, *ABORTION: THE CLASH OF ABSOLUTES* 112 (2d ed. 1992).

<sup>101</sup> See *Buck*, 274 U.S. at 207

<sup>102</sup> *Id.*

<sup>103</sup> See Heidi A. Boyden, Comment, *Heller v. Doe: Denying Equal Protection*

had been sterilized, including the insane and feeble-minded, criminals, drunkards, and sex offenders.<sup>104</sup> It is this potential for defining “normalcy” – and by comparison, inferiority – through the detection and selection of genetic propensities that illuminates the great possibility of harm resulting from genetic discoveries.

### 3. *Science and Popular Culture*

Science, formerly unimpeachable in the popular culture, recently has appeared in the media in a more negative light. The reasons for this are numerous, but as one commentator aptly noted, “[c]osts and hubris make doctors and scientists Hollywood’s newest villains.”<sup>105</sup> While fears about the excessive and uncontrolled price of scientific discovery may be unfounded, those concerns are becoming more pervasive. Dr. Arthur Caplan, director of the Center for Bioethics at the University of Pennsylvania, has observed:

“Our culture has a schizophrenic attitude about science and technology these days. If you look at opinion polls, scientists are scoring very well. But it is also clear that bubbling beneath the surface are primeval fears about profiteering and science and technology run amok and scientists whose egos know no bounds.”<sup>106</sup>

The skepticism about advances in medical technology extends to genetic research.<sup>107</sup> Feeding this fear are the Human Genome Project and

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*to the Mentally Retarded*, 21 NEW ENG. J. ON CRIM. & CIV. CONFINEMENT 437, 450 (1995).

<sup>104</sup> See Thomas A. Green, *Freedom and Criminal Responsibility in the Age of Pound: An Essay on Criminal Justice*, 93 MICH. L. REV. 1915, 2053 n.62 (1995).

<sup>105</sup> Gina Kolata, *Forget the Butler; The Medical Industry Did It*, N.Y. TIMES, Oct. 17, 1993, at 2.

<sup>106</sup> *Id.* (quoting Dr. Arthur Caplan, director of the Center for Bioethics at the University of Minnesota).

<sup>107</sup> While geneticists may have intended (as the discoverers of gunpowder and atomic energy may have intended) that their discoveries would be used for the advancement of humankind, the utility of the new technology may be counterbalanced by equal and opposite malevolent uses. Perhaps the most well-known abuse to date involving genetics research is biological warfare. While biological warfare has not been employed often, its use has been recorded as early as 600 B.C., when an Athenian legislator polluted the water supply in the city Kirrha by adding the roots from the hellebores plant. See SUZUKI & KNUDTSON,

gene therapy, which “remind the public that scientists are on the threshold of manipulating humanity”<sup>108</sup> The duplication of a human embryo in the laboratory, in particular, fueled the public perception of science operating without societal restraints,<sup>109</sup> raising the specter of Mary Shelley’s Frankenstein coming to life.

The potential political misuse of genetic screening, for example, is a significant by-product of genetic advances:

Taken to a gloomy extreme, obsessive genetic screening of employees could one day even result in a Huxleyan hierarchical caste system of workers. The lowest rung of the ladder would be occupied by those whose genetic test results marked them as hypersusceptible workers, stigmatizing them as economic untouchables destined to be chronically unemployed. At the highest rung would be workers whose test results established them as model employees whose genotypes – genetically resistant, in one way or another, to the environmental or psychological stresses of important occupational tasks – would guarantee them permanent, if monotonous, positions in the work force.<sup>110</sup>

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*supra* note 59, at 212.

Biological warfare can be defined as the deliberate use of micro-organisms or toxic substances derived from living cells for hostile purposes – that is, to kill, injure or incapacitate human beings or the animals or plants on which they depend. It has aptly been called “public health in reverse,” for it is founded on this dark premise: that the very pathogens – disease-causing viruses, bacteria, fungi and other micro organisms – against which medicine has waged endless battle can be used to military advantage by harming the health of political foes.

*Id.* at 208-09.

Other potential misuses are more subtle but still as pernicious. While genetic information may be useful to employers in evaluating a worker’s predisposition to disease caused by industrial chemicals, genetic information could be used by an employer to discriminate. *See* Catherine M. Valerio Barrad, Comment, *Genetic Information and Property Theory*, 87 NW U. L. REV 1037, 1045 (1993). Susceptibility to alcoholism or job-related disabilities such as chronic fatigue syndrome, carpal tunnel syndrome, back or neck injuries, or any other job-related condition – including absenteeism – could be used against current or potential employees. *See id.* It has been suggested that even the Human Genome Project may discriminate in that it is working on essentially a Caucasian genome and may fail to take into account differences from other groups. *See id.*

<sup>108</sup> Kolata, *supra* note 105, at 2.

<sup>109</sup> *See, e.g.*, Elmer-Dewitt, *supra* note 92, at 65.

<sup>110</sup> SUZUKI & KNUDTSON, *supra* note 59, at 171.

Genetic screening is but one form of the application of the science of genetics that is susceptible to misuse and potentially<sup>111</sup> significant consequences.<sup>112</sup>

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<sup>111</sup> The potential for genetic abuse, especially following on the heels of computer crime and other forms of technology-related crime, is real. Information collected by the government for the purpose of solving crimes could be misused by third parties if they received access to the data. This might occur, for example, if the information is released to those desiring the material for insurance or employment purposes. Genetic information could be used to deny a person insurance or employment, depending on its contents. Because genetic information is permanent, its misuse could have long-lasting and profound effects on the individual "donors," even after the individuals have been cleared of any wrongdoing or released from incarceration and reentered society.

If information is collected for DNA-profiling purposes, there is nothing to prevent the data bank holder from performing or allowing additional tests on the DNA. These tests could range from cholesterol tests, to searching for predispositions to disease, to locating genes regarding aggressiveness and the like. See Yee, *supra* note 40, at 475.

Improper uses of genetic information may include baby-shopping; seeking the perfect genetic child; genetic surgery that makes "normal" human beings better; and privacy issues as to who has access to genetic information and who owns it. If these genetic uses occur, they may be considered criminal not only because of the harm they cause, but because to many people, there are some things that human beings are just not meant to know. See DAVIS, *supra* note 86, at 241. For example, [o]nly 450 years ago, it was considered a serious sin to dissect human cadavers. The knowledge of the inner workings of the human body was forbidden. When the Flemish anatomist Andreas Vesalius published his illustrated book *De Humani Corporis Fabrica* in 1543 he violated that then-absolute tenet. Ninety years later Galileo violated another "not-meant-to-know" rule using the newly invented telescope to examine the heavens and prove that the earth was not at the center of the universe.

*Id.*

<sup>112</sup> Another area of potential abuse involves the collection and storage of genetic data in data banks. To protect against such potential abuses one commentator noted that "just as authorities now routinely return property seized after its relevance to criminal proceedings has ceased, so they should restrict the use of private information seized after the purposes for which it was obtained have ended." Harold J. Krent, *Of Diaries and Data Banks: Use Restrictions Under the Fourth Amendment*, 74 TEX. L. REV. 49, 100 (1995). But see Dan L. Burk & Jennifer A. Hess, *Genetic Privacy: Constitutional Considerations in Forensic DNA Testing*, 5 GEO. MASON U. CIV. RTS. L.J. 1, 11 (1994) (noting that "given the limits of RFLP and PCR analysis of the samples, the information found in these databases will probably reveal little more than the identity of individuals whose DNA patterns are

### III. REIMAGINING THE CRIMINAL LAW – CREATING A GENETICALLY ORIENTED CRIMINAL JUSTICE SYSTEM

#### A. *The Traditional Conception of the Criminal Law*

The criminal law serves to maintain the peace and good order of the community<sup>113</sup> through policies of predictability, efficiency, and fairness.<sup>114</sup> Traditionally, it was designed “to prevent harm to society – more specifically, to prevent injury to the health, safety, morals, and welfare of the public. This it accomplishes by punishing those who have done harm, and by threatening with punishment those who would do harm, to others.”<sup>115</sup> In other words, the criminal law is intended<sup>116</sup> to deter, punish,<sup>117</sup> isolate, and rehabilitate transgressors.<sup>118</sup>

The baseline or foundational component of the criminal law is moral blameworthiness, which the community uses to determine what conduct is criminal. The social element of morality, connoting the shamefulness of the conduct, makes the criminal law distinct from civil law and not readily explainable solely on efficiency or consequentialist grounds.<sup>119</sup> In other

matched to those stored in the database”).

Prosecutors may use such information as corroboration or to substitute for other evidence, and police may use such data to expand or focus their criminal investigations. The collection of such valuable DNA information is considerably worrisome because, like other things of value, it has the potential to be abused. Two major areas of potential abuse involve governmental use of genetic information and the lawful private scientific development of genetic information.

<sup>113</sup> See generally WAYNE R. LAFAVE & AUSTIN W. SCOTT, JR., *HANDBOOK ON CRIMINAL LAW* (1972).

<sup>114</sup> At times, these policies conflict. Fairness often requires flexibility, which may directly contravene predictability and/or efficiency.

<sup>115</sup> LAFAVE & SCOTT, *supra* note 113, at 9.

<sup>116</sup> See, e.g., LAWRENCE TAYLOR, *BORN TO CRIME: THE GENETIC CAUSES OF CRIMINAL BEHAVIOR* 17 (1984) (arguing that our current criminal justice system is predicated on the assumption that criminal behavior is solely the result of environmental factors rather than biological factors, and this system is thus inherently designed “to modify deviant conduct through environmental influences exclusively, such as with prison and rehabilitation programs.”).

<sup>117</sup> The United States Supreme Court recently noted that the two primary objectives of the criminal law are retribution and deterrence. See *Kansas v. Hendricks*, 117 S. Ct. 2072, 2082 (1997).

<sup>118</sup> These objectives were to be implemented in such a way as to provide notice to members of society of what would constitute minimally acceptable conduct.

<sup>119</sup> A person who attempts a crime but does not succeed, for example, has

words, culture and genetics generally form a duality in the criminal law, with the cultural mores and axioms playing a more central and salient role.

The criminal law is limited by the constitutional requirement of due process,<sup>120</sup> defined as predictable and fair procedures for resolving criminal charges. Due process mandates notice and a hearing prior to conviction, and generally, a public and impartial trial before a jury of the defendant's peers.

An adult person is presumed to be legally responsible for his or her conduct.<sup>121</sup> Legal responsibility is predicated on autonomy;<sup>122</sup> it is presumed that humans base their conduct on volitional behavior.<sup>123</sup> Autonomy involves "self-determination and choices."<sup>124</sup> The concern with autonomy in the law runs deep. The use of statistical analysis to convict, for example, has been decried because of its categorization based on groups rather than on the individual.<sup>125</sup> While it is readily accepted that an individual's

committed a wrongful act and deserves to be punished even if there is no identifiable "victim" or individual harm.

<sup>120</sup> The Due Process Clauses are found in the Fifth and Fourteenth Amendments to the United States Constitution. Those clauses work to restrict the federal and state governments, respectively.

<sup>121</sup> Two of the motivating policies underlying the definition of "criminality" are moral blameworthiness and deterrence. A criminal conviction is the equivalent of societal moral condemnation. The act committed is generally considered morally wrong or bad, ("malum in se") and not just bad because it is prohibited by law ("malum prohibitum"). This moral dimension helps to distinguish criminal from civil law, and explains why solicitation, attempts, and other inchoate crimes are criminal even though there is no measurable harm that has resulted.

<sup>122</sup> The implicit questions raised by the human genome project about the criminal justice system's presumption of human autonomy are far-ranging. As several commentators have inquired:

When the human genome is mapped, what will become of the specific duties of respect for and protection of autonomous choices and privacy of persons, and respect for and protection of vulnerable human beings who are, or will become, incapacitated to express autonomous choices? Will such duties survive intact? Or will they be diminished and disappear for the most vulnerable?

Fletcher & Wertz, *supra* note 41, at 747-48.

<sup>123</sup> See, e.g., Michael S. Moore, *Causation and the Excuses*, 73 CAL. L. REV. 1091 (1985); Coffey, *supra* note 25, at 353; John L. Hill, Note, *Freedom, Determinism, and the Externalization of Responsibility in the Law: A Philosophical Analysis*, 76 GEO. L.J. 2045 (1988).

<sup>124</sup> Fletcher & Wertz, *supra* note 41, at 775.

<sup>125</sup> The great number of protocols that form the basis of any statistical analysis



behavior is influenced by both his or her environment and genetic composition, the legal cause of the behavior is firmly placed within the actor's free will. The system accepts external causes of behavior only in exceptional cases.<sup>126</sup> Such cases involve both physiological causes, such as reflex responses, epileptic seizures, sleepwalking, and hypnotism, and psychological causes, such as insanity, battered woman's syndrome, and post-traumatic stress syndrome. As a general rule, however, if an act is voluntary and the appropriate mental state is shown, the actor may be held legally responsible for the conduct.<sup>127</sup>

In this way, criminal responsibility incorporates a psychological perspective. It focuses on an actor's mental state, which raises questions of culpability and moral blameworthiness. Conduct becomes criminal when the concurrent mental state of the actor renders it blameworthy. Some conduct that is otherwise blameworthy may be justified or excused. Self-defense exemplifies a justification, while the insanity defense is but one illustration of excuse.

