

# THE SEARCH FOR SUSCEPTIBILITY GENES IN A BRAVE NEW WORLD: PSYCHIATRIC GENETICS, ETHICS AND LAW

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Science fiction writers who presciently wrote about genetic engineering<sup>1</sup> have clairvoyantly peered into the future to 'bravely go where no one has gone before'. Psychiatric genetics is an interdiscipl

inary field that holds enormous potential to understand mental illness<sup>2</sup> as it interweaves new forms of technologies, methodologies and theoretical concepts.<sup>3</sup> Uncertainty often associated with rapid advancement in scientific knowledge<sup>4</sup> requires ethical checks and balances to be established so mental health research is never again performed in a context void of ethical standards.<sup>5</sup> Practical ethical guidelines should be established to fuse the gap between psychiatric genetics, law and ethics in a way that fosters transparent dialogue.

Medical, psychiatric and behavioral geneticists have different research agendas and methodological approaches. Medical geneticists are often clinician-scientists who study the genetics of biological disorders,<sup>6</sup> while behavioral geneticists include psychologists and criminologists who often focus on personality disorders and criminal behavior.<sup>7</sup> Psychiatric geneticists, on the other hand, attempt to unravel the molecular and genetic basis of mental disorders. This mottled approach to studying the genetics of mental disorders offers researchers different perspectives of ethical norms and values.

The marriage between psychiatry and genetics has led to the development of international journals,<sup>8</sup> interdisciplinary congresses,<sup>9</sup> working papers,<sup>10</sup> funding opportunities<sup>11</sup> and international surveys specific to psychiatric genetics.<sup>12</sup> Worldwide 25% of individuals display one or more mental or behavioral disorders throughout their life.<sup>13</sup> In Canada, for example, the economic cost of mental illnesses was estimated at \$7.331 billion in 1993<sup>14</sup> and rose to \$14.4 billion in 1998.<sup>15</sup> Among Canadian children and adolescents, a 15% overall prevalence rate translates into 1.2 million children who will experience a mental illness.<sup>16</sup>

The quest for "susceptibility genes" of mental disorders is byzantine,<sup>17</sup> and even if susceptibility genes of a given disorder are identified predicting onset is limited until all the variance from environmental risk factors is explained. Furthermore, everyone is at risk or susceptible in one way or another.<sup>18</sup> The multi-factorial and complex traits of psychiatric disorders,<sup>19</sup> through genetic-environmental interactions, means that no single gene can be identified as a necessary and sufficient condition for a disorder's onset.<sup>20</sup> Bold prophecies that someone will develop a mental disorder on a remote predisposition are unpromising<sup>21</sup> and convoluted by the fact that some genes evolve new functions with others remaining unexpressed for long periods of time.<sup>22</sup> As competing research paradigms employ different methodologies to study psychiatric genetics,<sup>23</sup> a multifarious approach is needed to pluralistically explain<sup>24</sup> problems of the human mind, consciousness and reality. Psychiatric epigenetics is yet another emerging field that raises new methodological challenges as it studies DNA modifications associated with mental illnesses.<sup>25</sup>

## Psychosocial perceptions: public and professional

The public should be fully informed of the strengths, weaknesses and possible research outcomes of psychiatric genetics.<sup>26</sup> Evidence-based research should explore perceptions of risk in a way that captures the public's imagination through a community of moral discourse.<sup>27</sup> Public risk perceptions of causal determinants in genetic research are starting to be understood,<sup>28</sup> despite internet and other media-hype which occasionally provides misleading information on the genetics of mental illness.<sup>29</sup> For example, when perceptions lump together mental health survivors with individuals suffering from physical disabilities communication gaps are bound to occur.<sup>30</sup>

Perceptions may also differ between geneticists, primary physicians and psychiatrists on the ethical implications of psychiatric genetics.<sup>31</sup> For example, scientists may be engaging with the public from their own linguistic and social domains as rationale thinking 'experts', while the public may perceive genetics through the lens of emotional feeling 'non-experts'.<sup>32</sup> Depending on one's perspective, causal belief explanations have the potential to either perpetuate stigma<sup>33</sup> or promote fatalistic attitudes towards overcoming mental illness.<sup>34</sup>

While courts acknowledge the need to prevent stigma,<sup>35</sup> it is not clear to what extent geneticization of mental illness actually increases stigmatization.<sup>36</sup> Psychiatric genetic information may have both negative and positive stigmatizing effects.<sup>37</sup> Labeling someone with a genetic mental disorder may generate feelings of guilt for carrying a 'defective' gene, affect self-esteem, self-perception and self-concept.<sup>38</sup> If psychiatrists and geneticists remain insulated from public perceptions, the scientist-public chasm will only widen.<sup>39</sup>

Although a link exists between achievement, creativity and mental disorders, determining causality is difficult.<sup>40</sup> Suppose psychiatric geneticists discover a treatment for a given mental disorder, but which at the same time thwarts creativity, to what extent would patients reject the treatment because it dulls their mind and diminishes their creativity?<sup>41</sup> How indispensable is creativity to the greater community as a whole?<sup>42</sup> Is there a compensatory advantage for individuals carrying a psychosis gene,<sup>43</sup> and is it possible that small quantities of mental illness genes are adaptive?<sup>44</sup> These questions raise concerns that psychiatric genetics research is not driven solely by interest for individuals but also for broader societal<sup>45</sup> and political factors.<sup>46</sup>

## Genetic discrimination: eugenics and sexual sterilization

With a 'new eugenics' on the horizon,<sup>47</sup> there is a shift from authoritarian eugenics, where the State has the sole responsibility to improve human physical attributes, to a liberal eugenics where human excellence is viewed pluralistically and differences are respected.<sup>48</sup> The term eugenics, originally coined by Francis Galton,<sup>49</sup> has several meanings although most agree that when defined as a form of public policy to "clean up the gene pool" this is a coercive eugenic goal.<sup>50</sup> Based on early concepts of 'degeneration',<sup>51</sup> eugenics can be thought of as improving humankind either through positive or negative eugenics.<sup>52</sup> New eugenicists face the same methodological and classificatory issues as traditional eugenicists in defining value-laden terms such as "unfitness", "feeble-mindedness" and "defectiveness", much in the same way that psychiatrists today struggle with defining mental *illness*, *disease*, or *disorder*.<sup>53</sup> Separating "objective" science from the "subjective" scientist and hidden policy agendas is not always apparent,<sup>54</sup> evident by the fact there was a time when finding a respected psychiatrist who did not espouse favorable views of eugenics was virtually impossible.<sup>55</sup>

Genetic determinism is a reductionist view that the formation of a person's genome and human behavior is causally determined by our genes,<sup>56</sup> and efforts to augment our knowledge of genetic diseases increases the potential for discrimination.<sup>57</sup> Recommendations to pass genetic nondiscrimination legislation that protects genetic information<sup>58</sup> has been favored by some as sensitive to past abuses<sup>59</sup> while others see it as ineffective and possibly inequitable.<sup>60</sup> A recent Hong Kong District Court ruled on the potential misuse of genetic information, where firing individuals from employment because they have a genetic risk to develop a mental disorder is unlawful and discriminatory.<sup>61</sup> To suggest someone may commit a violent act because of an association between violence and mental illness is far from definitive.<sup>62</sup> Genetic discrimination laws vary among countries depending on cultural perceptions of mental illness.<sup>63</sup> For example, in Canada there have been no legal cases dealing specifically with genetic discrimination of the mentally ill, although experts have testified on the risk of genetic and heredity factors.<sup>64</sup>

