chapter six
Trevor, in trouble with the law

Growing up on a farm in Iowa, Trevor was always into some crazy adventure — leaping out of barn windows, diving off high rock into the quarry pond, or racing his four-wheeler across unplowed fields. His parents doted on him and let him do as he pleased.

He was a restless youth who never stuck with any activity for long, until he discovered cars. There were several junkers on the farm and he learned from his father how to fix their engines and bodies. When he was sixteen, Trevor put together a stockcar from old parts and smashed his way to a blue ribbon at the state fair’s demolition derby.

Trevor dropped out of high school in the twelfth grade and into his early thirties travelled the country on the stock car racing circuit. In this high-risk sport, he was notable for the risks he was willing to take. This is attested to by his many injuries and his many wrecked cars. Trevor’s reckless attitude — plus the heavy drinking and gambling that got him into a variety of trouble — eventually forced him out of racing.

With huge debts, Trevor got a job in a warehouse in Oklahoma. One day he impulsively stole some goods from the warehouse and fenced them. It was so easy that he began to regularly support his income in this fashion. One night with a lot of cash in his hands and investigators on his tail, Trevor decided to skip town. He and his girlfriend sped off in his souped-up sports car, but they didn’t get far. The car flipped going 130 miles an hour down a Texas highway. Today Trevor is in jail, charged with manslaughter in the death of his girlfriend.

Trevor’s family hired him a lawyer who, while doing some library research, learned about a couple of instances where defendants have pleaded not guilty by reason of their genetics. The lawyer wonders if he might be able to pursue this kind of defense. Could Trevor plausibly plead not guilty based on the argument that he was genetically compelled to act rashly?
Impulsive behavior and ADHD

There is a saying that a weed is merely a plant out of place. The same could be said of many character traits. The boisterous person might be out of place in a monastery dedicated to silence but not in the stands at a basketball game. Boisterousness, its counterpoint meekness, and many other aspects of personality are undesirable traits only when they create problems for the person displaying them or for others who interact with that person.

Are some character traits always and in every circumstance undesirable? This interesting question has been raised in the context of attention-deficit hyperactivity disorder (ADHD), a controversial but increasingly frequent diagnosis of children with problem behavior.

The primary traits associated with ADHD are impulsive activities and short attention spans. Both traits are universal to all children; however, they become hallmarks of ADHD when a child exhibits them to a much larger degree than other children of the same age in similar settings.
ADHD symptoms usually appear when children reach the ages of three to five, though in many cases they are not noticed until later. Up to 10 percent of all schoolchildren worldwide have ADHD, according to some estimates; this disorder has been found in every nation and culture where researchers have looked for it. It affects a much larger proportion of boys than girls. The problems associated with ADHD can persist into adulthood, affecting work performance and personal relationships.

Scientists speculate that ADHD is caused by underdevelopment of several parts of the brain critical to such mental tasks as being aware of oneself and time; resisting distractions; over-riding immediate impulses with reasoned responses; and delaying gratification. One way ADHD has been described is that affected persons display too much public speech and behavior; they have not learned how to internalize and self-correct their thoughts and actions.

A variety of unproven environmental factors have been suspected of triggering ADHD. These include premature birth, maternal alcohol and tobacco use, exposure to high levels of lead in early childhood, inoculations, infections, and brain injuries. Researchers have pretty much ruled out diet and child-rearing methods as causal factors for ADHD.

Researchers estimate that ADHD is 70 to 80 percent heritable. This refers to the variation in the incidence of ADHD in a population that can be attributed to genetic factors. Heritability estimates do not tell us what to expect for individuals, but family studies tell us that a child is much more likely to be diagnosed with ADHD if a sibling or parent has been diagnosed.

ADHD is believed to be polygenic, involving several genes that are normally very active in the parts of the brain that appear underdeveloped in persons suffering from ADHD.

Much research attention has focused on genes involved in the regulation of dopamine. This is a neurotransmitter, a brain chemical that carries messages between nerve cells. Some genes code for dopamine to be taken up by “receptor” nerve cells, other genes code for dopamine to be distributed by “transporter” nerve cells, and still other genes code for unused dopamine to be reabsorbed by transporter nerve cells for re-use later.

Various genes related to these functions have been tentatively associated with ADHD. One such candidate is called SNAP-25, located on Chromosome 20. In a study published in 2002, genome scans were conducted on 93 Irish families that had two or more members with ADHD. According to that study’s results, one particular allele for the SNAP-25 gene is 50 percent more likely to appear in persons with ADHD than in persons without it. Other studies have found small associations with other
Another study published in 2002 suggests that a gene associated with ADHD may lie somewhere within a specific region of Chromosome 16. This study also included genome scans, conducted on 203 families with more than one child diagnosed with ADHD. The scans revealed a series of molecular markers (DNA sequences that vary from human to human) on Chromosome 16 shared by sibling pairs more than 50 percent of the time. Since siblings share on average 50 percent of their alleles, this higher rate of sharing for the molecular markers may correlate with the occurrence of ADHD.²

Interestingly, other genome scan studies suggest that this region on Chromosome 16 may also include a gene associated with autism. This is a complex developmental disability that emerges in early childhood and interferes with the normal development of social skills and communication. Since about 150 genes lie within this region of Chromosome 16, it may not be the same gene associated with both ADHD and autism. But researchers speculate that if it is the same gene, then perhaps one neurobiological mechanism — one process involving cells of the brain — underlies both disorders.