The criminal justice system has evolved over time. From a common law system that evidenced considerable inconsistency from jurisdiction to jurisdiction in the early 1800s, the Fourteenth Amendment to the Constitution and its incorporation doctrine served to standardize many processes in state prosecutions.<sup>128</sup> Still, the criminal law system is defined and customized by local communities, often through comprehensive penal codes that define crimes and the administration of the prosecution of those

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further undermine the predictive use of such statistics for the particular individual. See Jack F. Williams, *Classifying Pre-Trial Detention Decisions Under the Bail Reform Act of 1984: A Statistical Approach*, 30 AM. CRIM. L. REV. 255, 288 (1993). The misuse of statistics has occurred in many contexts, including *People v. Collins*, 438 P.2d 33 (Cal. 1968), in which a statistical expert testified about the probability of a second pair of suspects in a robbery case existing in the vicinity of the alleged robbery. The Supreme Court of California found that the statistical data was not sufficiently reliable to admit into evidence and reversed the convictions of the two alleged perpetrators. See *id.* at 33.

<sup>126</sup> This concept of "free will" is contrary to biology and the sciences, including psychiatry, which assume behavior to be predictable to a significant extent from external causes such as biology or environment. See Hill, *supra* note 123, at 2045.

<sup>127</sup> A complete genetic explanation for conduct, however, would have a great impact on this axiomatic assumption of "voluntariness."

<sup>128</sup> See, e.g., *Duncan v. Louisiana*, 391 U.S. 145 (1968) (stating that the right of trial by jury is applicable to defendants in state criminal cases); *Palko v. Connecticut*, 302 U.S. 319 (1937) (refusing to incorporate the Double Jeopardy Clause), *overruled by Benton v. Maryland*, 395 U.S. 784 (1969).

crimes as well. Codification by the legislature confirms the social significance of a system designed to deter and coerce its citizens into maintaining minimally acceptable standards of behavior.

### *B. The Social Construction of the Criminal Law*

Implicit within the traditional conception of the criminal law is the significant role played by non-legal institutions in the law's formation. In other words, social policies and societal beliefs shape the scope and nature of criminal responsibility.<sup>129</sup> The expansive role of social science and popular culture is reflected in an explanatory device called social constructivist theory.

Social constructivist theory suggests that institutions such as the criminal justice system are not constructed merely through ethereal law, jurisprudential analysis, or even universal principles, but rather out of the cloth of the larger society.<sup>130</sup> A salient premise of social constructivist theory is that circumstances are important to understanding societal institutions. Since circumstances change, the institutions will also change over time as a matter of course.

Social constructivist theory essentially uses context to look at an issue and analyze it. These contexts, much like the sedimentary layers of soil examined by an archaeologist, constitute a totalizing, holistic analysis of an issue, rather than an empirical, objective construction.<sup>131</sup> Thus, social constructivism expressly includes experiential review as much as scientific methodology. The social constructivist approach belies the scientific view of objectivity and believes, instead, that all knowledge is based on

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<sup>129</sup> See generally LAFAVE & SCOTT, *supra* note 113.

<sup>130</sup> See Janet E. Ainsworth, *Re-Imagining Childhood and Reconstructing the Legal Order: The Case for Abolishing the Juvenile Court*, 69 N.C. L. REV. 1083, 1086 (1991). It has been suggested that the current legal order is not simply composed of legal rules and principles, but is in effect socially constructed. See *id.* at 1087. This assertion relies on social constructivist theory to illustrate the social dimension of the criminal justice system and its reality. See *id.* It is these foundational beliefs about reality that will undergo dramatic changes in a system built on genetic discoveries.

<sup>131</sup> See, e.g., CLIFFORD GEERTZ, *THE INTERPRETATION OF CULTURES* (1973); CLIFFORD GEERTZ, *LOCAL KNOWLEDGE* (1983). Professor Geertz, a cultural anthropologist, argues that law, art, and knowledge are socially created, so that the world around us is defined by us as much as we are defined by the world around us. See *id.* at 124. See also THOMAS S. KUHN, *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* (2d ed. 1970).

preexisting categories as created by human beings, thus containing subjectivity. Consequently, maps of reality depend on the time in which they are created, the circumstances surrounding them, and who is doing the creating.<sup>132</sup>

Another premise of social constructivist theory is that the actors in the system have the power to change the system. If the system is socially ordered, it can be socially disordered or even dismantled by those within it.<sup>133</sup> This is quite apparent from recent events in the former U.S.S.R., where what appeared to be a firmly entrenched political system was rapidly dismantled.

While the result of these premises is that the legal system is created by individuals within it and the society as a whole, the participants in the legal system are not merely passive observers who play no role in creating institutions and societal understandings. Clifford Geertz, the cultural anthropologist, noted that "legal thought is constructive of social realities rather than merely reflective of them."<sup>134</sup> This characterization of law recognizes the law's impact on society. This phenomenon was readily evident in the context of the O.J. Simpson criminal trial, where the trial impacted society just as social pressure and commentary likely influenced the trial.

Society also has contributed to the transformation of the definition of criminality by supporting exceptions to acts that are otherwise blameworthy. These exceptions have been carved out by the recognition of psychological syndromes such as post-traumatic stress disorder, battered woman's syndrome, and rape victim's syndrome, and various other exculpatory circumstances that have contributed to "abuse defenses." Technological advances also have caused significant changes in the proof of criminal conduct. DNA fingerprint testing and other genetic discoveries, while revolutionizing the forms of exculpatory or inculpatory evidence, threaten to redefine the method and form of proof offered at trial.

While the historical social context may hold the key to the creation of criminality, what is currently criminal is in large part traceable to the legislature acting on behalf of the community. The current system has reacted strongly, for example, to the proliferation of narcotics use in this country, attaching severe consequences to the possession, use, and distribution of substances such as marijuana, cocaine, and heroin. The legislature has also responded to drunk driving accidents and other modern

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<sup>132</sup> See Ainsworth, *supra* note 130, at 1086.

<sup>133</sup> See *id.* at 1086-87.

<sup>134</sup> See GEERTZ, LOCAL KNOWLEDGE, *supra* note 131, at 232.

acts of immorality by increasing the penalty for, and the enforcement of, such conduct. In recent years, the system has used more resources, such as the legislative adoption of the "three strikes and you're out" sentencing proposals, to prosecute white collar crime and new forms of immoral conduct such as computer fraud.

In light of social constructivist theory, it is the interactive relationship between the criminal justice system and society that actually defines criminality. To fully reconstruct a criminal justice system and a new understanding of criminality based on genetic advances, revised social expectations and attitudes must be included.

### C. *The Reconstruction of a Genetics-Enhanced Criminal Justice System*

If the discoveries of the Human Genome Initiative reveal that genetics play a large role in determining human behavior, the impact will be far-reaching.<sup>135</sup> A genetically reordered system would revolve around a biological basis of conduct, rather than the psychological basis of the current system. With more than two thousand diseases already shown to have originated from single gene defects,<sup>136</sup> it might well be a logical projection to expand the reliance on genetics as a source for defining behavior. The presumption of free will would dissipate in light of evidence to the contrary.

Support for a genetic reordering already can be found in empirical studies. Research has indicated the existence of a correlation between biological conditions and criminal behavior, although the linkage is insufficient to show causation.<sup>137</sup> In a recent publication of the journal *Science*, Dutch researchers claimed to have discovered a genetic link to violent behavior.<sup>138</sup> They studied several generations of a Dutch family that had exhibited significant levels of antisocial and criminal behavior.<sup>139</sup> The

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<sup>135</sup> Even the descriptive psychology of phenomenology, which describes the eidetic, or fundamental, laws of experience, would have to be adjusted to reflect genetic discoveries. Through the prism of phenomenology, the Kantian antinomy of the individual and the world would collapse into one conjunctive entity based on biological analysis. Society's understanding of legal concepts like the doctrine of negligence would require radical surgery as well.

<sup>136</sup> See Barrad, *supra* note 107, at 1043.

<sup>137</sup> See generally Richard F. Daly & J. Preston Harlet, *Frequency of XYY Males in Wisconsin State Correctional Institutions*, 18 *CLINICAL GENETICS* 116 (1980); Morell, *supra* note 16.

<sup>138</sup> See Morell, *supra* note 16, at 1722.

<sup>139</sup> Many of the male family members had a low IQ and engaged in such

researchers found that members of the family were deficient in a particular enzyme, monoamine oxidase A (“MAOA”), associated with levels of the neurotransmitter serotonin in the brain.<sup>140</sup> They concluded that there was a link between this genetic abnormality and the family’s antisocial behavior.<sup>141</sup> One of the researchers stated, “It was always clear that genetics was involved in behavior. . . . But this is the first example showing a specific gene that changes the behavior of individuals.”<sup>142</sup> In another study, researchers examined mice with an MAOA deficiency.<sup>143</sup> Just like the family in the Dutch study, MAOA-deficient adult mice exhibited excessively aggressive behavior.<sup>144</sup> In another study of mice, it was found that males who lacked the gene that produces nitrous oxide were more prone to violence.<sup>145</sup> Several significant studies of twins also have been undertaken. “Twin studies” are significant because twins often are raised in a common environment and generally have the same genetic compositions.<sup>146</sup>

Some researchers suggest that the limbic area of the brain is responsible for violent behavior. The limbic brain houses the amygdala, which is important in the control of such emotions as fear and anger.<sup>147</sup> The “flight or fight” mechanism in animals also marked early humans, and only as civilization has advanced has such a response become “seen as antisocial and maladaptive.”<sup>148</sup> Some researchers have concluded that the small group

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conduct as arson, assault, and rape. See Han G. Brunner, *MAOA Deficiency and Abnormal Behaviour: Perspectives on an Association*, in GENETICS OF CRIMINAL AND ANTISOCIAL BEHAVIOUR, *supra* note 15, at 156.

<sup>140</sup> See Denno, *Legal Implications of Genetics and Crime Research*, *supra* note 15, at 252.

<sup>141</sup> See *id.*

<sup>142</sup> Geoffrey Cowley & Carol Hall, *The Genetics of Bad Behavior*, NEWSWEEK, Nov. 1, 1993, at 57 (quoting Dr. H. Hilger Rogers).

<sup>143</sup> See Olivier Cases et al., *Aggressive Behavior and Altered Amounts of Brain Serotonin and Norepinephrine in Mice Lacking MAOA*, 268 SCIENCE 1763 (1995).

<sup>144</sup> See *id.*

<sup>145</sup> See Stephen C. Maxson, *Issues in the Search for Candidate Genes in Mice as Potential Animal Models of Human Aggression*, in GENETICS OF CRIMINAL AND ANTISOCIAL BEHAVIOUR, *supra* note 15, at 31.

<sup>146</sup> See Price-Huush, *supra* note 88, at 611. The two most important twin studies involved Danish twins and twins serving in the military. See, e.g., *id.* at 611-12.

<sup>147</sup> See TAYLOR, *supra* note 116, at 52.

<sup>148</sup> J. Michael Echevarria, *Reflections on O.J. and the Gas Chamber*, 32 SAN DIEGO L. REV. 491, 527 (1995).

of individuals who commit the majority of crimes have a genetic marker causing them to act in a violent manner.<sup>149</sup>

Taking these studies of the limbic brain one step further, scientists have examined the relationship between biology and human conditions such as addiction, personality disorder, and antisocial behavior.<sup>150</sup> While no specific genes were isolated that proved to be the causal agents of these conditions, the scientists did conclude that genetics influenced an individual's propensity for antisocial behavior. For example, sociopathic, alcoholic fathers were twice as likely to have children exhibiting sociopathic behavior than parents without such attributes, and psychopathic fathers were more likely to have psychopathic children.<sup>151</sup>

Claims of a link between genetics and behavior have been made in many other areas, including "mental illness, homosexuality, aggressive personality, dangerousness, job and educational success, exhibitionism, the tendency to commit arson, stress, risk-taking, shyness, social potency, traditionalism, and even zest for life."<sup>152</sup> Experts have suggested that mental illnesses such as schizophrenia could have genetic origins. As one commentator noted, "Remarkably, schizophrenics who have been deaf from birth claim to 'hear' voices, providing strong evidence that there really is a brain malfunction involved."<sup>153</sup>

### 1. *Major Shift: "Propensity Determinism"*

"[T]he law treats man's conduct as autonomous and willed, not because it is, but because it is desirable to proceed as if it were."<sup>154</sup>

Perhaps the most important among the many changes likely to occur in a genetics-based system<sup>155</sup> is a reemergence of determinism as an

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<sup>149</sup> See *id.*

<sup>150</sup> See Cloninger & Gottesman, *supra* note 13, at 104-07; Coffey, *supra* note 25, at 375.

<sup>151</sup> See Coffey, *supra* note 25, at 377

<sup>152</sup> Dreyfuss & Nelkin, *supra* note 7, at 320.

<sup>153</sup> WILLS, *supra* note 44, at 255.

<sup>154</sup> Moore, *supra* note 123, at 1122 (quoting HERBERT L. PACKER, *THE LIMITS OF THE CRIMINAL SANCTION* 74-75 (1968)).