With 2007 marking the 100<sup>th</sup> year since the first sexual sterilization law was enacted,<sup>65</sup> it should be morally abhorrent to our deepest intuitions that criminals, idiots, imbeciles and rapists were once sterilized upon the recommendation of an expert review board. In *Buck v. Bell*,<sup>66</sup> an unfortunate low point in US constitutional history, the Supreme Court upheld a Virginia statute involving sterilization laws. It was believed sterilization would protect the public from dependency and degeneracy and "heredity plays an important part in the transmission of insanity, imbecility."<sup>67</sup> As is often the case in law, it was the dissenting voice who reminded us that any move towards a new eugenics must demonstrate a thorough knowledge of science, and human judgment and systems of public policy are fallible.<sup>68</sup> After *Buck*, legal cases emerged that sterilization of habitual criminals is unconstitutional.<sup>69</sup>

In Canada, individuals viewed as feeble-minded, promiscuous and dangerous led to the province of Alberta enacting sterilization laws in 1928. During these early years, pioneer psychiatrists believed heredity's part in the evolution of insanity was underestimated.<sup>70</sup> Although the Alberta statute was later repealed due to questionable medical and eugenic basis, legislation was often based on the whims of a few elite.<sup>71</sup> Since that time Canadian courts have ruled that non-therapeutic sterilizations of the mentally ill are not permissible.<sup>72</sup>

The Human Genome Project affects how vast amounts of biological data are stored, analyzed and interpreted, creating a new role for the field of bioinformatics.<sup>73</sup> If left unchecked, the genomics revolution has the potential to misrepresent, overstate and create false hopes and achievements,<sup>74</sup> creating ethical and legal concerns about the extent of mandatory international data-sharing.<sup>75</sup> Where entire populations share the same ancestry, the hunt to find susceptibility genes predisposing individuals to complex diseases<sup>76</sup> raises a host of other ethical and legal issues.<sup>77</sup> If a significant portion of a population is identified with a predisposition to a mental disorder, what precautions are in place to avoid the stigmatization of an entire community?

## **Clinical issues**

The emergence of psychiatric genetics has created new clinical duties for doctors so that traditional medical ethics may need to accommodate a more flexible ethical framework.<sup>78</sup> For example, in light of shared genetic familial traits affecting third parties it may be necessary to re-conceive of the family unit as a collective patient.<sup>79</sup> If discovered that someone has a genetic predisposition towards suicide this does not imply the act will be committed, but at what point are doctors legally obligated to inform patients they have a

higher risk than average?<sup>80</sup> The traditional *Tarasoff* duty to warn<sup>81</sup> will need to be reexamined as doctors contemplate treatment for the genetics of mental illness.<sup>82</sup> Courts may decide a duty to warn exists by examining (i) the likelihood family members are at risk, (ii) the severity of potential consequences, 3) whether effective interventions would mitigate the risk.<sup>83</sup>

Predictive testing for the genetics of mental disorders only reveals the level of susceptibility to a disease, an estimate of risk, and does not indicate the degree individuals will actually be affected. Susceptibility to most psychiatric disorders depends on the combined effects of pre-disposing and protective alleles at multiple loci, therefore making any absolute statements extremely difficult.<sup>84</sup> Furthermore, predictions may not develop for decades when new therapeutic advances may be developed in the interim to circumvent the disorder's onset. Universal consensus and data-protection laws should be established before susceptibility genes become widely available.<sup>85</sup> Parents may ask their doctors to portend whether their children will develop a mental disorder. Other parents may not wish to test their children for adult-onset disorders, but allow their children to decide later in adulthood<sup>86</sup> to avoid being stigmatized with a "bad gene" and other siblings experiencing "survivor guilt".<sup>87</sup>

Past oversights in obtaining informed consent within psychiatric research centers demonstrates that the absence of consent legislation can lead to unwanted treatment and experimentation of patients.<sup>88</sup> Non-physical harm to individuals can occur when there is a failure to understand the differences between clinical diagnosis, expected treatment and research intended to produce generalizable scientific data.<sup>89</sup> The ability to give consent for knowledge regarding genetic predispositions to mental illness implies ownership of one's genes, but what exactly is an individual consenting to and what degree of specification is necessary?<sup>90</sup> The level of competency and capacity patients need to give for an educated consent is contingent on how a doctor presents information,<sup>91</sup> particularly where genetic research is not easily comprehensible. Doctors may also be required to understand other aspects of an individual's life, such as religious and epistemological views of genetics and mental illness.<sup>92</sup>

Should physicians be under an ethical or legal obligation to tell family members that a loved one is at higher than average risk of developing a mental disorder based on predictive genetic testing?<sup>93</sup> A "therapeutic misconception" often exists between family members and research participants on the hopes, expectations and outcomes of such statements.<sup>94</sup> If family members discover that a relative has an elevated risk of developing a mental disorder, doctors and researchers may be under a primary obligation to encourage the patient to explain the susceptibility risk to family members. How should doctors deal with individuals who do not wish to know they have a disabling and ultimately fatal disorder?<sup>95</sup> When research generates results that affects other family members this should be discussed before obtaining informed consent.<sup>96</sup> Hospital administrators and research institutions should provide active education programs on the ethics of psychiatric genetics to new residents, clinicians and researchers.<sup>97</sup>

### **Social policy considerations**

In addition to clinical issues, there are other broader social policy considerations associated with genetic risk that could lead to discrimination.<sup>98</sup> Workplace employers may wish to use genetic data to predict an employee's risk of developing a mental disorder, loss of working days or filing for early retirement.<sup>99</sup> Past research indicates healthy working men are more willing to participate in genetic research than women,<sup>100</sup> knowledge that

employers and insurance companies would undoubtedly be interested in. While US research institutions can obtain confidentiality certificates to protect individuals from disclosing information to third parties,<sup>101</sup> a balance is needed between protecting individual rights and allowing access to information with unforeseeable dangers.<sup>102</sup> It is not clear why individuals without a genetic loading for serious mental illnesses should pay the same amount of insurance rates as individuals diagnosed with a mental disorder.<sup>103</sup> US courts have held that genetic mental disorders can affect whether a group health insurance policy is granted.<sup>104</sup>

Parents have requested predictive testing for schoolchildren to assess predispositions to mental illness, potential academic prowess and reading and language disorders,<sup>105</sup> even when there is insufficient evidence to justify screening tests.<sup>106</sup> Children are unable to understand the implications of transmitting complex genetic information, which could lead to feelings of guilt, self-blame or unworthiness.<sup>107</sup> They may experience real or perceived stigmatization,<sup>108</sup> and parents may inadvertently lower their children's expectations and educational potential<sup>109</sup> or attempt to reconstruct their learning environment.<sup>110</sup> Others may be interested in screening adopted children with higher rates of psychopathology and genetic vulnerability towards psychiatric disorders.<sup>111</sup> Parents and children may also play the 'blame game' for what is actually a genetic loading of mental disorders.<sup>112</sup>

Would public interest be strong enough to call for a policy whereby the mental health of world leaders, and other important world figures, is considered in the public domain? Should the public have access to predictive information of whether such leaders may develop violent tendencies, promote strong family values or will develop a future mental illness?<sup>113</sup>

## **Research ethics**

Psychiatric geneticists wishing to obtain federal funding for research must ensure procedural guidelines are followed, otherwise Research Ethics Boards (REB) have the power to suspend research studies.<sup>114</sup> Obtaining informed consent from participants and informing third parties of potential risks raises new issues for REB members as they decide what constitutes minimal risk during a study's assessment stage.<sup>115</sup> Determining the level of ethical risk is particularly important in psychiatric genetics where the discipline revolves around predicting risk.

