

in shaping human behaviors and the outcomes of an individual's life choices.

BACKGROUND AND ISSUES

Human Genome Project

In 1990, the US Human Genome Project (HGP) coordinated by the US Department of Energy and the National Institute of Health, launched an effort to identify all of the 30,000 genes in human DNA and to determine the sequences of the 3 billion chemical base pairs that make up this DNA. To date, several genome maps have already been completed, and a working draft of the entire human genome sequence was made available to the public in June 2000. More than US\$3 billion has been spent worldwide on the HGP since its official launch in 1990. Overseers of the HGP understand that the ethical, legal, and social issues that arise as a result of their work need to be addressed as well. What would the social consequences be of revealing an individual's "genetic record" including differences in intelligence, shyness, criminality, risk taking, or even homosexuality? What effect would the discovery of a gene associated with violence have on social systems of justice? If a "particular gene" could be linked to antisocial forms of behavior, would it lead to greater or lesser acceptance of people exhibiting these kinds of actions? Would we recommend that those with this "particular gene" be treated and/or refrain from having children through conventional means? The research engenders very strong responses because of the substantial social consequences that may apply. Therefore, all of these critical research issues need to be worked out before the HGP has proceeded much further.

Gender Development

A rapidly growing body of empirical evidence reflects the importance genetics plays in determining a human's gender development. Direct socialization into gender roles by parents does not appear to be as singular an influence on children's sex-typed preferences and behaviors as social scientists once thought.³ In the past decades, human development researchers have placed too little emphasis on how genetics interacts with environmental influences to guide children's gender development. Although conventional research on gender de-

velopment has mapped out how the sexes differ in their preferences, interests, and activities and has tried to uncover the reasons why such differences emerge and why some children are more sex-typed than others, this strategy of seeking to explain gender divergence during childhood through analyzing individual differences in sex-typing has provided little insightful interpretation so far. While children's environments indeed play important roles in their gender development, as is evidenced by studies of cultural differences in gender roles, Maccoby³ argued that, normally, the daily routines of family life do not have much impact on the strong tendency of children to separate into same-sex groups, or probably also on the distinctive activities enacted by male and female groups. Research has indicated that environmental settings not only directly influence behavior, but also exert indirect effects by altering biological processes. In addition, experiments with nonhuman primates show that administering testosterone to female fetuses late in gestation yields more typically masculine behavior. Furthermore, ethological studies have revealed that gender divergences are not limited to humans, but also appear in other animals. The parallels are sufficiently strong to give us some confidence that there is an evolved, genetic basis for several of the robust gender divergences that have been documented in human children.

Behavioral problems in children from divorced families have been partially attributed to family conflict and parental maladjustment. Newly reported research findings, coincidentally, have found that both genetic and environmental factors mediate how well or poorly a child will perform after the parents divorce. From a longitudinal study of 398 adoptive and biological families (the Colorado Adoption Project), researchers examined how much children's self-concept, social competence, academic achievement, behavioral and emotional health, and likelihood of early drug use were influenced by stress associated with divorce. In the biological family sample, 28 % of the parents had divorced by the child's 12th birthday. Following the divorce, these children had more behavioral and emotional problems (aggressive behavior, delinquency, depression, anxiety, and withdrawal), lower levels of academic achievement, and poorer social adjustment as reported by their teachers. The children also reported earlier drug use more than did children whose parents were not divorced.