<sup>155</sup> A genetic reordering would almost completely change the face of the existing system. Defenses would be redefined in genetic terms, as would the conception of mens rea or the mental state necessary to form criminal intent. Genetic mapping, which consists of polymorphic markers at certain intervals,

overarching theme of the criminal law. Determinism can be roughly defined as a philosophical doctrine that suggests that actions can be explained by prior causes.<sup>156</sup> The antithesis of determinism is free will, which is based on the tenet that individuals have the power to determine their own behavior. While few would suggest that genes alone determine a person's behavior,<sup>157</sup> the criminal law would become more like psychiatry, which "purports to be rigorously scientific and therefore takes a determinist position. Its view of human nature is expressed in terms of drives and dispositions which, like mechanical forces, operate in accordance with universal laws of causation."<sup>158</sup> The real question would be: How much determinism? Whether a strong form of determinism,

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would be used in trial as evidence of the cause of criminal conduct. See Eric P. Hoffman, *The Evolving Genome Project: Current and Future Impact*, 54 AM. J. HUM. GENETICS 129, 131 (1994) (discussing how a genetic map of polymorphic markers at determined intervals facilitates discovery of diseased genes). Instead of being an essential element of the overwhelming majority of crimes, the mental state of the actor would be relegated to a lesser status, perhaps existing only as an affirmative defense to be proven by the accused.

<sup>156</sup> Questions of determinism have been analyzed for centuries. Locke, for example, believed that our knowledge of substances is inherently limited. See generally John Locke, *Essay Concerning Human Understanding*, Book IV. Francis Bacon, on the other hand, believed that there was no inherent limitation to scientific knowledge. See *Novum Organum*, in *THE PHYSICAL AND METAPHYSICAL WORKS OF LORD BACON* (Joseph Devey ed., 1911), in which Bacon contended that the goal of having knowledge was to discover the laws of nature.

<sup>157</sup> One analogue to reconceiving human identity lies in archaeology, where scientists have attempted to reconstruct the history of homo sapiens. This history illuminates the point at which human beings were differentiated from other primates:

For more than a century, archaeologists, anthropologists, and biologists have been digging through layers of dirt and rock, sieving fossils and artifacts, in an attempt to figure out when, where, and how human beings differentiated from other primates to become a unique species.

The development of molecular genetic techniques for analyzing DNA offers a new source of evidence in the ongoing debate about human origins. Techniques for mapping and sequencing DNA allow researchers to compare different species and different individuals from the same species at the most basic level.

OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, *MAPPING OUR GENES - THE GENOME PROJECTS: HOW BIG, HOW FAST?* 71 (1988).

<sup>158</sup> Moore, *supra* note 123, at 1121-22 (quoting JEROME HALL, *GENERAL PRINCIPLES OF CRIMINAL LAW* 455 (2d ed. 1960) (citations omitted)).

yielding the conclusion that genes actually cause behavior, or a weaker form, where causation is interdependent on genes and environmental factors, prevails, may prove to be a matter of degree or a question of interpretation. How deterministic human behavior really is could be the focal point of many future debates.

Much has been written about determinism. Some scholars, such as Harvard University Professor James Q. Wilson, have long argued that “[c]ertain genetic traits, including temperament and intelligence,” are causal factors in determining who commits crimes.<sup>159</sup>

Linking criminal behavior more firmly to genetics would create a new set of underlying assumptions in the area of criminal responsibility.<sup>160</sup> The tension between the common law definition of criminal responsibility and a “geneticized” definition would be illuminating.<sup>161</sup> A geneticized criminal law would appear to impose a less discretionary foundation for analyses of guilt or innocence. If genetics could provide a coherent and broader, if not all-encompassing, explanation about an individual’s behavior, it would create a definition of “normalcy” apparently outside the scope of the particular circumstances,<sup>162</sup> the social mores, or local culture. The normalcy standard would become the new measuring stick for determining who will be held criminally responsible.

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<sup>159</sup> *A Conversation with James Q. Wilson: “Genetic Traits Predispose” Some to Criminality*, U.S. NEWS & WORLD REP., Sept. 30, 1985, at 54; see also HERRNSTEIN & MURRAY, *supra* note 21, JAMES Q. WILSON & RICHARD J. HERRNSTEIN, *CRIME AND HUMAN NATURE* (1985); Abbe Smith, *They Dream of Growing Older: On Kids and Crime*, 36 B.C. L. REV. 953, 965 (1995).

<sup>160</sup> Utilizing genetics in assessing, preventing, and prosecuting criminal behavior would turn the current system on its head. Its impact can properly be assessed, perhaps, using a combination of various social sciences and contextualized perspectives.

<sup>161</sup> Historically, however, some biological impairments have been permitted to explain or excuse criminal behavior. Disabilities caused by external factors, such as lead-paint poisoning, the ingestion of narcotics causing organic brain injury, exposure to nuclear radiation, and the consumption of alcohol, all may properly be raised at trial. See Deborah W. Denno, *Considering Lead Poisoning as a Criminal Defense*, 20 FORDHAM URB. L.J. 377, 397 (1993); Dorothy E. Roberts, *Foreword: The Meaning of Gender Equality in the Criminal Law*, 85 J. CRIM. L. & CRIMINOLOGY 1, 10 (1994). Similar to genetic defects, these biological influences are permitted to explain and defend otherwise criminal behavior.

<sup>162</sup> This explanatory approach would be superior to the imprecision of the current scheme, which rests almost entirely on the ability of lay jurors.



Also, if propensity determinism<sup>163</sup> is accurate and personal traits are a concretized, predictable part of an individual, the presumption that traits and dispositions of human beings are changeable over time, subject to rehabilitation and external, environmental impact, would become more questionable.<sup>164</sup> This shift towards “propensity determinism,” while not wholly excluding cultural, circumstantial, and historical influences in determining criminal responsibility, minimizes those external influences and propels determinism into evaluations of other complex social phenomena such as homelessness.<sup>165</sup>

## 2. Genetic Propensities and the “Criminally Inclined”

The operative form of determinism in the new system would focus on the genetic propensities of the actor. These propensities would be used to explain behavior much like the diagnosis of attention deficit hyperactivity disorder is used to explain learning difficulties and chronic fatigue syndrome is used to explain an otherwise inexplicable set of symptoms. Pertinent inquiries would include whether the actor has genes indicating aggressiveness, perversity, or other abnormalities. This new character evidence would be far removed from the traditional opinion or reputation evidence,<sup>166</sup> and would stem, instead, from a genetic evaluation of a person.

Genetic “character evidence” would differ from traditional character evidence in at least one major way: its permanency. Traditional character evidence is transitory, since it is premised on the belief that people can change.<sup>167</sup> Biological explanations, on the other hand, particularly those rooted in genetics, presumably do not change. If genes are “all-powerful,” human beings could be reduced to their genetic codes. With the increasing

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<sup>163</sup> “The interest in genetic identity includes a preoccupation with biological determinism.” Dreyfuss & Nelkin, *supra* note 7, at 320 (observing that several newspapers during a three-year span had 416 articles associating genetics with behavior; *see id.* at 320 n.50).

<sup>164</sup> This concept is called “genetic essentialism” and “posits that personal traits are predictable and permanent, determined at conception, ‘hard-wired’ into the human constitution.” *Id.* at 320-21.

<sup>165</sup> The editor of *Science* magazine, Daniel Koshland, has stated that “people don’t realize that the homeless are impaired [and that] [n]o group would benefit more from the application of human genetics.” Ruth Hubbard & Elijah Wald, *The Eugenics of Normalcy – The Politics of Gene Research*, 23 *ECOLOGIST* 185, 187 (1993).

<sup>166</sup> *See* FED. R. EVID. 404(a) and 405.

<sup>167</sup> *See, e.g.*, FED. R. EVID. 404(a), Advisory Committee’s Note.

number of discoveries about genetics, it is easy to understand why the populace may be persuaded that "genes control everything."<sup>168</sup>

### 3. *Subsidiary Effects of Propensity Determinism*

Propensity determinism would impact many specific areas of the criminal law. The most significant areas, however, would probably be in the areas of defenses to crimes and sentencing decisions. In both contexts, genetic predispositions could serve as mitigating factors in judicial determinations. While such evidence might not stand alone, it could be the most significant of the mitigating factors, particularly in a serious case in which the accused is facing the death penalty.

#### a. *Predictions of Dangerousness*

The Supreme Court has consistently stated that the prediction of dangerousness is not so random as to be excluded from courts of law. For example, in *United States v. Salerno*,<sup>169</sup> the Supreme Court upheld the constitutional validity of the 1984 Bail Reform Act provision permitting the pre-trial detention of an accused. The Court observed that it could not "categorically state that pretrial detention 'offends some principle of justice so rooted in the traditions and conscience of our people as to be ranked as fundamental.'" <sup>170</sup> Relying on its previous decision in *Schall v. Martin*,<sup>171</sup> the Court concluded that "there is nothing inherently unattainable about a prediction of future criminal conduct."<sup>172</sup> Similarly, the Court in *Schall*<sup>173</sup> asserted that it "specifically rejected the contention 'that it is

<sup>168</sup> Hubbard & Wald, *supra* note 165, at 185.

<sup>169</sup> *United States v. Salerno*, 481 U.S. 739 (1987).

<sup>170</sup> *Id.* at 751 (quoting *Snyder v. Massachusetts*, 291 U.S. 97, 105 (1934)).

<sup>171</sup> *Schall v. Martin*, 467 U.S. 253 (1984).

<sup>172</sup> *Salerno*, 481 U.S. at 751 (quoting *Schall*, 467 U.S. at 278).

<sup>173</sup> The decision in *Schall* has been widely criticized. One commentator stated, "The examples of a court's prediction of future dangerousness employed by the Court in *Schall* and implicitly approved in *Salerno* possess one common thread – the dangerousness prediction occurred after conviction." Williams, *supra* note 125, at 277. Stated another commentator:

One scarcely knows where to begin in describing the deficiencies of the predictions of dangerousness upheld in *Schall v. Martin*. The detainee has not been adjudged guilty of any crime. In fact, the court need not even find probable cause for detention. The only two factors known to have any relevance to recidivism, the number and type of prior criminal offenses, are

impossible to predict future behavior and that the question is so vague as to be meaningless.’<sup>174</sup>

*Schall* was not the only case in which the Supreme Court has had the opportunity to address predictions of dangerousness. Recently, in *Kansas v. Hendricks*,<sup>175</sup> the Supreme Court upheld a law permitting the civil commitment of persons with mental abnormalities or personality disorders who are likely to “engage in ‘predatory acts of sexual violence.’”<sup>176</sup> The Court concluded that the precommitment finding of dangerousness was sufficient when coupled with a finding of mental abnormality or personality disorder.<sup>177</sup> This case therefore furthers the rationale set forth in *Schall*—that pre-conviction predictions of dangerousness are sufficiently cognizable to be implemented in criminal law.

A genetically reordered system would greatly extend this trend toward pre-conviction predictions of dangerousness and the association of mental illness with criminally violent conduct. Under the new system, persons

not used as criteria. The discretion is standardless, the standard of proof is vague, the defendant has no way of proving that he will not commit a crime, and there is not a scintilla of evidence that public safety is enhanced by the procedure.

Elyce H. Zenoff, *Controlling the Dangers of Dangerousness: The ABA Standards and Beyond*, 53 GEO. WASH. L. REV. 562, 594 (1985). One observer pointed to the fact that the *Schall* determination was not based upon a record of evidence indicating dangerousness in that particular case, and opined that dangerousness in the abstract is an illegitimate basis for a decision. Williams, *supra* note 125, at 279. An applicable parable states this position well:

According to Rabelais’ account of the matter in *Gargantua and Pantagruel*, when Judge Bridlegoose was cited to appear before the High Court of Mirelinguais to state his grounds for a doubtful decision, he explained that his method of deciding cases was by casting dice for the defendant and the plaintiff, and awarding the decision to the party getting the highest score. He said that in the instant case, because of advancing years, he might have misread the dice, especially as they were very small. It was urged on his behalf that in forty years the appellate court had not failed to uphold his judgments when appealed from, a fact that Pantagruel explained by suggesting that Bridlegoose, knowing how obscure the law was, had put himself under divine guidance which revealed itself in the fall of the dice.

RICHARD EGGLESTON, EVIDENCE, PROOF AND PROBABILITY 1 (2d ed. 1983).

<sup>174</sup> *Schall*, 467 U.S. at 278-79 (quoting *Jurek v. Texas*, 428 U.S. 262, 274 (1976)).

<sup>175</sup> *Kansas v. Hendricks*, 117 S. Ct. 2072 (1997).

<sup>176</sup> *Id.* at 2076 (quoting KAN. STAT. ANN. § 59-29a02 (1994)).

<sup>177</sup> *See id.* at 2080.

would be classified according to their genetic predispositions to violence. The degree of aggressiveness evidenced in a person's genetic predisposition, coupled with other "abnormal" genetic traits or "mental abnormalities," would play a major role in questions of pre-trial release, character evidence at trial, post-trial release, sentencing, and parole. The perceived dangerousness of a person might be modified by conduct that defied his or her genetic "scorecard," but that "scorecard," much like blood type, would be permanent.