While psychiatric research raises ethical concerns for REBs,<sup>116</sup> psychiatric genetics raises other issues related to the education and training of its board members. Approximately 90% of Institutional Review Boards (IRB) chair members believe more education is required for investigators, and only 5% believe they are adequately trained for their duties.<sup>117</sup> The interdisciplinary nature of psychiatric genetics requires specific education be provided to IRBs on ethical guidelines,<sup>118</sup> and educational training for psychiatry residents enrolled in psychiatric genetics programs.<sup>119</sup> Whenever novel technologies are developed individuals judging the scientific merits of proposals should be technically and ethically qualified.<sup>120</sup> To this end, IRB members considering research proposals involving mental disorders should include at least two members familiar with the disorder and who are concerned for the population.<sup>121</sup> As sample sizes of psychiatric genetic studies are often large, taking place across several sites, researchers may be required to submit applications to several ethics committees for approval, not all of whom will have congruent views on ethical issues.

One of the challenges for international research ethics is “how to apply universal ethical principles to biomedical research in a multicultural world with a multiplicity of health-care systems and considerable variation in standards of health care.”<sup>122</sup> The *Nuremberg Code*, the first set of ethical principles governing medical researcher’s conduct, states that the degree of risk should yield fruitful results for the good of society.<sup>123</sup> If REB members do not feel they have the appropriate expertise to know whether an “experiment will yield fruitful results for the good of society”, they will be placed in a difficult ethical decision-making position.<sup>124</sup> The *Declaration of Helsinki* reinforces the need to balance individual and societal concerns with affects of the research on third parties.<sup>125</sup> In Canada, the *Tri-Council Policy Statement (TCPS)*,<sup>126</sup> a policy document that has become the gatekeeper to obtain governmental research funding, stresses how psychosocial harm and stigmatization may occur if genetics studies focus on improving or enhancing populations through cosmetic manipulation.<sup>127</sup>

Codes of Ethics promote international consensus, raise awareness in research, and ensure that such research is conducted in a safe and ethical manner.<sup>128</sup> While they are usually based on abstract principles and aspire to be universal, Codes of Practice recommend specific guidelines applicable to front-line researchers.<sup>129</sup> An *International Code of Practice for Psychiatric Genetics* would ideally fall somewhere between the abstract and the practical,<sup>130</sup> as providing guidance to policymakers and public health officials of new technologies and emergent research in the field.<sup>131</sup> Considering the historical fusion of psychiatry and genetics and the rapid development within the field, such a Code could prioritize commonly conflicting principles of public welfare with dignity and respect for the individual. It would also help balance Western and Asian ethical approaches to psychiatric genetics so the international research community develops uniform views.<sup>132</sup>

### **Crime, genes and mental illness**

In the past twenty years there has been an intensified search for a link between genes, criminal behavior and mental illness,<sup>133</sup> which raises a host of ethical, scientific, legal and philosophical questions about personal rights, the nature of criminal responsibility, free will and court’s competency to decide such complex arguments.<sup>134</sup>

Criminal defense lawyers have argued that criminal acts are associated with genetic weaknesses rooted in mental illness, although US courts have been reluctant to allow scientific studies into evidence which do not reach verifiable certainty.<sup>135</sup> Although most agree there is a connection between genes and behavior, some see the use of genetics to predict criminal behavior as unlikely.<sup>136</sup> How much will psychiatric genetics affect notions of criminal responsibility and our current understanding of *mens rea*, a criminal law concept that focuses on the mental state of the accused? Perhaps the drive to find a gene for criminal behavior is our way of dealing with social nonconformity.

The high rate of comorbidity among psychiatric disorders makes it difficult for courts to determine primary or secondary influences on criminal behavior,<sup>137</sup> and this in turn challenges judges to separate genetic causality from moral blameworthiness.<sup>138</sup> While criminal law presumes behavior is a consequence of free will, are genetic predispositions so strong that an impulse to commit an act is irresistible?<sup>139</sup> Lawyers have argued the genetic violence theory in US courts with little success.<sup>140</sup>

In the early days of psychiatry, the mentally ill were institutionalized in hospitals and physically isolated from paupers, criminals and alcoholics.<sup>141</sup> The Italian psychiatrist and criminologist, Cesare Lombroso, wedded Darwinian Theory with psychiatry in the 1870’s to develop one of the first theories discussing heredity of mental and moral traits

through the concept of the “born criminal”.<sup>142</sup> Lombroso’s atavistic theories posited that certain biological types are predisposed by their heredity traits to commit crimes based on cranial and facial characteristics.<sup>143</sup> Others argued for a “sanitary utopia” that criminals should be castrated for all sexual crimes or misdemeanors to protect society.<sup>144</sup> In the 1920’s tabloids began to feature articles on the biological basis of crime, and psychopathic laboratories were formed to develop tests and screen people with abnormal criminal minds.<sup>145</sup>

As criminal acts become increasingly linked to biologically heritable traits, traditional concepts of *mens rea* may become displaced or modified by medical models of prevention and treatment, creating a gap between neuroscience, psychiatry and the criminal justice system.<sup>146</sup> Criminal responsibility raises the issue of assessing mental fitness for one’s actions in court,<sup>147</sup> and is related to free will and the extent personality is influenced by biologically heritable and developmental factors.<sup>148</sup> As scientific research is seldom conducted in a value-neutral vacuum, psychiatric geneticists should understand how criminal responsibility and moral agency is shaped by such research. Psychiatric geneticists may be called on to “market” the credibility of genetic mental disorders, which raises other concerns about the personal political, social or moral agendas that find their way into the courtroom.<sup>149</sup>

For example, Antisocial Personality Disorder<sup>150</sup> affects individuals so they fail to conform to society’s norms and expectations, and yet research indicates this disorder is moderately heritable<sup>151</sup> with family, twin and adoption studies, combined with physiological markers supporting the link to criminality as a biologically heritable component.<sup>152</sup> Substance dependence and abuse are both mental disorders involving genetic factors with research indicating there is a genetic predisposition to drinking,<sup>153</sup> corroborated by family, twin and adoption studies.<sup>154</sup>

Researchers may think that genetic discoveries related to mental illness are independent of criminal law, but lawyers are arguing a “genes made him do it” defense.<sup>155</sup> When the insanity defense was first introduced lawyers pleaded it on biological determinants of behavior,<sup>156</sup> much in the same way psychiatric genetics argues for heritability. Although there have been few court cases involving psychiatric genetics, behavioral genetics or the relationship between crime and genes more generally, judges are recognizing the importance of this emerging field.<sup>157</sup> Most judges do not possess advance training in molecular genetics, statistics or psychiatry, and call upon experts to testify as to the nature of mental disorders. As U.S. Supreme Court Justice Stephen Breyer stated, “law itself increasingly needs to access sound science...a judge is not a scientist and a courtroom is not a scientific laboratory,”<sup>158</sup> creating the need to build foundations that integrate sound science in law. As the court’s gatekeeper, judges should be receptive to valid psychiatric and behavioral evidence that offers new insights into legal standards<sup>159</sup> that are based on credible evidence.<sup>160</sup> Providing judges with basic understanding of biotechnology, molecular sciences, genetics, and sub-disciplines such as psychiatry and psychology can help.<sup>161</sup>

## Conclusion

While psychiatric genetics creates a great deal of uncertainty about the future of mental illness, this interdisciplinary field will continue to raise ethical challenges as it explains core features of human thoughts, emotions and behavior. Psychiatric genetics is an exciting new area that offers fantastic possibilities for the mentally ill, family members and society. As is the case with most new scientific technologies, a measure of caution is

necessary so that past ethical mistakes are not repeated. Interdisciplinary collaboration among multiple stakeholders is important so that research, education, communication, and the development of reliable research methods are promoted. We must strive for the highest ethical standards in research and translate the application of these findings into clinical psychiatric practice. Although uncertainty still exists, as psychiatry and genetics ventures into a brave new world on parallel tracks we should prepare to embrace its possibilities with optimism, confidence and hope.