The subsidiary effects of this new system would be plentiful. The police would create new strategies of investigation based on the genetic propensities of suspects. When pulled over for speeding, an individual could be asked for a driver's license, registration, and genetic propensities card. When a fight at a bar occurred, the investigating officers could run a genetics check on the participants.<sup>178</sup> Discovery of an accused's genetic propensities would be sought in a wide variety of criminal cases and be made available through computer files for fast, nationwide referencing. A cadre of "dangerousness" experts, ready to testify about their expertise at trial, would develop. This group would offer a different approach to dangerousness than that of the psychologically oriented psychiatrists and psychologists of today.<sup>179</sup> At sentencing, the length of the defendant's sentence might be affected by his or her "dangerousness quotient." Rehabilitation would be relegated to an official secondary status and would be oriented toward those individuals whose genes indicated they could be most influenced by environmental factors. Incarceration would be recognized for what it has already become in many settings – merely a means of separating dangerous individuals from the rest of society. Genetic predispositions would also become increasingly important at the parole stage, while the prisoner's conduct in prison would lessen in importance.

### *b. Sentencing Issues*

Sentencing and parole issues increasingly occupy the attention of politicians and the public, as well as criminologists. In one recent study, it was found that of 15,000 inmates released early, more than one-third were

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<sup>178</sup> Door guards might even deny admission to prospective patrons who flunked genetic predisposition checks.

<sup>179</sup> Disputes between the two groups and their approaches to dangerousness would likely develop in the media, at trial, and at academic conferences. The disputes would concern the nature, scope, and accuracy of dangerousness predictions.

back in prison by the time their initial sentences expired.<sup>180</sup> There are many reasons for this, including some relating to the philosophy surrounding sentencing. The philosophy of sentencing involves several different policy strands that at times appear irreconcilable. These sentencing objectives include the prevention of further crimes – deterrence – as well as punishment and rehabilitation.<sup>181</sup> Genetic information, particularly about dangerous genetic deficiencies or predispositions, arguably would assist judges and parole boards in furthering the philosophical goals of sentencing.

Sentencing generally permits consideration of mitigating factors. These factors cover a wide range of possibilities. There is no reason the possibilities ought not include genetics. The “story” of the crime may include genetic syndromes and propensities. If genetic influences affect behavior, genetics may not only provide an explanation, but also offer a means of preventing repeat crimes. In the same vein, family history would gain increasing importance as further evidence of a genetic predisposition. The prosecution and defense would evaluate the family history not only in the context of sentencing, but also for determinations of dangerousness, charging decisions, and genetic defenses at trial. Genetic “reconstructionists,” the equivalent to accident reconstructionists, would build a genetic family history to support a biological theory of the defendant’s or victim’s conduct. These experts could testify at trial about genetic causes and effects.

The use of gene therapy in the sentencing phase of a case is very appealing in an age when the prison system is under widespread attack. Such therapy would be intended as a means of reducing recidivism rates. Precedent exists for such an ideal. For example, in the first part of the twentieth century, states adopted laws allowing sterilization for some sex offenders. In 1942, the United States Supreme Court considered the constitutionality of such laws in *Skinner v. Oklahoma*.<sup>182</sup> In *Skinner*, the Court struck down an Oklahoma law providing for the sterilization of

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<sup>180</sup> See Rhonda Cook & Bill Torpy, *Is Parole Worth its Price?*, ATLANTA J. & CONST., Jan. 19, 1997, at A1.

<sup>181</sup> See Richard Lowell Nygaard, *On the Philosophy of Sentencing: Or, Why Punish?*, 5 WIDENER J. PUB. L. 237, 238 (1996) (arguing that the United States’ sentencing philosophy is based on a “facile myth of punishment,” and that “imprisonment, the central method of criminal punishment, has not provided sufficient pain to dissuade offenders from their anticultural behavior or to assuage the public’s desire for revenge. Indeed, the notion of inflicting a just measure of pain is a paradox.”).

<sup>182</sup> *Skinner v. Oklahoma*, 316 U.S. 535 (1942).

recidivist offenders convicted of sex crimes. In his concurring opinion, however, Chief Justice Stone did not dismiss the concept of using genetics to control recidivism. He wrote that “[s]cience has found and the law has recognized that there are certain types of mental deficiency associated with delinquency which are inheritable. But the State does not contend that the criminal tendencies of any class of habitual offenders are universally or even generally inheritable.”<sup>183</sup>

Such precedent for gene therapy extends into the 1990s and is evidenced by the existence of drugs that “chemically castrate” sexual predators. Inmates are often given the option of further incarceration or of taking the “chemical castration” drugs, usually de-provera. Even though these drugs may be effective, the public appears to be uneasy about this course of governmental action. This public uneasiness taps into what is perhaps the greatest fear surrounding the Human Genome Project – the use of genetic research to alter and modify the human genome system of living persons.<sup>184</sup> This possibility is widely known as “genetic engineering.” While the potential for improving the quality of life is great, the prospect of malevolent interference is sobering. As one commentator noted:

The reassertion of concern over inadequate oversight was doubtless largely a result of a certain basic horror at the notion of direct intervention in human life (which manifested itself from the first genetic engineering controversies in the frequency with which analogies were drawn to Dr. Frankenstein)<sup>185</sup>

In the criminal justice context, this fear emerges in the areas of sentencing and rehabilitation. Whether gene therapy should be used as a

<sup>183</sup> *Id.* at 545 (Stone, C.J., concurring).

<sup>184</sup> Advances in genetic research pose the question of how that information will be used. This question is not always predicated on the interpretive construct that knowledge is power. For example, one philosopher, Michael Foucault, believes that “knowledge is a power over others, the power to define others. In his view knowledge ceases to be a liberation and becomes a mode of surveillance, regulation, discipline.” MADAN SARUP, AN INTRODUCTORY GUIDE TO POST-STRUCTURALISM AND POST MODERNISM 73 (1989) (describing Foucault).

<sup>185</sup> Alexander Morgan Capron, *Which Ills to Bear? · Reevaluating the “Threat” of Modern Genetics*, 39 EMORY L.J. 665, 672 (1990); see also PRESIDENT’S COMMISSION FOR THE STUDY OF ETHICAL PROBLEMS IN MEDICINE AND BIOMEDICAL AND BEHAVIORAL RESEARCH, *SPLICING LIFE: A REPORT ON THE SOCIAL AND ETHICAL ISSUES OF GENETIC ENGINEERING WITH HUMAN BEINGS* 13-17 (1982).

form of rehabilitation or to cure sex offenders raises both social and legal issues. The practice of “fixing genes” through germline intervention might run afoul of the due process clause much like attempts by states to sterilize recidivist sex offenders.<sup>186</sup>

In the new system, the fear of abuse of gene therapy might dissipate in the wake of widespread use of new genetics techniques, particularly if a comprehensive statutory scheme governed the area.<sup>187</sup> If the application of gene therapy is successful, inmates could be released without the considerable – and often justifiable – fear of recidivism. These techniques could be combined with other technological advances such as electronic bracelets to provide a more flexible and independent sentencing program. Other changes would also result from gene therapy techniques. Notice provisions, such as “Megan’s Law,”<sup>188</sup> would no longer be necessary if genetic procedures were used to prevent or deter recurrences. Such procedures would save the considerable expense of continued incarceration, while permitting the individuals to rejoin society. Questions would be raised, however, about the effectiveness and duration of the treatment, as well as about any potential harmful side-effects. If there are side-effects, constitutional challenges under the due process clause would be asserted.<sup>189</sup>

### c. *Deterministic Defenses*

Another subsidiary effect of propensity determinism is the use of genetics as a defense to a crime. While prosecutors would use genetic information to prove their cases, defense counsel would attack the scientific analyses as flawed. The scientific validity of the genetic information might be questioned based on the currentness or accuracy of the data upon which

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<sup>186</sup> See *supra* notes 182-83 and accompanying text.

<sup>187</sup> See Doroty C. Wertz, *Ethical and Legal Implications of the New Genetics: Issues for Discussion*, 35 SOC. SCI. & MED. 495, 503 (1992) (stating that a “code of ethics in human genetics” would among other things, “allay public fears about genetics.”).

<sup>188</sup> New Jersey’s Sexual Offender Registration Act, commonly known as “Megan’s Law,” requires convicted sex offenders to register with local police upon their release from prison. The law also provides for possible public dissemination of information concerning the registrant. See N.J. STAT. ANN. § 2C:7-6 (West 1995).

<sup>189</sup> These challenges may include procedural due process claims requesting notice and/or a hearing or basic substantive due process claims, arguing that the rules are unreasonable.

the calculations are based on the procedures might be attacked if they were performed under poor or imprecise conditions. Further, the credibility of the scientists would be attacked for bias and interest.

The traditional common law presumed that behavior was volitional, but with genetic discoveries, this presumption likely would no longer be valid. Instead, in a genetically focused system, proof of voluntariness by the prosecution may be required. If a prima facie case of voluntariness is made by the prosecutor, a plethora of newly created defenses should be available to defendants based on genetics. Individuals would claim that their genes caused their behavior, so they should be exonerated from criminal liability.<sup>190</sup> Juries would be forced to evaluate how much of a person's behavior was attributable to genetics – and biological determinism – and how much was volitional. Thus, fact issues would be transposed to center on questions of causation.

### *1. Minimizing Environmental Explanations of Criminal Behavior*

The implications of biological determinism would inevitably spill over into the social sciences. If genetic blameworthiness exists,<sup>191</sup> “[s]cientists’ speculations about genetic influences are interpreted as proof that social problems such as crime and poverty are less the by-products of destructive environments than the result of genetic endowment.”<sup>192</sup> The new genetics rhetoric would minimize the need for “psychological” descriptions of behavior. Thus, most, if not all, social influences would be considered irrelevant. Syndromes such as the rape-trauma syndrome, battered woman's syndrome, battered child syndrome, and post-traumatic stress disorder would be of suspect validity, unless they were found to be genetically based or influenced. New genetically oriented syndromes, on the other hand, may be discovered from the genetics research.

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<sup>190</sup> The use of genetics as a defense to criminal charges generally has been unsuccessful. Evidence of genetic make-up has not been recognized as a valid defense to criminal charges. For example, in *State v. Sikora*, 210 A.2d 193, 198-99 (N.J. 1965), the court held that it was proper to exclude evidence that the accused's genetic composition (coupled with life-long environmental factors) removed the defendant's ability to premeditate the crime.

<sup>191</sup> If genetics are not a cause of criminal behavior, violence must be attributable to free will, environment, and acculturation. See CHARLES E. SILBERMAN, *CRIMINAL VIOLENCE, CRIMINAL JUSTICE* 123 (1978).

<sup>192</sup> Dreyfuss & Nelkin, *supra* note 7, at 320; see also WILSON & HERRNSTEIN, *supra* note 159.



*ii. Scientific Reliability*

The increasing use of expert testimony on various scientific matters already has led to a long battle over what kind of scientific information is admissible at trial. A primary battlefield is whether scientific evidence is sufficiently reliable. Genetic evidence is subject to the same test of reliability as other scientific evidence. The test that governed the admissibility and determined the reliability of novel scientific evidence for several decades resulted from the seminal case of *Frye v. United States*.<sup>193</sup> *Frye* required scientific methodology to "be sufficiently established to have gained general acceptance in the particular field in which it belongs."<sup>194</sup> In 1993, the Supreme Court held in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*<sup>195</sup> that the *Frye* test had been superseded by the adoption of the Federal Rules of Evidence,<sup>196</sup> paving the way for a more flexible approach to admissibility. Factors such as peer review, the testable nature of the techniques, and the risk of error are now significant in determining the reliability of the scientific evidence.<sup>197</sup> Peer review of scientific methodologies is "the most accessible and often most dependable element of the process of invention, validation, and refinement by which scientific knowledge advances."<sup>198</sup> Instead of resolving all issues of admissibility, *Daubert* merely transformed them. The dispute about what scientific evidence is admissible continues.

#### IV EVALUATING A DETERMINISTICALLY REORDERED CRIMINAL LAW SYSTEM

##### A. Problems with Propensity Determinism

Many problems with propensity determinism exist. These range from practical applications to structural and conceptual conflicts with the criminal law. Some of the more significant issues are discussed below.

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<sup>193</sup> *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

<sup>194</sup> *Id.* at 1014.

<sup>195</sup> *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

<sup>196</sup> *See id.* at 587.

<sup>197</sup> *See id.* at 599.

<sup>198</sup> Bert Black et al., *Science and the Law in the Wake of Daubert: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715, 778 (1994).

### 1. *Overstatement*

The focus on propensity determinism likely will produce a problem with overstatement. Overzealous researchers and observers have announced in recent years that genes have been found to cause bipolar disorder, schizophrenia, alcoholism, and smoking-related lung cancer.<sup>199</sup> These genes, however, were never actually identified, and the announcements about them were premature, at least.