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<sup>1</sup> See H.G. Wells, *The Island of Doctor Moreau: A Critical Text of the 1896 London First Edition*, with an Introduction and Appendices, ed. by Leon Stover (Jefferson, NC: McFarland & Company, 1996); Aldous Huxley, *Brave New World and Brave New World Revisited* (New York: Harper & Row, 1965) (1932, 1958) (Martin Green intro.); C. S. Lewis, *The Abolition of Man* (New York: Macmillan Publishing Company, 1955) at 83.

<sup>2</sup> Laura Weiss Roberts, "Ethics and Mental Illness Research" (2002) 25 *Psychiatric Clinics of North American* 525 at 540 [Roberts].

<sup>3</sup> Nicholas Agar, *Liberal Eugenics—In Defence of Human Enhancement* (Malden: Blackwell Publishers, 2005) at 2 [Agar].

<sup>4</sup> Stephen H. Dinwiddie, Jinger Hoop & Elliot S. Gershon, "Ethical Issues In the Use of Genetic Information" (2004) 16 (4) *International Review of Psychiatry* 320 at 327 [Dinwiddie].

<sup>5</sup> Michael J. Owen & Alastair G. Cardno, "Psychiatric Genetics: Progress, Problems, and Potential" (1999) 354 *The Lancet*, S11 at S14 [Owen].

<sup>6</sup> Erik Parens, "Genetic Differences and Human Identities" (2004) 34 *The Hastings Report* S1.

<sup>7</sup> Jeffrey W. Gilger, "Contributions and Promise of Human Behavioral Genetics" (2000) 72 *Human Biology* 229.

<sup>8</sup> See the journal *Psychiatric Genetics*, online: <http://www.psychgenetics.com>.

<sup>9</sup> The World Congress on Psychiatric Genetics is a yearly conference sponsored by the International Society of Psychiatric Genetics, online: <http://www.ispg.net/DesktopDefault.aspx>.

<sup>10</sup> See the recent working paper by Canada Institutes of Health Research, Institute of Neurosciences, Mental Health and Addiction (INMHA), *Canadian Research Consultation on Psychiatric Genetics, Neurogenetics and Brain Genomics Workshop Report*, (March 31, 2003) online: <http://www.cihr-irsc.gc.ca/e/25098.html>.

<sup>11</sup> *Ibid.*

<sup>12</sup> See Dorothy C. Wertz & John C. Fletcher, *Genetics and Ethics in Global Perspective*, (Dordrecht: Kluwer Academic Publishers, 2004) at 3 [Wertz].

<sup>13</sup> World Health Organization (WHO), "Mental and Neurological Disorders" (December 2001), online: <http://www.who.int/mediacentre/factsheets/fs265/en/>.

<sup>14</sup> Public Health Agency of Canada, "A Report on Mental Illnesses in Canada" (October 2002), online: [http://www.phac-aspc.gc.ca/publicat/miic-mmacc/chap\\_1\\_e.html](http://www.phac-aspc.gc.ca/publicat/miic-mmacc/chap_1_e.html).

<sup>15</sup> N. Joubert & T. Stephens, "The Economic Burden of Mental Health Problems in Canada" (October 2001), online: Public Health Agency of Canada [http://www.phac-aspc.gc.ca/publicat/cdic-mcc/22-1/d\\_e.html](http://www.phac-aspc.gc.ca/publicat/cdic-mcc/22-1/d_e.html).

<sup>16</sup> Interim Report of The Standing Senate Committee on Social Affairs, Science and Technology (November 2004), online: <http://www.parl.gc.ca/38/1/parlbus/commbus/senate/com-e/soci-e/rep-e/report3/repintnov04vol3-e.pdf> [Kirby].

<sup>17</sup> A.R. Sandlers, J. Duan & P.V. Gejman, "Complexities in Psychiatric Genetics" (2004) 16 (4) *International Review of Psychiatry* 284; Patricia Baird, "Identification of Genetic Susceptibility to Common Diseases: The Case for Regulation" (2002) *Perspectives in Biology and Medicine* 516.

<sup>18</sup> Trudo Lemmens, *Ethical and Policy Issues of Genetic Testing in the Workplace* (LL.M. Thesis, McGill Faculty of Law, 1995) [unpublished].

<sup>19</sup> Lori Andrews & Erin Shaughnessy Zuiker, "Ethical, Legal, and Social Issues In Genetic Testing For Complex Genetic Diseases" (2003) 37 *Val. U.L. Rev.* 793 [Andrews].

<sup>20</sup> Paul S. Appelbaum, "Ethical Issues in Psychiatric Genetics" (2004) 10 (6) *Journal of Psychiatric Practice* at 343 [Appelbaum]. Stephen V. Faraone, Ming T. Tsuang & Debby W. Tsuang, *Genetics of Mental Disorders: A Guide for Students, Clinicians, and Researchers* (New York: Guilford Press, 1999) at 6 [Faraone].

<sup>21</sup> Shauna Labman, "Genetic Prophecies: The Future of the Canadian Workplace" (2004) 30 *Man. L.J.* 227.

<sup>22</sup> Manyuan Long *et al.*, "The Origins of New Genes: Glimpses from the Young and Old" (2003) 4 *Nature Reviews Genetics* 865.

<sup>23</sup> For an explanation of these methodologies see Kenneth S. Kendler, "Psychiatric Genetics: A Methodologic Critique" (2005) 162 *The American Journal of Psychiatry* 3 [Kendler]. Marianne BM van den Bree & Michael J. Owen, "The Future of Psychiatric Genetics" (2003) *Trends in Molecular Medicine* 122 at 123; Kopall Tandon & Peter McGuffin, "Review Article: The Genetic Basis For Psychiatric Illness In Man" (2002) 16 *European Journal of Neuroscience* 403; Peter McGuffin, Michael J Owen & Irving I. Gottesman, *Psychiatric Genetics & Genomics* (Oxford: Oxford University Press, 2004) at 31 [McGuffin].

<sup>24</sup> Kendler, *Ibid.* note 39.