Exaggeration, however, creates more than just false hopes. "By exaggerating the importance of genes, hereditarians try to find simple answers to complicated questions. But the interactions and transformations that go on inside us, and between us and our environment, are too complex to be forced into simplistic patterns."<sup>200</sup> This mythic importance of genes creates the new eugenics that focuses again on heredity and minimizes, even trivializes, the environment. Heredity is being used politically to explain and affirm differential treatment of the sexes and other groups, and to legitimize social hierarchies and discrimination.<sup>201</sup>

The use of chromosomal abnormality within the criminal justice system to explain violent behavior, for example, has had a checkered past.<sup>202</sup> In particular, the extra Y chromosome in XYY males was believed by some researchers in the 1960s to indicate aggressiveness and violence. This chromosomal variance is relatively rare but was found to occur more often in institutionalized men.<sup>203</sup> The studies suggested that XYY males were more aggressive than males lacking the extra Y chromosome.<sup>204</sup> Yet, the studies were revealed to be "bad science" because of inadequate numbers of such males, and were eventually repudiated. Because no reliable causal link was demonstrated between the XYY chromosomal

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<sup>199</sup> See Hubbard & Wald, *supra* note 165, at 185.

<sup>200</sup> *Id.* at 185-86.

<sup>201</sup> See *id.* at 185.

<sup>202</sup> See Deborah W. Denno, *Gender, Crime, and the Criminal Law Defenses*, 85 J. CRIM. L. & CRIMINOLOGY 80, 126 (1994) [hereinafter Denno, *Gender, Crime, and the Criminal Law Defenses*].

<sup>203</sup> See Patricia A. Jacobs et al., *Aggressive Behaviour, Mental Sub-normality and the XYY Male*, 208 NATURE 1351, 1352 (1965) (stating that "the finding that 3.5 per cent of the population [of institutionalized men] were XYY males must represent a marked increase in frequency by comparison with the frequency of such males at birth.").

<sup>204</sup> See *id.* at 1351.

make-up and criminal behavior,<sup>205</sup> such evidence was routinely barred from trial.<sup>206</sup>

## 2. *Disutility*

Propensity determinism would support “[p]olicymakers and theorists [who] increasingly enlist biology to explain social problems, thereby dismissing the need for social change”<sup>207</sup> and give “proof” to proponents of biological determinism, who previously suggested that traits such as dangerousness, mental illness, aggressiveness, and even shyness are genetically determined.<sup>208</sup> Researchers have gone so far as to say that social programs designed to assist in overcoming poverty and other social ills would be futile given that the current hierarchical social strata may be attributable to genetic causes.<sup>209</sup> No longer would the criminal law be “‘a practical, normative science which, while it draws upon the empirical sciences, [is designed to] pass judgment on human conduct.’”<sup>210</sup>

The use of scientific evidence and theory about genetics would promote inefficient short-cuts of several kinds. Eventually, these short-cuts would stimulate the recreation of discretionary, moral approaches to the criminal law. Scientific analysis has credibility with the public because it is reproducible, predictable, and apparently objective. Great deference has

<sup>205</sup> Cf. Peter T. Farrell, *The XYY Syndrome in Criminal Law: An Introduction*, 44 ST. JOHN'S L. REV. 217, 218 (1969) (asserting that the relevance of the syndrome to an insanity defense “should not be opened to serious dispute”); David Skeen, *The Genetically Defective Offender*, 9 WM. MITCHELL L. REV. 217, 263-65 (1983) (arguing that genetic abnormality is relevant to prove retardation rather than an aggressive character).

<sup>206</sup> See *People v. Tanner*, 91 Cal. Rptr. 656 (Ct. App. 1970) (affirming the exclusion of XYY Syndrome evidence offered to establish an insanity defense); *People v. Yukl*, 372 N.Y.S.2d 313, 319 (Sup. Ct. 1975) (barring genetic information about chromosomal abnormalities unless “one establishes with a high degree of medical certainty an etiological relationship between the defendant’s mental capacity and the genetic syndrome”); Denno, *Gender, Crime, and the Criminal Law Defenses*, *supra* note 202, at 80, 126.

<sup>207</sup> Dorothy E. Roberts, *The Genetic Tie*, 62 U. CHI. L. REV. 209, 220 (1995).

<sup>208</sup> See GEORGE P. SMITH II, *THE NEW BIOLOGY: LAW, ETHICS, AND BIOTECHNOLOGY* (1989); Dreyfuss & Nelkin, *supra* note 7, at 314.

<sup>209</sup> See HERNSTEIN & MURRAY, *supra* note 21.

<sup>210</sup> Moore, *supra* note 123, at 1122 (quoting HALL, *supra* note 158, at 455) (citations omitted).

been accorded to the scientific method and the scientists who perform it.<sup>211</sup> Yet simply because science can offer an answer to a question does not mean it is the “right” answer. This is especially true in the context of the criminal justice system, where the centerpiece of “justice” has not been reducible to quantitative analysis in the past. While the public may desire formulaic and quick answers to questions about facts and guilt, attempts to generalize scientific evidence may be problematic on several levels. Scientists may be prematurely pressured to produce or generalize their findings, particularly if their research is the subject of considerable publicity. Further, scientific studies often are not ready for generalization. For example, the results of the publicized studies of the benefits of eating oat bran and the relationship of criminality to a XYY chromosomal make-up were far from proven fact, but were treated as such.<sup>212</sup> The early studies of the XYY chromosome, for example, which linked criminality to a person’s genes, were not representative of the entire population and contained significant bias due to the small samples used. Later XYY studies that attempted to correct these defects still fell short of scientific validity and were discredited.<sup>213</sup> The broad publicity attendant to the discovery that a mutation in the gene for MAOA might cause aggressive and even violent behavior in males was based on a study of a single Dutch family.<sup>214</sup> Yet, the thirst for a simple and clear explanation for behavior drove the extensive publicity and testimonials about the discovery. Thus, public pressure to adopt and generalize scientific studies, including genetic studies, has backfired in the past, and likely would do so in the future.

Another significant “side-effect” of the deterministic focus would involve distractions and delays in the attempt to remedy important social problems.<sup>215</sup> While the criminal justice system has served to prompt legislators and others to confront such social problems as juvenile delinquency, mental illness, and homelessness, that function effectively would lie fallow in a genetically reordered system. These problems would accumulate until politicians and others recognized that even genetically caused behavior needs social treatment, leading once again to social input on questions of free will, defenses, and treatment.

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<sup>211</sup> See DuFault, *supra* note 22, at 242.

<sup>212</sup> See, e.g., Jeffrey F. Ghent, Annotation, *XYY Syndrome as Affecting Criminal Responsibility*, 42 A.L.R. 3d 1414, 1415 (1972); *Question of Y*, TIME, Oct. 25, 1968, at 76; *Oats: The Final Word?*, TIME, July 6, 1992, at 21.

<sup>213</sup> See, e.g., Daly & Harlet, *supra* note 137, at 116.

<sup>214</sup> See Beckwith, *supra* note 37, at 1, 2; Morell, *supra* note 16; *supra* notes 138-42 and accompanying text.

<sup>215</sup> See Wertz, *supra* note 187, at 503.

### 3. *Racism and Discrimination*

Propensity determinism could be used to assist those who suffer from violent predispositions. Yet, it might also lend itself to racism and discrimination in several pernicious ways.<sup>216</sup>

#### a. *"Normalcy"*

Assumptions based on biology would lead to a new look at what is "normal" behavior. Rather than setting a standard based on culture and mores, the paradigm would lean toward the chromosomal. With the identification of a "proper" or "representative" genome, all other human genomes could be compared to the model. Such a system based on resemblance "presupposes a primary reference that prescribes and classes."<sup>217</sup> Thus, hierarchies of resemblance would occur, leading inevitably to ranking of genomes and labels such as bad, good, and better. Genetic dissimilarities, not similitude, would be emphasized, and socially derived comparisons would become less pervasive.<sup>218</sup>

#### b. *Trying to Create a Nexus Between Genes and Crime*

The adoption of propensity determinism, particularly a strong rather than a weak version, would resurrect the specter of racism and eugenics. The subject of race, politics, and the causes of crime has been broached in various circles. Books like *The Bell Curve: Intelligence and Class Structure in American Life*<sup>219</sup> have advanced genetic explanations for racial disparities in the incidence of crime, inflaming the debate. Even the decision to discuss the topic in academia has created controversy.<sup>220</sup> In

<sup>216</sup> See Price-Huish, *supra* note 88, at 603.

<sup>217</sup> MICHEL FOUCAULT, THIS IS NOT A PIPE 44 (James Harkness ed. & trans., 1982). Michel Foucault compares resemblance to similitude, where there is no set hierarchy involving a correct model, just comparisons of similarities and differences. *See id.*

<sup>218</sup> *See id.* (stating that in comparison to resemblance, "[t]he similar develops in series that have neither beginning nor end, that can be followed in one direction as easily as in another, that obey no hierarchy, but propagate themselves from small differences among small differences.").

<sup>219</sup> HERRNSTEIN & MURRAY, *supra* note 21.

<sup>220</sup> One commentator has stated:

I am persuaded by the radical critique when I wonder about the roots of the ugly truth that blacks commit many crimes at substantially higher rates than

1992, the National Institute of Health withdrew funding for an academic conference entitled *Genetic Factors in Crime: Findings, Uses and Implications*. The official reason for the withdrawal was that the project was biased in favor of finding some relationship between crime and genetics.<sup>221</sup> Unofficially, the conference was criticized for having “perpetuated racist misconceptions and embodied either a ‘politically-fueled revival of the discredited theories of eugenics’ or ‘reductionism gone wild.’”<sup>222</sup>

The alleged nexus appears to offer an invitation to discriminate and to stereotype “genetic minorities.” The mere creation of criminally suspect groups has several damaging consequences in addition to the obviously improper criminal “class system” that would develop. Such a biological approach would lead to the failure to closely scrutinize environmental factors such as child-rearing practices, schooling, and cultural influences, and may even overlook differences in genes – from mutations to latency to interactive questions – within the labeled group. As a senior fellow at The Hoover Institution recently noted, even “within every race, there are genetic differences among individuals and families.”<sup>223</sup> Extrapolation of any genetic information may include biases and prejudices, rendering “objective” genetic information “subjective.”

Consequently, the potential for the abuse of such information would be high. The bases for propensity determinism, allegedly supported by science, could lead to permanent and unshakable beliefs about dispositions and traits previously thought to be changeable and alterable. If this occurs, the genetic basis for such characterizations would end up serving as a subterfuge for insidious discrimination.

Useful parallels exist. According to one study, discrimination based on predisposition to disease already has occurred in both the employment and insurance contexts.<sup>224</sup> The study asked questions of 322 members of genetic support groups about how their genetic disorders affected their lives. Of this group, twenty-two percent believed that they had been denied health

whites. Most white Americans, especially liberals, would publicly offer an environmental, as opposed to genetic, explanation for this fact. They would probably concede that racism, historical and current, plays a major role in creating an environment that breeds criminal conduct.

Paul Butler, *Racially Based Jury Nullification: Black Power in the Criminal Justice System*, 105 YALE L.J. 677, 694 (1995).

<sup>221</sup> See Lois Shepherd, *Sophie's Choices: Medical and Legal Responses to Suffering*, 72 NOTRE DAME L. REV. 103, 128 n.139 (1996).

<sup>222</sup> *Id.* (quoting Coffey, *supra* note 25, at 355).

<sup>223</sup> Thomas Sowell, *Ability and Biology*, NEWSWEEK, Sept. 8, 1997, at 14.

<sup>224</sup> See Lapham et al., *supra* note 79, at 621.

insurance because of their condition and thirteen percent believed that their disorder kept them from obtaining employment.<sup>225</sup> Although this study was very limited, it does show that genetics can be used as a basis for discrimination in a variety of areas. In addition, the study points out that even if such discrimination is rare, the mere fear of its existence can have some serious negative consequences. Many may choose not to have genetic testing done for fear of unfair treatment or because of fears regarding propensities to engage in "antisocial" conduct, or family histories of the same. If this were to happen, the genetic testing could be a double-edged sword.

An individual inclined to crime because of his or her genes could be tracked by methods similar to the current computer software programs police use to track arrest and bench warrants, criminal records, stolen cars, and the like. The genetic basis for the grouping would suggest that the organizational scheme is objective, without human biases and prejudice. Yet, the selection of individuals for tracking and investigating would still retain the human element, and there may be a greater degree of reliance on rounding up "the usual (genetic) suspects."<sup>226</sup>

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<sup>225</sup> See *id.*

<sup>226</sup> Perhaps the most popular tracking tool would be the genetic "fingerprint." DNA fingerprinting is probably the most publicized current use of genetics in the criminal law. This technique, which is admissible in many jurisdictions, is a way of obtaining information from the tiny amounts of biological material that are almost always left behind at the scene of a crime: a few hairs, a drop of blood, some semen, even skin cells from under the fingernails of a victim. [W]hile real fingerprints are unique to each individual, there is a small possibility that two people can have – or appear to have – the same DNA fingerprint. This possibility increases if the material left at the scene is difficult to work with, or if there is not enough of it to extract much information.

WILLS, *supra* note 44, at 166.