<sup>25</sup> Anonymous, "Breakthrough of the year: peering into 2000" (1999) 286 *Science* 2240; A. Petronis *et al.* "Psychiatric Epigenetics: A New Focus for the New Century" (2000) 5 *Molecular Psychiatry* 342; Centre for Addiction and Mental Health, "Psychiatric Neurogenetics: CAMH Research Annual Report 2002" (2002) online: [http://www.camh.net/research/psych\\_neurogenetics\\_rar2002.html](http://www.camh.net/research/psych_neurogenetics_rar2002.html); H.M. Abdolmaleky, S. Thiagalingam & M. Wilcox,

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- <sup>27</sup> James M. Gustafson, "Genetic Therapy: Ethical and Religious Religions" (1992) 8 *J. Contemporary Health L. & Pol'y* 183, 190.
- <sup>28</sup> Theresa M. Martineau *et al.* "Predictive Genetic Testing for Alzheimer's disease: Impact upon Risk Perception" 25 (2) *Risk Analysis* 397; Theresa M. Marteau & Vicky Senior, "Illness Representations after the Human Genome Project: The Perceived Role of Genes in Causing Illness" in Keith J. Petrie & John A. Weinman, *Perceptions of health and illness: Current Research and Applications* (Amsterdam: Harwood Academic Publishers) 241-266; Roxanne L. Parrott, Kami J. Silk & Celeste Condit, "Diversity In Lay Perceptions Of The Sources Of Human Traits: Genes, Environments, and Personal Behaviors" (2003) 56 *Social Science & Medicine* 1099.
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- <sup>30</sup> Peter Beresford & Anne Wilson, "Genes Spell Danger: Mental Health Service Users/Survivors, Bioethics and Control" (2002) 17 (5) *Disability & Society* 541.
- <sup>31</sup> Wertz, *supra* note 12 at 46.
- <sup>32</sup> Guy Cook, Elisa Pieri & Peter T. Robins, "The Scientists Think and the Public Feels: Expert Perceptions of the Discourse of GM Food" (2004) 14 (4) *Discourse and Society* 443.
- <sup>33</sup> Ian Walker & John Read, "The Differential Effectiveness of Psychosocial and Biogenetic Causal Explanations in Reducing Negative Attitudes toward "Mental Illness"" (2002) 65 (4) *Psychiatry* 323; P. Byrne, "Psychiatric Stigma" (2001) 178 *British Journal of Psychiatry* 281.
- <sup>34</sup> Roxanne L. Parrott, Kami J. Silk & Celeste Condit, "Diversity in Lay Perceptions of the sources of Human Traits: Genes, Environments, and the Personal Behaviors" (2003) 56 *Social Science & Medicine* 1099.
- <sup>35</sup> See *R. v. Swain* [1991] 1 S.C.R. 933.
- <sup>36</sup> McGuffin, *supra* note 23 at 426.
- <sup>37</sup> Jo C. Phelan, "Genetic Bases of Mental Illness—A Cure for Stigma?" (2002) 25 (8) *Trends in Neurosciences* 430; Jo C. Phelan, Rosangely Cruz-Rojas & Marian Reiff, "Genes and Stigma: The Connection between Perceived Genetic Etiology and Attitudes and Beliefs about Mental Illness" (2003) 6 (2) *Psychiatric Rehabilitation Skills* 159.
- <sup>38</sup> Andrews, *supra* note 19 at 53.
- <sup>39</sup> E.M. Petty *et al.* "Neuropsychiatric and Behavioral Genetics: Expectations for and Anticipated Implications of Genetic Applications for Managing Mental Illness: Voices of Patients and Psychiatrists" (2001) 29 *J.L. Med. & Ethics* 13.
- <sup>40</sup> Dinwiddie, *supra* note 4 at 324; Erika Lauronen *et al.*, "Links between Creativity and Mental Disorder" (2004) 67 *Psychiatry* 81.
- <sup>41</sup> *Starson v. Swayze*, [2003] 1 SCR 722.
- <sup>42</sup> Lawrence Gostin, "Public Health Law in a New Century: Part I: Law as a Tool to Advance the Community's Health" (2000) 283 *JAMA* 2837.
- <sup>43</sup> For further reading on the scientific link between creativity, mental illness and genetics see generally, Neus Barrantes-Vidal, "Creativity & Madness Revisited from Current Psychological Perspectives" (2004) 11 *Journal of Consciousness Studies* 58; Gerald Schoenewolf, *Psychotherapy with People in the Arts: Nurturing Creativity* (Binghamton: Haworth Clinical Practice Press, 2002); RA Prentky, "Mental Illness and Roots of Genius" (2001) 13 (1) *Creativity Research Journal* 95; Yoon-Mi Hur, *Personality correlates of mental abilities: Roles for Genes and Environment* (Doctoral Thesis, University of Minnesota, 1993) [unpublished].
- <sup>44</sup> Faraone, *supra* note 20 at 234.
- <sup>45</sup> Deirdre Madden, "Ethical and Legal Issues in Psychiatric Genetics Research" (2004) 10 *MLJI* 38 [Madden]; Denise K. Casey, "Genes, Dreams and Reality: The Promises and Risks of the New Genetics" (1999) 83 (3) *Judicature* at 106.
- <sup>46</sup> M. Baron, "Psychiatric Genetics and Prejudice: Can the Science Be Separated From the Scientist?" (1998) 3 *Molecular Psychiatry* 96 at 99.
- <sup>47</sup> Garland E. Allen, "Is a New Eugenics Afoot?" (2001) *Science* at 59.
- <sup>48</sup> Agar, *supra* note 3 at 5.
- <sup>49</sup> Leon Eisenberg, "Why Has the Relationship between Psychiatry and Genetics Been So Contentious" (2001) 3 (5) *Genetics in Medicine* 377.
- <sup>50</sup> Wertz, *supra* note 12 at 49; see also, Francis Galton, *Inquiries into the Human Faculty* (London: Macmillan, 1883) at 44 where Galton defined eugenics as "the study of the agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally; Diane B. Paul, "Is Human Genetics Disguised Eugenics" in Robert F. Weir, Susan C. Lawrence & Evan Fales, *Genes and Human Self-Knowledge Historical and Philosophical Reflections on Modern Genetics* (Iowa City: University of Iowa Press, 1994) at 67-83 [Weir].
- <sup>51</sup> Thomas G. Schulze, Heiner Fangerau & Peter Propping, "From Degeneration to Genetic Susceptibility, From Eugenics to Genetics, from Bezugsziffer to LOD score: the history of psychiatric genetics" (2004) 16 (4) *International Review of Psychiatry* at 248-49 [Schulze].
- <sup>52</sup> *Ibid.*; George P. Smith, *Human Rights and Biomedicine* (The Hague: Kluwer Law International, 2000) at 113. Dinwiddie, *supra* note 4 at 321.
- <sup>53</sup> Christina Cogdell, *Eugenic Design* (Philadelphia: University of Pennsylvania Press, 2004) at 233.