DNA profiling occurs when one sample is compared to another to determine whether the two samples match. The most common method of obtaining a sample has been through blood analysis. Recent research has shown, however, that DNA can be detected on items people touch, such as car doors, keys, or telephones. See *DNA Found on Pens, Keys, Phones Can Be Traced to People*, THE MISSOULIAN (Missoula, Mt.), June 19, 1997, at A12. This discovery allows scientists to trace DNA remnants to criminal suspects. Furthermore, the researchers learned that a person's DNA could be picked up by others' hands, leading to easier DNA identification and misidentification at the same time. See *id.*

DNA profiling has also been used in other countries. In England, it has been used to facilitate criminal convictions since the 1980s. See Denise A. Filocoma, *Unraveling the DNA Controversy: People v. Wesley, a Step in the Right Direction*,

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3 J.L. & POL'Y 537, 567 n.18 (1995). The most widely used DNA test is the restriction fragment length polymorphism ("RFLP") test. The other test used is the PCR test. Both tests focus on genetic band patterns that can be compared to a known sample. These tests have been criticized, however. Interpreting the bands is difficult since "they are often blurry and difficult to read." Paul B. Tyler, *The Kelly-Frye "General Acceptance" Standard Remains the Rule for Admissibility of Novel Scientific Evidence: People v. Leahy*, 22 PEPP. L. REV. 1274, 1292 (1995).

DNA fingerprinting is often used by prosecutors or defense attorneys in establishing the guilt or innocence of a defendant accused of a crime. This most often occurs in sexual batteries. For example, in March 1990, a conviction was overturned because genetic fingerprinting showed that the defendant was not the perpetrator. *See* WILLS, *supra* note 44, at 166.

DNA evidence often relies on the "product rule" for determining the likelihood of a match. When the product rule is used, a population data base is used for a particular allele, which is a specific genetic characteristic. The frequency in the population of that characteristic "is multiplied to produce the frequency of the combination of all alleles found. The validity of [this rule] rests on the assumption that the population does not contain sub-populations with the distinct allele frequencies, and thus each individual's alleles comprise statistically independent random selections from a common gene pool." Peter A. Talieri, *Case Comment*, 29 SUFFOLK U. L. REV. 357, 359 n.16 (1995) (citations omitted).

One significant problem with DNA evidence is the lack of standardization in laboratories that analyze and examine the DNA. This was readily apparent in the O.J. Simpson criminal trial, where the FBI crime lab came under fire for poor procedures. Similarly, problems with the functioning of the FBI laboratory were discovered as it tested evidence relating to the Oklahoma City bombing. Testing procedures are of great concern to courts. For example, in one case the United States Court of Appeals for the Eighth Circuit held that the trial court must determine whether testing procedures were performed properly before admitting any samples of DNA from that laboratory. *See* *United States v. Two Bulls*, 918 F.2d 56, 61 (8th Cir. 1990), *appeal dismissed*, 925 F.2d 1127 (1991). Once admitted, an expert witness could describe the variations in DNA, called polymorphisms, that make the DNA unique. Each person's DNA is different from every other person's DNA, with the exception of identical twins.

In the reordered system, DNA fingerprinting would occur as a matter of course, and the procedures used in the testing would be more difficult to challenge given the frequency of use and the probable standardization of methods. DNA data would still be challenged on statistical grounds, given that the fingerprinting does not provide an absolute identification. However, this undoubtedly would not deter prosecutors, jurors, and the public from relying on the information. Thus, several important by-products might result. For example, trials would appear to become scientific endeavors, dominated by scientific witnesses and terminology. Jurors might defer to these experts more than they already defer to experts and would perhaps even abdicate their responsibility to review the evidence and determine the



#### 4. *Flaws in the Genetic Theory and Application*

In a genetically reordered criminal justice system, there would, of course, be flaws in genetics-based theories and their application. Exceptions to the general rule of determinism would recognize the limitations of genes to control and predict behavior.<sup>227</sup> Even with the new genetics, it would be difficult to prove that a causal relationship exists between genetic composition and a specific behavior. The belief that there is a particular genomic sequence of all human beings is erroneous. Professor Richard Lewontin of Harvard University states:

While the talk is of sequencing *the* human genome, every human genome differs from every other. The DNA I got from my mother differs by about one tenth of one percent from the DNA I got from my father, and I differ by about that much from any other human being. The final catalogue of “the” human DNA sequence will be a mosaic of some hypothetical average person corresponding to no one.<sup>228</sup>

Furthermore, genetics technology would likely continue to revolve around monogenetic diseases – those caused by a single defective gene.<sup>229</sup> However, isolating genetic causes oversimplifies complex questions of cause and effect, and distorts proper remedies.<sup>230</sup> Many diseases and

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facts. Most significantly, eyewitness testimony may be accorded less importance, particularly if DNA evidence offers fewer doubts about its accuracy. Individuals who proclaim their innocence, and even those who offer their guilt, can be tested almost immediately to avoid miscarriages of justice. DNA identification cards may be developed along with “genetic propensity” cards and may be as common as Social Security numbers in identification endeavors.

<sup>227</sup> There are two main objections to using genetic predisposition or aberrations as a basis for a defense to criminal charges. These objections involve a lack of scientific proof and a lack of causation between any alleged genetic structure and the particular behavior in question. *See Coffey, supra* note 25, at 389. The possibility of abuse is based on past experience in the 1960s and 70s, when studies attempted to link “XYY Syndrome” with criminal behavior. The correlations, however, soon were “abandoned or discredited.” *Burk & Hess, supra* note 112, at 14.

<sup>228</sup> R. C. LEWONTIN, *BIOLOGY AS IDEOLOGY: THE DOCTRINE OF DNA* 68 (1992) (emphasis added).

<sup>229</sup> *See* Charles C. Mann, *Behavioral Genetics in Transition*, 264 *SCIENCE* 1686, 1688 (1994). Monogenetic diseases include Huntington’s disease and sickle-cell anemia. *See id.*

<sup>230</sup> *See* Ruth Hubbard, *Predictive Genetics and the Construction of the Healthy*

behavioral traits are the result of multiple genes and the way in which they interact.<sup>231</sup> Consequently, these diseases and traits would not fit neatly into a genetically reordered system, but would rather be the subject of considerable disagreement over their causes. Some forms of schizophrenia, for example, may be genetically based, while other forms are not genetically linked.<sup>232</sup> Likewise, scientists now believe there are more than ten genes influencing cholesterol metabolism.<sup>233</sup> Even genes that appear in a regular and predictable pattern, such as the "cystic fibrosis gene," interact with other genes in a unique matter and preclude easy prediction.<sup>234</sup> Thus, predicting behavior depends in effect on systems theory, and how the genes will operate as a group.

In addition, intervening factors, including environmental ones, may also be contributing causes of certain diseases or traits. Perhaps the most widely accepted environmental influence on genetic predispositions is the impact of a high fat diet and a lack of exercise on a person's cholesterol level.<sup>235</sup> The same is true for mental disorders. Ironically, greater understanding about the genes that could cause schizophrenia may allow scientists to correlatively learn more about the relationship between these genes and the environmental factors with which they interact.<sup>236</sup>

In a different vein, even when some genetic cause could be hypothesized, the scientific methodology used may be suspect. This is because the results are only as good as the scientists performing the tests and data analysis. Studies that are based on a limited sample or are insufficiently controlled should not be considered reliable<sup>237</sup> in a court of law or other contexts. Valid studies, moreover, sometimes yield inconsistent results, some finding correlations and others finding none.<sup>238</sup>

In light of these deficiencies, the tendency to generalize scientific findings and jump on the "science/genetics bandwagon" may quickly

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III, 27 SUFFOLK U. L. REV 1209, 1213 (1993).

<sup>231</sup> See Mann, *supra* note 229, at 1688.

<sup>232</sup> See Alex Robinson, *The Ethics of Gene Research*, 150 CANADIAN MED. ASS'N J. 721, 724 (1994).

<sup>233</sup> See *id.* at 723.

<sup>234</sup> See Hubbard & Wald, *supra* note 165, at 186.

<sup>235</sup> See, e.g., David Brand, *Take a Walk on the Well Side; How You Can Eat, Drink and Jog Yourself to Healthier Cholesterol Counts*, TIME, Dec. 12, 1988, at 68.

<sup>236</sup> See Anne Farmer & Michael J. Owen, *Genomics: The Next Psychiatric Revolution?*, 169 BRIT. J. PSYCHIATRY 135, 136 (1996).

<sup>237</sup> See Denno, *Gender, Crime, and the Criminal Law Defenses*, *supra* note 202, at 128.

<sup>238</sup> See, e.g., *id.*

backfire. If flaws appear in the genetic foundations of the criminal law, the public's confidence in the system may indeed be undermined.

### 5. *Mutations*

Mutations in genes regularly occur as a matter of evolution. In an average person, approximately five to ten percent of genes are mutations. The impact of these mutations on a person's behavior may vary considerably. For example, the gene found to cause cystic fibrosis is a recessive disorder that has more than 250,000 DNA letters.<sup>239</sup> It is a monogenetic defect present in one of every 2000 Caucasians.<sup>240</sup> Yet, possessing the gene does not necessarily mean a person will develop cystic fibrosis, since more than 350,000 mutations in this gene have been discovered. Thus, "mutations defenses" would be raised regularly in response to genetic predisposition evidence, with the result being a battle of the experts and a comparison of conflicting studies. Jurors - and even the experts - may have difficulty evaluating the data and may resort to a common sense, experiential analysis with which they are comfortable.

### 6. *The Latency of Genes*

Even if genes have not mutated, their effect may be muted as a result of being latent. Latent genes do not actually operate. Rather, they serve as genetic red herrings. The latency problem has arisen in attempts to localize a gene for diabetes. The metabolic disturbances caused by diabetes can be divided into two types, those that appear often during adolescence and those that gradually arise in middle age. The stimuli for these diabetes types appear to be quite different, and why, in this context, some genes are latent and others are not is unknown.<sup>241</sup>

### 7 *Administrability Problems*

Even assuming the existence of a competent genetic theory and application, numerous questions of administrability would arise and destabilize the new system. The most significant issue would be when and to what extent propensity determinism should be recognized as a full-fledged cause of behavior. If determinism is interactive and a matter of degree, this

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<sup>239</sup> See Thompson, *supra* note 76, at 57

<sup>240</sup> See Rommens et al., *supra* note 47, at 1059.

<sup>241</sup> The adult onset of diabetes, for example, may be tested perhaps with genetic and protein tests to detect predispositions.

recognition would keep shifting as new information is discovered and old information is discredited. A second administrability problem would call into question the very meaning of genetic defenses. If a genetic predisposition served as a complete defense, that may mean the person would effectively be given permission to engage in criminal behavior in the future. Further, even if genes "caused" a person's criminal behavior, the legal system might not be able to distinguish under which circumstances a person's conduct should be excused partially or completely. This might prove to be the slippery slope that leads to a total degeneration of an objective, genetics-based criminal law conception of individual responsibility and blameworthiness.<sup>242</sup> In effect, the moral component may have become too entrenched, and too appropriate, for it to be shelved completely.

Another situation is illustrative. Alcoholics who drive and then become unconscious, and epileptics who drive and then have a seizure, are both considered to be criminally responsible for the resulting accident, if it causes injury to another, through an expansion of the time line of responsibility. The alcoholic who is unconscious or the epileptic having a seizure is not at that moment acting with free will. However, the exercise of free will is not judged at the moment of the accident, but rather at the time the negligent decision to drive was made. The same analysis could be applied to individuals who know they have, or should know they have, certain genetic propensities. These persons could be held responsible for their behavior.

The more difficult question would be how to treat persons who have no prior knowledge about their genetic propensities. Applying Packer's "as if" approach to presume the existence of free will<sup>243</sup> would be a particularly transparent fabrication as more and more knowledge about genetics became available. Administering gradations of responsibility and creating predictable categories of excuse and responsibility would be extremely difficult. Even if some genetic exceptions could be identified, a serious question would remain – how to treat them. Perhaps some genetic traits would give rise to the equivalent of a diminished capacity partial defense. This question of administrability would undermine attempts to provide partial defenses, as well as create a cottage industry of experts identifying and explaining the affect of genetics on behavior.

### 8. *The Public Backlash*

Even an administrable genetically reordered criminal justice system likely would suffer from a backlash. Unrealistic expectations by the public

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<sup>242</sup> See generally Bruce J. Winick, *Ambiguities in the Legal Meaning and Significance of Mental Illness*, 1 PSYCHOL. PUB. POL'Y & L. 534, 597 (1995).

<sup>243</sup> See Moore, *supra* note 123, at 1122.

would be vetted by some scientists making unsupported claims and others who expose such claims.<sup>244</sup> Conversely, public outrage may be kindled by the commission of morally reprehensible acts by individuals who are excused due to genetic defenses.<sup>245</sup> These occurrences are likely to foster a revival of the social construction of the criminal law.

Public reaction would demand increasing scrutiny of the processes used by labs in their genetic research,<sup>246</sup> including DNA research. While convictions have been overturned based on DNA testing, the trend is for prosecutors to proceed with a case despite DNA tests that indicate the accused did not commit the crime charged.<sup>247</sup> Some prosecutors deny DNA tests are dispositive of guilt or innocence, especially since the science is still evolving and not fully understood.<sup>248</sup>

Additionally, just as the backlash after the John Hinckley trial triggered a reworking of the insanity defense in many jurisdictions, so too would the acquittal of a person charged with a particularly heinous crime based on a genetics defense or the conviction of a person with a high propensity to violence who later was shown to be innocent. The reworking would involve a narrowing of the genetic attribution of criminal behavior.

This backlash would increase the level of skepticism surrounding the use of statistical probabilities to predict behavior, and provoke a renewed examination of environmental variables or simply a greater adherence to a belief in free will. The most explosive area in the free will debate, however, may involve "the alcohol factor." Scientists have found that the risk of alcoholism is linked to genetic make-up, and that some individuals, "because of inherited factors, are biologically and behaviorally different from individuals who have few or no inherited factors that predispose them to alcoholism."<sup>249</sup> Instead of excusing or even explaining criminal conduct

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<sup>244</sup> The public may not understand that even scientific discoveries evolve over time.

<sup>245</sup> Similarly, the public was outraged by the case of the Menendez brothers, who killed their parents and claimed it was attributable to years of abuse. *See, e.g.*, Elizabeth Gleick, *Second Time Around*, TIME, Oct. 23, 1995, at 90.

<sup>246</sup> This was the strategy used in the trial of O.J. Simpson. *See, e.g.*, Leon Jaroff, *Order in the Lab! As the Judge Sets a Date for the Simpson Trial, Lawyers Wrangle Over the DNA Tests That Could Seal O.J.'s Fate*, TIME, Aug. 8, 1994, at 46.

<sup>247</sup> *See, e.g.*, Richard Willing, *Va. Death-Row Case Illustrates New Approach to DNA Evidence*, USA TODAY, July 28, 1997, at 4a.

<sup>248</sup> *See id.*

<sup>249</sup> Kenneth Blum et al., *Allelic Association of Human Dopamine D<sub>2</sub> Receptor Gene in Alcoholism*, 263 JAMA 2055, 2056 (1990). The study found that "the dopamine D<sub>2</sub> receptor gene is significantly associated with alcoholism." *Id.* at 2055.

caused or promoted by the consumption of alcohol, society's intolerance with alcohol-related conduct may spur a revised responsibility for avoiding the first drink, thereby reintroducing free will even though part of the conduct may be "genetically involuntary"

*a. Choice and the Law*

Another ground for the backlash would be the antidemocratic nature of strong determinism, which effectively takes out of the jury's – and consequently the public's – hands, the decision of guilt or innocence. The jury system is predicated on the representatives of the public passing judgment on behalf of the community. The more deterministic the system, the less of a role the jury plays in assessing blameworthiness.

Diminishing the importance of the jury's role might correspondingly diminish the stability and public acceptance of the jury system. If the public loses faith in the system, the system will lose its effectiveness.

*9. Structural Deficiencies – How We "Ought" to Behave*

In *Regina v. Dudley & Stephens*,<sup>250</sup> the defendants were stranded on a life boat in the middle of the ocean without any hope of rescue when they killed a third person for sustenance. Upon their chance rescue, they were charged with and convicted of murder. The rationale for this controversial decision was that the criminal law was designed to promote how members of society ought to behave, and not how they do behave.<sup>251</sup> This same rationale underlies the current social construction of the criminal law. The moral baseline is drawn where society ought to behave, not where most people behave in reality. Thus, even a genetic predisposition may not be enough to overcome the deeply embedded "ought to act" requirement.

Extending this line of argument, humans were cannibals at one time in history, and there probably can be found genes that still support such behavior. Yet, historical behavior, even the likelihood of current behavior under particular circumstances – such as being stranded in a lifeboat or a plane wreck – will not serve as an excuse under the criminal law. In essence, the support for many kinds of behaviors can and will be found in the genes, but a correlation does not mean that the genes should be considered the legal cause of the behavior.

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<sup>250</sup> *Regina v. Dudley & Stephens*, 14 Q.B.D. 273 (1884). This English case is the classic illustration of the homicide exception to the necessity defense, and is used in most criminal law classes.

<sup>251</sup> See *id.* at 288.

B. *Problems with the Subsidiary Effects of Determinism*<sup>252</sup>

1. *Problems with Genetic Predictions of Dangerousness*

One problem with genetically based predictions of dangerousness lies in the use of statistical possibilities as predictive tools. A mere possibility

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<sup>252</sup> There are various types of privacy issues that arise from a genetics-enhanced system. One involves screening. Individuals can be screened for carrying particular diseases or defects such as cancer or heart disease. The screening can be of the general population, in the workplace, or in other particular environments. Such screening, however, may invade a person's constitutional or statutory right to privacy, and courts likely will be faced with exploring the extent to which privacy rights attach to a person's genetic code.

At what point does the nonconsensual genetic testing of an accused or a victim violate his or her constitutional rights? While cases such as *Schmerber v. California*, 384 U.S. 757 (1966), permit the extraction of blood from an accused – as well as hair, handwriting, and voice samples – so long as the extraction is not unduly invasive, there may be a point at which the extraction of information violates the individual's right to privacy and Fourth Amendment right against unreasonable searches and seizures.

To create a cohesive response to the increasing demand for and use of genetic information, the House of Representatives proposed the Genetic Privacy and Nondiscrimination Act, H.R. 2198, 105<sup>th</sup> Cong. (1997). The Act protects against the unauthorized disclosure and use of genetic information by an individual's health insurance plan or employer. *See id.* §§ 2(a), 3(a).

States have enacted laws granting individuals property rights in their own genetic information. *See, e.g.*, OR. REV. STAT. § 659.710 (1996); Michael M.J. Lin, Note, *Conferring a Federal Property Right in Genetic Material: Stepping Into the Future with the Genetic Privacy Act*, 22 AM. J.L. & MED. 109 (1996). The impact of such property rights is that they provide limits on how others may acquire and use such information. *See id.* at 124. One exception involves the criminal process, where the information may be necessary for fair proceedings.

Genetic data bases are but one kind of population-wide data base. One specific genetic data base, for example, is the Guthrie spot program, where dry blood spots from newborns are taken and stored. *See* Lawrence O. Gostin, *Health Information Privacy*, 80 CORNELL L. REV. 451, 468 (1995). These spots can be readily stored for several years, and if frozen have an indefinite shelf life. *See id.* These data bases are established by a wide variety of groups, from government agencies to private consortiums or philanthropic organizations. *See id.*

Many states have enacted laws providing for the collection of DNA samples from individuals convicted of serious crimes. *See id.* The laws either permit or require certain convicted offenders, ranging from sexual offenders to all convicted felons, to provide a blood or saliva sample. *See* Yee, *supra* note 40, at 474. This collected DNA data is to be used to solve crimes, especially sexual offenses, where DNA fingerprint evidence is often used. *See id.* at 461. Such DNA evidence is also referred to as DNA "typing" or "profiling" evidence. *See id.*

There are concerns that the Fourth Amendment may be violated by the involuntary seizure of blood or saliva for the purpose of investigating future crimes. If such collection occurs, the state agency controlling such information might not appropriately safeguard the privacy interest that attaches to the information. The agency could deny access to third parties outside of the criminal justice system. Information obtained from the samples may be used in a manner exceeding the scope of law enforcement and extending to a search for other genetic characteristics such as predisposition to disease. *See id.* at 475.

The Fourth Amendment prohibits unreasonable search and seizure. The fact that an inmate has been convicted does not necessarily mean that he or she will commit a crime again in the future. In fact, the opposite conclusion can be reached if an inmate is incarcerated, because there will not be any crimes committed by him or her in society during the period of incarceration. Further, if the information from the seized blood or saliva is used to determine whether the inmate committed other crimes that are the subject of current investigations, unless there are other bases for such belief, the possibility of ties to other crimes is extremely speculative and does not meet probable cause standards.

The Fourth Circuit dealt with such issues in *Jones v. Murray*, 962 F.2d 302 (4th Cir. 1992). Several inmates challenged a Virginia law requiring all sex offenders to provide blood samples to be deposited in a DNA data bank. The law applied to offenders convicted after July 1, 1990. The inmates claimed the law violated their Fourth and Fourteenth Amendment rights. *See id.* at 303. Armed with statistics, the State countered that the recidivism rates were very high and that “[a]n estimated 22.7% of all prisoners were rearrested for a violent offense within 3 years of their release.” *See id.* at 306 (quoting ALLEN J. BECK & BERNARD E. SHIPLEY, U.S. DEP’T OF JUSTICE, *RECIDIVISM OF PRISONERS IN 1983* 1 (1989)). The court held that while the Fourth Amendment applied to the extraction of blood under the circumstances, a person’s privacy rights lessened upon lawful arrest and detention, and that the State had a legitimate interest in pursuing the identification of suspects. *See id.* The court stated, “As with fingerprinting, the Fourth Amendment does not require an additional finding of individualized suspicion before blood can be taken from incarcerated felons for the purpose of identifying them.” *Id.* at 306-07. The improvement in law enforcement, according to the court, outweighed the intrusion caused by taking the blood sample. *See id.* at 307.

Thus, the court analogized the DNA bank to fingerprint records. Fingerprint records, however, only contain information used to identify an individual. On the other hand, DNA information is much broader and significant in many contexts, such as employment, health, and family. As more genetic discoveries are made, the breadth and invasiveness of genetic information will increase. Questions about which information may be gathered – and under what circumstances – would likely result in the creation of a new area of the law. Questions about the right of access would proliferate. *See Barbara B. Ott, The Human Genome Project: An Overview of Ethical Issues and Public Policy Concerns*, 43 *NURSING OUTLOOK* 228, 229-31 (Sept./Oct. 1995).



is not a certainty and it has always been the deep-rooted policy of the criminal justice system that broad predictions must be supported by more than just probability evidence. In *People v. Collins*,<sup>253</sup> for example, the California Supreme Court held that probability evidence was inadmissible because of numerous flaws, including its method of calculation, its aura of correctness, and perhaps most importantly, its misstating of the crucial question, who committed the crime, as who was most likely to have committed the crime.<sup>254</sup> Thus, while the statistics may be valid in the realm of mathematics, they may not be as useful case-by-case in the legal system. A woman who underwent genetic counseling during her pregnancy is instructive in her condemnation of the use of statistics in individual cases:

“Now, I’m not even allowed to pet my cat, or have a glass of wine after a hard day’s work. I’m supposed to think that three cigarettes a day is what first caused my first miscarriage. They can see a lot of patterns, but they sure can’t explain them. But they talk as if they could explain them. I mean, they want you to have a baby by the statistics, not from your own lifestyle.”<sup>255</sup>

Even if genetic markers are not dispositive of dangerousness, they may soon reach the point where they are reliable enough to be considered relevant. Whether a judge or jury can make such a distinction in the evidence, however, remains a significant question. Further, assuming that a propensity for dangerousness can be identified and catalogued, it must be further assumed that an isolated gene’s activity is not affected by other genes. This has not and likely will not be proven true, thereby weakening predictability. To the contrary, it appears that genes act in concert and are affected by other genes and environmental factors.

## 2. *Problems with Genetic Defenses*

If genetic defenses are allowed, the question of when genetic evidence is sufficiently reliable to present to the jury will arise. No mechanical standard would exist, and precedent would probably support many different outcomes.

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<sup>253</sup> *People v. Collins*, 438 P.2d 33 (Cal. 1968).

<sup>254</sup> *See id.* at 38.

<sup>255</sup> Julia E. Hanigsberg, *Homologizing Pregnancy and Motherhood: A Consideration of Abortion*, 94 MICH. L. REV. 371, 392 n.91 (1995) (quoting Rayna Rapp, *Constructing Amniocentesis*, in UNCERTAIN TERMS: NEGOTIATING GENDER IN AMERICAN CULTURE 28, 38-39 (Faye Ginsburg & Anna Lowenhaupt Tsing eds., 1990)).

This issue would be approached by courts under the parameters of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*<sup>256</sup> or the state equivalent.

This issue was confronted by one court at the sentencing stage of the case. The Georgia case involved a defendant, Stephen Mobley, who was convicted of robbing a pizza store and killing the store manager without provocation.<sup>257</sup> At trial, the jury recommended the death penalty, and the defendant was sentenced to death.<sup>258</sup> On appeal, Mobley claimed that the trial court improperly denied his request for money to seek genetic testing, specifically of whether his genes were MAOA-deficient. Mobley was prepared to argue that such a deficiency, coupled with a family history of generations of violent behavior, would have predisposed him to violent tendencies.<sup>259</sup>

Even with the support of some scientific studies of a relationship between genetics and violent behavior,<sup>260</sup> the Georgia Supreme Court affirmed the conviction. The court found that the evidence was insufficiently reliable, failing to reach the requisite level of “verifiable certainty.”<sup>261</sup>

Such evidence, in effect, must pass beyond the speculative stage to truly help the jury. Otherwise, it simply distorts reality, for how a jury is to weigh and assess such information is not within the realm of common experience. Instead, the evidence would feed the genetic mythology – that genes cause and can explain all behavior. Ironically, if a standard was developed to decide how much determinism was necessary to show causality, the standard would likely be socially constructed, that is, it would be no different than the existing determinations of “proof beyond a reasonable doubt” or “unfairly prejudicial.”

### 3. *Problems with Genetics in Sentencing*

Technologies such as germ line gene therapy, in which genetic changes are passed from one generation to the next, are susceptible to abuse. While arguments in favor of germ line gene therapy include an inability to treat patients with alternative somatic cell gene therapy and the belief that generational germ line treatment is more efficient,<sup>262</sup> the potential for “gloom

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<sup>256</sup> *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

<sup>257</sup> *See Mobley v State*, 455 S.E.2d 61, 65 (Ga.), *cert. denied*, 116 S.Ct. 377 (1995).