- <sup>54</sup> Michael J. Malinowski, "Choosing The Genetic Makeup of Children: Our Eugenics Past—Present, and Future?" (2003) 36 Conn. L. Rev. 125.
- <sup>55</sup> Ian Robert Dowbiggin, *Keeping America Sane* (Ithaca: Cornell University Press, 1997) at xi [Dowbiggin]. Farmer, *supra* note 26 at 426.
- <sup>56</sup> Bartha Maria Knoppers, *Human Dignity and Genetic Heritage: A Study Paper prepared for the Law Commission of Canada* (Ottawa: Law Reform Commission of Canada, 1991) at 43.
- <sup>57</sup> Weir, *supra* note 60 at 35.
- <sup>58</sup> A bill was introduced on March 10, 2005 in the U.S. House of Representatives which would bar health insurers and employers from discriminating against people with a genetic predisposition to disease.
- <sup>59</sup> American Psychiatric Association, News Release online: [http://www.psych.org/news\\_room/press\\_releases/geneticdiscrimination04012004.pdf](http://www.psych.org/news_room/press_releases/geneticdiscrimination04012004.pdf); see also Deborah Hellman, "What Makes Genetic Discrimination Exceptional?" (2003) 29 Am. J. L. and Med. 77.
- <sup>60</sup> Trudo Lemmens, "Selective Justice, Genetic Discrimination, and Insurance: Should We Single Out Genes In Our Laws?" (2000) 45 McGill L.J. 347.
- <sup>61</sup> *K & Others v Secretary for Justice*, (unreported) [2000] DCE03, 4, 7/99. <http://www.butterworths-hk.com>.
- <sup>62</sup> Josephine G. Wong & Felice Lieh-Mak, "Genetic Discrimination and Mental Illness: A Case Report" (2001) 27 J Med Ethics 393.
- <sup>63</sup> Baroness Helena Kennedy, *Legal Conundrums in Our Brave New World* (London: Sweet & Maxwell, 2004) at 32 [Kennedy].
- <sup>64</sup> For example, see *Re Kimberly-Clark and C.E.P., Local 440*, 1999 C.L.A.S.J. 628540 (where an individual suffering from mental illness is not permitted to return to work), *Henley v. Jamieson*, 142 Nfld. & P.E.I.R. 69 (where genetic factors are contemplated in deciding which parent should have custody of the child).
- <sup>65</sup> The state of Indiana was the first to enact legislation related to sexual sterilization in 1907. In Canada the first legislation on sexual sterilization was enacted in the province of Alberta in 1928 as the *Sexual Sterilization Act*. See Dowbiggin, *supra* note 55 at 77.
- <sup>66</sup> *Buck v. Bell*, 274 US 200 (1927) [Buck].
- <sup>67</sup> *Ibid.*
- <sup>68</sup> Phillip Thompson, "Silent Protest: A Catholic Justice Dissents in *Buck v. Bell*" (2004) 43 Catholic Law 125.
- <sup>69</sup> *Skinner v. Oklahoma ex rel. Williamson*, 316 US 535 (1942).
- <sup>70</sup> Dowbiggin, *supra* note 55 at 142.
- <sup>71</sup> A. N. Nind, "Solving an "appalling" Problem: Social Reformers and the Campaign for the Alberta Sexual Sterilization Act, 1928" (2000) 38 Alta L. Rev. 536; See Jana Grekul, Harvey Krahn & Dave Odynak, "Sterilizing the "Feeble-minded": Eugenics in Alberta, Canada, 1929-1972" (2004) 17 (4) Journal of Historical Sociology 358.
- <sup>72</sup> See *E.D. v. British Columbia B.C.D.* (2003) Civ. J. 15499; *E. (Mrs.) v. Eve*, [1986] 2 S.C.R. 388; see also *Muir v. Alberta* 132 D.L.R. (4<sup>th</sup>) 695, 1996 where a doctor attempts to argue that eugenics is a good social policy.
- <sup>73</sup> Aiden Corvin & Michael Gill, "Psychiatric Genetics in the post-genome age" (2003) 182 The British Journal of Psychiatry 95.
- <sup>74</sup> John Kelsoe, "Genomics and the Human Genome Project: Implications for Psychiatry" (2004) 16 (4) International Review of Psychiatry 294 [Kelsoe].
- <sup>75</sup> Samuel H. Barondes, "An Agenda for Psychiatric Genetics" (1999) 56 Archives of General Psychiatry 549 at 551 [Barondes]; Kelsoe, *ibid* note 136.
- <sup>76</sup> See Farmer, *supra* note 26 for an example of where the Government of Iceland sold DNA from the entire population to a biopharmaceutical company, deCode genetics, to develop new drugs for complex gene diseases.
- <sup>77</sup> Andrews, *supra* note 19.
- <sup>78</sup> Wertz, *supra* note 12 at 275.
- <sup>79</sup> Madden, *supra* note 45.
- <sup>80</sup> Anthony J. Pelosi & Anthony S. David, "Ethical Implications of the New Genetics for Psychiatry" (1989) 1 International Review of Psychiatry 315.
- <sup>81</sup> *Tarasoff v. Regents California*, 17 Cal. 3d 425; 551 P.2d 334; 131 Cal. Rptr. 14 (Cal. 1976)
- <sup>82</sup> *Dahlin v. Evangelical Child & Family Agency*, 2002 WL 31478216 (N.D. Ill., Dec. 18).
- <sup>83</sup> See UNESCO, "The Universal Declaration on the Human Genome and Human Rights" online: [http://portal.unesco.org/shs/en/ev.php-URL\\_ID=2228&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/shs/en/ev.php-URL_ID=2228&URL_DO=DO_TOPIC&URL_SECTION=201.html); Appelbaum, *supra* note 20.
- <sup>84</sup> McGuffin, *supra* note 23 at 454.
- <sup>85</sup> Wolfgang Maier, "Prospects for Genetic Research in Psychiatry" (2003) 16 (2) Current Opinion in Psychiatry S53 [Maier].
- <sup>86</sup> Nuffield Council on Bioethics, Mental Disorders and genetics: The Ethical Context. (September 1990) online: <http://www.nuffieldbioethics.org/go/ourwork/mentaldisorders/introduction> [Nuffield]; see also Appelbaum, *supra* note 20; Wertz, *supra* note 12.
- <sup>87</sup> Weir, *supra* note 50.
- <sup>88</sup> Amy James, "The Psychiatric Power and Informed Consent in Post-World War II Canada" (2002) 22 Health L. Canada 101.
- <sup>89</sup> Farmer, *supra* note 26 at 436.
- <sup>90</sup> Weir, *supra* note 50 at 286.
- <sup>91</sup> Madden, *supra* note 45.

- <sup>92</sup> Tina M. Harris, Roxanne Parrott & Kelly A. Dorgan “Talking about Human Genetics Within Religious Frameworks” (2004) 16 (1) Health Communication 105.
- <sup>93</sup> *Safer v Pack*, 677 A.2d 1188, cert. denied, 683 A.2d 1163 (1996).
- <sup>94</sup> Barbara B. Biesecker & Holly L. Peay, “Ethical Issues in Psychiatric Genetics Research: Points to Consider” (2003) 171 *Psychopharmacology* 27 at 29 [Biesecker].
- <sup>95</sup> Appelbaum, *supra* note 20.
- <sup>96</sup> Royal College of Psychiatrists, “Guidelines for Researchers and for Research Ethics Committees on Psychiatric Research Involving Human Participants” (June, 2000) online: <http://www.rcpsych.ac.uk/publications/cr/council/cr82i.pdf>.
- <sup>97</sup> Appelbaum, *supra* note 20.
- <sup>98</sup> Lori B. Andrews *et al.*, “Institute of Medicine Committee on Assessing Genetic Risks—Implications for Health and Social Policy” (Institute of Medicine, 1994), online: The National Academies Press <http://www.nap.edu/books/0309047986/html/1.html> at 99; Elliot Gershon, “The Challenges of Genetic Tests for Human Behavior” (2002) 39 (4) *Israel Journal of Psychiatry & Related Sciences* 206.
- <sup>99</sup> Maier, *supra* note 85.
- <sup>100</sup> Lori Weiss Roberts *et al.*, “Employees’ perspectives on Ethically Important Aspects of Genetic Research Participation: A Pilot Study” (2005) 46 *Comprehensive Psychiatry* 27.
- <sup>101</sup> Farmer, *supra* note 26 at 437.
- <sup>102</sup> Maier, *supra* note 85.
- <sup>103</sup> See Appelbaum, *supra* note 20 for a discussion on the role of insurance and statistics of policy refusal and Faraone, *supra* note 20 at 225-226 for a discussion on insurance.
- <sup>104</sup> *Kunin v. Benefit Trust Life Ins. Co.*, 910 F.2d 534, 538 (9th Cir. 1990).
- <sup>105</sup> McGuffin, *supra* note 23 at 129.
- <sup>106</sup> Max Yeh, Katherine I. Morley & Wayne D. Hall, “The Policy and Ethical Implications of Genetic Research on Attention Deficit Hyperactivity Disorder” (2004) 38 *Australian and New Zealand Journal of Psychiatry* 10.
- <sup>107</sup> M. Lessick & S. Faux, “Implications of genetic testing children and adolescents” (1998) 12 *Holistic Nursing Practice* 38 [Lessick].
- <sup>108</sup> L.F. Ross, “Predictive genetic testing for conditions that present in childhood” (2002) 12 *Kennedy Institute of Ethics Journal* 225.
- <sup>109</sup> Lessick, *supra* note 107.
- <sup>110</sup> Faraone, *supra* note 20 at 230.
- <sup>111</sup> Appelbaum, *supra* note 20.
- <sup>112</sup> See C. Wells, “‘I Blame the Parents’: Fitting New Genes in Old Criminal Laws’ (1998) 61 *Mod. L. Rev.* 724.
- <sup>113</sup> Kennedy, *supra* note 63 at 24.
- <sup>114</sup> For example, in a genetic research study of twins and their family members at Virginia Commonwealth University, a father of the study intercepted and opened an envelope with a questionnaire that was to be filled out by one of the daughters. The father took issue with one of the questions and that such information was requested without his consent, so he filed a complaint with the Office of Protection from Research Risks (OPRR) and the study was suspended. See United States Department of Health and Human Services, online: <http://www4.od.nih.gov/oba/sacgt/transcripts/sacgttrans6-6-00.htm> (accessed September 6, 2005). The US equivalent of an REB is an Institutional Review Boards (IRB).
- <sup>115</sup> For a discussion of ethics review within the context of schizophrenia research see, Laura B. Dunn & Laura Weiss Roberts, “Emerging Findings in Ethics of Schizophrenia Research” (2005) 18 *Current Opinion in Psychiatry* at 112.
- <sup>116</sup> Robert Michels, “Are Research Ethics Bad For Our Mental Health?” (1999) (340) *The New England Journal of Medicine* at 1427. For an extensive bibliography on the ethics of psychiatric research see, Laura Weiss Roberts *et al.*, “Ethics in Psychiatric Research” (1998) 22 *Academic Psychiatry* 1.
- <sup>117</sup> J. Bell, J. Whiton & S. Conelly, “Final Report: Evaluation of NIH implementation of Section 491 of the Public Health Service Act, Mandating A Program of Protection For Research Subjects” Office of Extramural Research, National Institutes of Health, (June 15, 1998).
- <sup>118</sup> D. Osborn & K. Fulford, “Psychiatric Research: What Ethical Concerns Do LRECs Encounter? A Postal Survey” (2003) 29 *Journal of Medical Ethics* 55.
- <sup>119</sup> Donald L. Rosenstein, Franklin G. Miller, & David R. Rubinow, “A Curriculum for Teaching Psychiatric Research Bioethics” (2001) 50 *Biological Psychiatry* 802; Eugene V. Beresin *et al.*, “Teaching Ethics of Psychopharmacology Research in Psychiatric Residency Training Programs” (2003) 171 *Psychopharmacology* 105.
- <sup>120</sup> Anne E. Farmer, Michael J. Owen, Peter McGuffin, “Bioethics and Genetic Research in Psychiatry” (2000) 176 *The British Journal of Psychiatry* 105 [Farmer].
- <sup>121</sup> See “National Bioethics Commission Seeks New Regulations For Research Involving People With Mental Disorders” (17 November, 1998) online: <http://www.georgetown.edu/research/nrcbl/nbac/nbacrlse.htm>.
- <sup>122</sup> Council for International Organizations of Medical Sciences (CIOMS), “International Ethical Guidelines for Biomedical Research Involving Human Subjects” (2002) online: [http://www.cioms.ch/frame\\_guidelines\\_nov\\_2002.htm](http://www.cioms.ch/frame_guidelines_nov_2002.htm) [CIOMS].
- <sup>123</sup> Nuremberg Code, online: National Institutes of Health <http://ohsr.od.nih.gov/guidelines/nuremberg.html>. art. 2.
- <sup>124</sup> Farmer, *supra* note 26 at 438
- <sup>125</sup> World Medical Association, Declaration of Helsinki, (1964) online: <http://www.wma.net/e/policy/b3.htm>.
- <sup>126</sup> Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans, (October 2005) online: Interagency Advisory Panel on Research Ethics <http://www.pre.ethics.gc.ca/english/policystatement/policystatement.cfm>.
- <sup>127</sup> *Ibid*, section 8.

<sup>128</sup> See the proposal of a Code of Ethics For The Life Sciences by Margaret Somerville & Ronald Atlas, “Ethics: A Weapon To Counter Bioterrorism” (2005) *Science* (in press) [Somerville].

<sup>129</sup> *Wertz, supra* note 12 at 278. For examples of Codes of Practice see, Advisory Committee on Genetic Testing. (September 1997). *Code of Practice and Guidance on Human Genetic Testing Services Supplied to the Public*. London: Health Departments of the United Kingdom, online: [http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT\\_ID=4005565&chk=ocwtl1](http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4005565&chk=ocwtl1).

<sup>130</sup> An example of a Code of Practice is the World Health Organizations’ (WHO), “Proposed International Guidelines on Ethical Issues in Medical Genetics and Genetic Services” (1998) online: <http://www.who.int/genomics/publications/en/ethicalguidelines1998.pdf>.

<sup>131</sup> *Wertz, supra* note 12 at 277.

<sup>132</sup> WHO, “Review of Ethical Issues in Medical Genetics” (2003) online: <http://www.who.int/genomics/publications/en/ethicalissuesinmedgenetics%20report.pdf>.

<sup>133</sup> Sarnoff Mednick, W.F. Gabrelli Jr. & B. Hutchins, “Genetic Influences in Criminal Convictions: Evidence From an Adoption Cohort” (1984) 224 *Science* 891; David C. Rowe & D. Wayne Osgood, “Heredity and Sociological Theories of Delinquency: A Reconsideration” (1984) 49 *American Sociological Review* 526.

<sup>134</sup> *Logerquist v. McVey*, 196 Ariz. 470, 1 P.3d 113 (2000).

<sup>135</sup> *Mobley v. State*, 265 Ga. 292; 455 SE2d 61 (1995).

<sup>136</sup> Joseph D. McInerney, “Genes and Behavior: A Complex Relationship” (1999-2000) 83 *Judicature* at 113.