<sup>258</sup> *See id.*

<sup>259</sup> *See id.* at 65-66.

<sup>260</sup> *See generally* Denno, *Legal Implications of Genetics and Crime Research*, *supra* note 15.

<sup>261</sup> *Mobley*, 455 S.E.2d at 66.

<sup>262</sup> *See* the explanation of LeRoy Walters, Director of the Center for Bioethics

and doom” resulting from such technology has not escaped the attention of those dealing with it. In its report entitled *Human Gene Therapy: A Background Paper*, the U.S. Congress Office of Technology Assessment stated:

Direct manipulation of the genome inspires visions of mankind controlling its own evolution, depleting the diversity of genes in the human population, and crossing species barriers to create new life forms. The magnitude and rapidity of change caused by direct genetic intervention, however, are likely to be far smaller than the large effects caused by relaxing historic selection pressures on the human population through changes in the environment, sanitation, and health care.<sup>263</sup>

*C. Overall Outcome: Social Reconstruction Still Occurs*

With the energizing of exceptions to genetically explained behavior and the growing critical scrutiny of the genetic proof process, the social context would become increasingly relevant to the genetically reordered system.<sup>264</sup> The social context, and the existence of moral blameworthiness (or lack thereof), would be used to contradict genetic predispositions. For example, studies might be offered showing that a person’s environment influences behavior. Such studies would be relevant, and probably admissible, given the general preference in the criminal law for an “even playing field.”

Ironically, the normative issues in the criminal law would remain; only the questions asked would change. It still must be considered whether the accused ought to be morally condemned for what he or she did. Moral blameworthiness eventually would still be the operative building block; it simply would be applied in a different manner. Moreover, while the ultimate arbiter of morals would remain the jury, which would have the power to discard the genetic analysis, the real and unintended moralist at trial often would be the expert geneticist, who, through either direct or cross-examination, would be able to revitalize notions of “good and bad” through testimony about genetic propensities.

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at Georgetown University, providing the general reasons for using germ line gene therapy, in EVE K. NICHOLS, *HUMAN GENE THERAPY* 164 (1988).

<sup>263</sup> OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, *HUMAN GENE THERAPY: A BACKGROUND PAPER* 31 (1984).

<sup>264</sup> It may become relevant, however, in a different context than that of the current system, and that is to rebut the presumption of genetic control of behavior.

In effect, genetic information would not be able to describe human conduct – at least not to a level satisfactory for the assignment of blame. As was discovered in the field of genetics research, even pea plants with “tall” genes may end up being short if they are inadequately nourished.<sup>265</sup> Environmental factors thus are crucial to understanding “the truth.” Perhaps the real difficulty with using genetics as the basis of a system of normalcy is the likelihood that the new reordering would be used covertly to achieve a secret social agenda, such as discrimination. For example, genetic testing might occur to confirm exclusions or sanctions not justifiable on other grounds. If genetic “defects” are discovered, this would permit a broader label of defective and in effect, a resurrection of eugenics. This line of thinking is not as unlikely as it sounds. In 1971, Bentley Glass, then the president of the American Association for the Advancement of Science, stated:

In a world where each pair must be limited, on the average, to two offspring and no more, the right that must become paramount is the right of every child to be born with a sound physical and mental constitution, based on a sound genotype. No parent will in that future time have a right to burden society with a malformed or mentally incompetent child.<sup>266</sup>

It is this kind of thinking that would allow advancements in genetics to manipulate the criminal justice system. Unless genetic predispositions are much better understood, and determination is not based on mere probabilities in an overall population,<sup>267</sup> which would considerably undermine longstanding historical conceptions, the Human Genome Project should not be adapted to the criminal law without careful scrutiny. Its value is not as a replacement for the current system.

## V RESPONSES: DEALING WITH THE ALLURE OF GENETICS

Generally, the numerous discoveries of the Human Genome Initiative have been warmly received by both the public at large and the criminal law

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<sup>265</sup> See Hubbard & Wald, *supra* note 165, at 186.

<sup>266</sup> Bentley Glass, *Science: Endless Horizons or Golden Age?*, 171 SCIENCE 23, 28 (1971).

<sup>267</sup> A statistical analysis called the product rule, “utilizes theoretical models to allow a statement of numerical significance that can go beyond the size of the sample population or databank.” Sue Rosenthal, *My Brother’s Keeper: A Challenge to the Probative Value of DNA Fingerprinting*, 23 AM. J. CRIM. L. 195, 200 (1995).

In some ways, the project offers a bit of all things to all people; reducing the world to a biological source does have considerable appeal. Professor Richard Lewontin has noted that the true importance of the Human Genome Project for some people:

lies less in what it may, in fact, reveal about biology, and whether it may in the end lead to a successful therapeutic program for one or another illness, then in its validation and reinforcement of biological determinism as an explanation of all social and individual variation. The medical model that begins, for example, with a genetic explanation of the extensive and irreversible degeneration of the central nervous system characteristic of Huntington's chorea, may end with an explanation of human intelligence, of how much people drink, how intolerable they find the social condition of their lives, whom they choose as sexual partners, and whether they get sick on the job. A medical model of all human variation makes a medical model of normality, including social normality, and dictates that we preemptively or through subsequent corrective therapy bring into line anyone who deviates from that norm.<sup>268</sup>

Biological problems appear easier to remove than sociological ones. Biology is more precise and predictable, is more objective and is encased in the aura of science, providing it with instant respectability. Furthermore, heredity is culturally powerful, almost of mythic importance, and even more powerful when mixed with genetics.

Americans have previously embraced "quick fixes" from science that later dissolved into thin air. Scientific findings about cold fusion, for example, were quickly repudiated, just as the XYY chromosomal make-up was rebuffed as a cause of violent behavior. Even if genetic findings are valid and reliable, the urge to overstate and exaggerate their value may prove irresistible, especially in the context of the criminal law, which in recent years has been pummeled in the court of public acclaim by such highly publicized cases as those involving John Hinckley,<sup>269</sup> O.J. Simpson,<sup>270</sup> the Menendez brothers,<sup>271</sup> and Rodney King,<sup>272</sup> among others.

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<sup>268</sup> LEWONTIN, *supra* note 228, at 65.

<sup>269</sup> See, e.g., Bennett H. Beach, *The Juror as Celebrity*, TIME, Aug. 26, 1992, at 42.

<sup>270</sup> See, e.g., Richard Corliss, *It's Already the TV Movie*, TIME, July 18, 1994, at 36.

<sup>271</sup> See, e.g., Massimo Calabresi, *Swaying the Home Jury: The Menendez Trial Has Been a Long-Running Soap Opera - and a High-profile Attraction - for Cable's Court TV*, TIME, Jan. 10, 1994, at 56.

<sup>272</sup> See, e.g., Janice Castro, *A Jarring Verdict, An Angry Spasm: Acquittals in*

Given this background, the criminal law must not abdicate its duty of dealing with individual circumstances and behavior simply by relying on genetic propensities. Much like Federal Rule of Evidence 404(a), which excludes other sources of deterministic behavior, such evidence should be treated skeptically and generally excluded. The adoption of categories of evidence would remove the temptation of admitting genetic data and consider genetic explanations with a case-by-case approach. This categories approach, which can be adopted by legislatures as well as by courts, prevents decision-making bodies from being overwhelmed by the particular circumstances and the allure of a short-cut through genetics. The following is an outline of how courts can sift through such evidence in a methodical and fair manner.

#### *A. A Framework of Analysis for Genetic Evidence*

The Federal Rules of Evidence, adopted well before the commencement of the Human Genome Project and its discoveries about the connections between biology and behavior, support a theory of intentionality that differentiates between propensity and other, more predictable behaviors. The evidence rules, specifically Rule 404(a), exclude propensity evidence because a person's traits or dispositions offer little assurance of his or her future behavior.<sup>273</sup> In a sense, while these rules were not developed to deal with the problem of genetic relationships, they apply precisely to situations where there is only a general "likelihood" of acting. The rules distinguish such situations from habit,<sup>274</sup> where there is much greater assurance of predictive behavior. According to the Advisory Committee Notes, habit is defined as the "regular response to a repeated specific situation."<sup>275</sup> This definition connotes that such conduct can be evaluated only over time and that the behavior is so ingrained that it can be counted on to occur upon the presence of a particular stimulus.

The rule on habit evidence in effect recognizes the predictive value of habitual behavior and suggests that it is so ingrained in a person that it is reliable.<sup>276</sup> Whether the behavior is genetic or learned or both, it has become a part of the neuronal pathways of the individual to the extent that a quasi-robotic response is part of the person's make-up.

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*the King-beating Trial Spark Disbelief, Rage and Rioting*, TIME, May 11, 1992, at 10.

<sup>273</sup> See FED. R. EVID. 404(a).

<sup>274</sup> See FED. R. EVID. 406.

<sup>275</sup> FED. R. EVID. 406 advisory committee's note (quoting CHARLES T. MCCORMICK, HANDBOOK OF THE LAW OF EVIDENCE § 162 (1954)).

<sup>276</sup> See FED. R. EVID. 406.

By comparison, the lack of testability of propensity evidence takes it out of the realm of causality. This notion can be understood in a different way, by focusing on time. Unless there is some predictive value in the future, the role of genes in a person's behavior remains only a guess, even if it is an educated guess. Such speculation, even by experts, is unwelcome in a court of law, which seeks decisions based on evidence. Even though experts may hazard opinions under the Federal Rules of Evidence, those opinions must assist the jury, as well as be based on facts reasonably relied on in the particular area of expertise.

### *B. Premises and Axioms*

This theory of causality permits a court to differentiate between factors that arguably cause conduct. The focus on predictability and testability yields the conclusion that conduct results from a combination of genes, culture, and environmental factors. The phrase "environmental factors" is intended to denote more than just the surrounding environment. In particular, the country in which one is raised and the subcultures within that country are both significant to a person's behavior. A person raised in Europe will be subject to different influences than a person raised in Africa, Asia, or North America, for example. Likewise, a person raised on a farm in Iowa will be subject to different influences than a person raised in New York City. Further, the same can be said for ethnic, religious, and other identifying influences. These influences, it is postulated, are so ingrained and unconsciously significant that they help to shape and determine how the raw pool of genes in a person will operate in concrete situations. Such situations may range from reactions to stress while driving a car to responses to the loss of a loved one to moments involving great joy. Thus, this theory is predicated on the belief that genes can be and in fact are shaped by culture and family.

Of course, people may have significant events in their lives that further shape their personalities. Death, injury, illness, riches, poverty, heartbreak, and many, many more are not only stimuli prodding genetic reactions but also stimuli that may shape and change a person's mode of conduct. Popular culture routinely speaks of people who "snap" or "grow" surly or peaceful or the like. This is simply recognition of the interactivity between a person and the surrounding environment, a concept studied and declared by Darwin in his theory of evolution. This concept of evolution undoubtedly affects behavior, so that even strongly ingrained habits can be modified and eliminated, although it may take considerable effort.

### C. *The Value of This Approach*

The significance of this theory, however, is that it appears to be able to accommodate and categorize additional discoveries about the relationship between genetics and behavior within a legal framework of analysis. While the line distinguishing such categories is fuzzy, it is certainly as workable as many other legal tests, such as “reasonableness,” “probative,” and “unfairly prejudicial.” In effect, the court has discretion whether to admit such evidence and how to treat such evidence upon admission. Yet, the court’s discretion is not absolute – it is guided, with signposts for consistency created by the limitation of predictability.

The adoption of categories of evidence would remove the temptation of admitting genetic data and considering genetic explanations based on a case-by-case analysis. This categories approach, which can be adopted by the legislature as well as the courts, prevents the decision-making bodies from being overwhelmed by the particular circumstances and the allure of a shortcut through genetics.

## VI. CONCLUSION

The criminal justice implications of the Human Genome Project are significant. From a revision of the definition of criminal responsibility, to predictions of dangerousness, to expert testimony on genetically caused behavior, many areas of the criminal justice system will be influenced by the Human Genome Initiative. Through a process of reimagining a genetically reordered system, the true extent of the changes that might occur are revealed. In the end, such a system would not necessarily perform better, and deference to genetics discoveries and scientific “short-cuts” would be counterproductive. It becomes clear that the criminal law is socially constructed to serve society as a democratic institutional tool, and that moral blameworthiness is its yardstick. The scientific approach would try to hide this moral yardstick without offering an acceptable substitute. Thus, a genetically reordered system would create different problems rather than solve existing ones. The lesson to be learned is that science may be appropriate in certain contexts and circumstances, but it is not the panacea for the legal system’s ills. Eventually, even the new genetically reordered system would be transformed and recreated to once again embrace the concepts of free will and moral blameworthiness. By exploring the ramifications of a genetically reordered system, however, it becomes apparent that only through the criminal law’s own evolution will it avoid falling inexorably behind in



creating a coherent and suitable approach to useful and dangerous genetics advances and evade the temptation to use genetics and science as a substitute for the necessary and imprecise social aspect of the criminal law