<sup>137</sup> Robert M. Wettstein, “Violence and Mental Illness: Additional Complexities” in Jeremy R. Botkin, William M. McMahon, Leslie Pickering Francis, *Genetics and Criminality: The Potential Use of Scientific Information in Court* (Washington D.C.: American Psychological Association, 1999) at 109-110.

<sup>138</sup> *Wilson v. Ozmint*, 357 F.3d 461, 464 (4th Cir. 2004).

<sup>139</sup> Statistical analysis has been used to deal with the probability of an outcome and assessing personal responsibility and genetic determinism. The positive predictive power (PPP) is based on the conditional probability that an individual actually displays a specific behavioral outcome given the presence of a particular finding on a genetic test. The negative predictive power (NPP) is the probability of not having an outcome given the absence the genetic defect. See Steven O. Moldin, “Genetic Research on Mental Disorders” in Jeremy R. Botkin, William M. McMahon, Leslie Pickering Francis, *Genetics and Criminality: The Potential Use of Scientific Information in Court* (Washington D.C.: American Psychological Association, 1999) at 133.

<sup>140</sup> *Landrigan v. Stewart*, 272 F. 3d 1221 (2001).

<sup>141</sup> *Dowbiggin, supra* note 55 at 14.

<sup>142</sup> Lombroso believed that the behavior of criminals was the product of their germ plasm and the “criminal type” was someone with “a low slanting forehead, long ear lobes, a large jaw with no chin, heavy ridges above the eye socket, and either excessive hair or an abnormally small amount of hair”, Susan Horan, “The XYY Supermale and the Criminal Justice System: A Square Peg in a Round Hole,” *Loyola Law Review* 25 (1992): 1343-1346, citing Cesare Lombroso, *Crime: Its Causes and Remedies* (1911). At least one Pennsylvania prison official took up this notion of a born criminal in writing, “everyone who has visited prisons and observed large numbers of prisoners together has undoubtedly been impressed from the appearance of prisoners alone, that a large portion of them were born to be criminals.” See also Philip R. Reilly, “Eugenic Sterilization in the United States” in Aubrey Milunsky & George Annas, *Genetics and The Law III* (New York: Plenum Press, 1984) at 228.

<sup>143</sup> Richard Weikart, *From Darwin to Hitler—Evolutionary Ethics, Eugenics, and Racism in Germany* (New York: Palgrave MacMillan, 2004) at 37.

<sup>144</sup> F. E. Daniel, President of the State Medical Association of Texas, “Should Insane Criminals or Sexual Perverts be Allowed to Procreate? *Medico-legal Journal*, Dec., 1893.

<sup>145</sup> Interestingly, it was not a scientist but a Chief Justice of the Chicago Municipal Court who formed this laboratory; Philip R. Reilly, “Eugenic Sterilization in the United States” in Aubrey Milunsky & George Annas, *Genetics and The Law III* (New York: Plenum Press, 1984) at 233.

<sup>146</sup> John Cornwell, “The Prozac Story” in David Rees & Steven Rose *The New Brain Sciences* (UK: Cambridge University Press, 2004) at 230-231.

<sup>147</sup> *Blacks Law Dictionary*, 7<sup>th</sup> ed. s.v. “criminal responsibility”.

<sup>148</sup> For a discussion of how courts treat scientific evidence for responsibility in the UK see, Stephen Sedley, “Responsibility and law” in David Rees & Steven Rose *The New Brain Sciences* (UK: Cambridge University Press, 2004) at 123-130.

<sup>149</sup> Robert M. Wettstein, “Violence and Mental Illness: Additional Complexities” in Jeremy R. Botkin, William M. McMahon, Leslie Pickering Francis, *Genetics and Criminality: The Potential Use of Scientific Information in Court* (Washington D.C.: American Psychological Association, 1999) at 112.

<sup>150</sup> Diagnostic Manual and Statistical Manual of Mental Disorders (DSM-IV-TR) 4<sup>th</sup> ed. (Washington, DC: American Psychiatric Association, 2000) s.v. “antisocial personality disorder”.

<sup>151</sup> Stephen H. Dinwiddie, “Psychiatric Genetics and Forensic Psychiatry: A Review” (1994) 24 (2) *Bulletins of the American Academy of Psychiatry Law*, 327-342 [Dinwiddie]; *Dinwiddie, supra* note 4.

<sup>152</sup> For one of the earliest twin studies conducted on antisocial personality disorder see J. Lange, *Crime as Destiny* (London: Allen and Unwin, 1931); An overview and methodological critique of adoption and twin studies involving antisocial personality disorder is discussed at Peter McGuffin, Terrie Moffitt, Anita Thapar, “Personality Disorders” in

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Peter McGuffin, Michael J Owen, Irving I. Gottesman, *Psychiatric Genetics & Genomics* (Oxford: Oxford University Press, 2004) at 188-195.

<sup>153</sup> Genetic factors likely play a greater role in alcohol dependence than in alcohol abuse where respective heritabilities in one study are 0.6 and 0.4 for males and 0.4 and 0.0 for females. See Steven O. Moldin, "Genetic Research on Mental Disorders" in Jeremy R. Botkin, William M. McMahon, Leslie Pickering Francis, *Genetics and Criminality: The Potential Use of Scientific Information in Court* (Washington D.C.: American Psychological Association, 1999) at 109-110. See *S.S.D. Estate et al., v. Plint et al.*, [2001] B.C.T.C. 997 for a case where a lawyer pleads that his client committed sexual assault because of a genetic predisposition to alcoholism.

<sup>154</sup> The view that alcohol dependence clusters in families was quoted by Plutarch (AD 45-125) and has been confirmed by modern family studies. See David Ball & David Collier, "Substance Misuse" in Peter McGuffin, Michael J Owen, Irving I. Gottesman, *Psychiatric Genetics & Genomics* (Oxford: Oxford University Press, 2004) at 268.

<sup>155</sup> Lori B. Andrews, "Predicting and Punishing Antisocial Acts: How the Criminal Justice System Might Use Behavioral Genetics" in Ronald A. Carson & Mark A. Rothstein, *Behavioral Genetics The Clash of Culture and Biology* (Baltimore: John Hopkins University Press, 1999) at 116-117.

<sup>156</sup> See Lawrie Reznick, *Evil or Ill: Justifying the Insanity Defence* (London: Taylor & Francis, 1998).

<sup>157</sup> Mark A. Rothstein, "The Impact of Behavioral Genetics on the Law and the Courts" (1999-2000) 83 *Judicature* 116 [Rothstein]; Robert D. Myers *et al.*, "Complex Scientific Evidence and the Jury" (1999-2000) 83 *Judicature* 150.

<sup>158</sup> Shirley S. Abrahamson, "Forward" (November-December, 1999) 83 (3) *Judicature* 102.

<sup>159</sup> Rothstein, *supra* note 157; Joseph T. Walsh, "Keeping the Gate: The Evolving Role of the Judiciary in Admitting Scientific Evidence" (1999-2000) 83 *Judicature* 142.

<sup>160</sup> Nuffield, *supra* note 86 at 168.

<sup>161</sup> For example, the National Judicial Institute has a series of workshops and seminars related to science and law which provide judges with an understanding of genetics and ethical issues in the field. See, National Judicial Institute, online: <http://www.nji.ca/Public/subcategory.cfm?CategoryID=29> (accessed, September 4, 2005); see also Franklin Zweig & Diane E. Cowdrey, "Educating Judges for Adjudication of New Life Technologies" (1999) 83 *Judicature* 158.