It must be remembered that the claims for ADHD susceptibility genes at SNAP-25, the region on Chromosome 16, and several other locations remain unconfirmed. They are based on small, preliminary studies that need replication.

The ultimate quest is not to find the one gene that causes this disorder; rather, it is to find the many genes and the many environmental factors that operate interactively to trigger the range of behaviors clustered under the ADHD diagnosis.

Is ADHD a disorder or a trait?

There has been an epidemic of ADHD diagnoses in recent years. In 1985, the U.S. had between 650,000 and 750,000 individuals diagnosed with ADHD. By the year 2000 this number exceeded 4 million. School-age children receive the bulk of ADHD diagnoses, and more than three-quarters of those diagnosed are prescribed drugs (stimulants and/or anti-depressants) that serve to slow down brain activity.

Critics of the skyrocketing rate of diagnoses suggest that many children labelled ADHD may actually be suffering from allergies or may be acting out of frustration caused by undiagnosed visual problems or learning disabilities. Other critics point out that in the past people took a more benign view of the behaviors now associated with ADHD; rambunctiousness used to be considered in the range of normal. Some even theorize that the traits associated with ADHD were favorable adaptations in early humans because it took quick reaction times to succeed as hunters.

It also has been argued that increases in cases of ADHD are occurring not because...
there has been an increase in brain dysfunction among children, but rather because an ADHD diagnosis is highly subjective, convenient, and acceptable. The diagnosis is based in part (sometimes in whole) on observations from people such as teachers who do not have medical training; it opens the door for special services from education systems; ADHD medication makes children more docile and less challenging; and the public now has a very relaxed attitude about treating problems with drugs.

It also has been pointed out that if children today are more restless and distractible, it is not because of problems inside their heads but rather because of problems in our culture. The fast pace of life, the onslaught of media messages, consumerist clutter, reduced opportunities for children to run free and play actively, fewer chores and other responsibilities given to children that would teach them to behave maturely: these are the conditions of modern life that create restless and out-of-control children, they say.

Others argue that restlessness and distractibility are natural to children; what is unnatural is our restrictive social environments. As one commentator has pointed out, “Why don’t we have a disorder called ‘quiet listening’? Maybe ‘bodily shrieking’ is the healthier behavior.” The controversy over whether ADHD is a medical or social disorder complicates but does not impede the search for the underlying genetic contributors to the behavior.

The majority of children diagnosed with ADHD are prescribed drugs to modify their behavior.
Novelty-seeking: a positive impulsive trait

Impulsivity, a prominent feature in ADHD, is also a feature of a behavior with more positive social connotations. This behavior is called novelty seeking, and it has been a favorite subject of study for genetic researchers. Novelty seekers are people who thrive on new experiences and heightened sensations. They enjoy adventures such as skydiving, mountain climbing, travel to exotic locations, or other extreme experiences.

Researchers identify novelty seekers through personality inventories completed by subjects about themselves and through scores on rating scales completed by observers of individuals. Those who score high in the trait are described as "impulsive, exploratory, and extravagant," while those who score low are described as "stolid" or "reflective and rigid."

Researchers speculate that novelty seeking, like ADHD, is related to activity of the brain chemical dopamine. In 1996, two association studies found a tentative correlation between novelty seeking and particular alleles of a gene called DRD4. Some subsequent studies supported a correlation between longer DRD4 alleles (i.e., those with more tandem repeats) and the novelty-seeking trait, while others contradicted it. A 2002 meta-analysis of DRD4 studies could not find any statistical association. The authors of this meta-analysis study suggested that the correlation may occur in the presence of as-yet-unknown "moderating" genes, which would account for contradictory findings. Still more studies have explored but not confirmed a connection between DRD4 alleles and alcoholism, drug abuse, depression, and ADHD.

Antisocial personality: a negative impulsive trait

Impulsivity is central to a slew of disorders listed in the key clinical reference book known as DSM-IV-TR. Along with ADHD, these include intermittent explosive disorder (the loss of control over impulses toward aggression), kleptomania (the impulse to steal unneeded objects), pyromania (the impulse to set objects on fire), trichotillomania (the impulse to pull out one's own hair), and other disorders.

Yet another diagnosis in DSM-IV-TR is antisocial personality disorder. A broad range of conduct falls under the label antisocial personality disorder and includes lying, cheating, breaking the law, aggressiveness, lack of social conscience, violating social norms, and acting with reckless disregard for others. It is the same condition that used to be described as "psychopathic" and "sociopathic."

Researchers theorize that antisocial personality disorder may emerge when persons with predisposing genotypes experience stressful environments. Specific genes remain wholly unidentified, but correlations have been found for...
such environmental factors as living in a poor urban area, living in high-density housing, experiencing violence in the home, and living with other familial dysfunctions.

One relevant study, of two-year-old twins in England and Wales, indicates that living in a deprived neighborhood is a greater risk factor for emotional and behavioral problems than any genetic factor. Many people grow up in deprived neighborhoods yet do not become antisocial. This is evidence that a given environment does not by itself cause antisocial personality disorder. By the same token, there is little likelihood that any particular gene causes antisocial behavior by itself.

In 2001, a meta-analysis was conducted of 51 twin and adoption studies...
having to do with antisocial behavior. Through this project, scientists found that these proportions best explain the variance of antisocial behavior in the general population: additive genetic influence, .32; nonadditive genetic influence, .09; shared environment, .16; and nonshared environment, .43. Think of these numbers as percentages. Note that they do not explain how genetic and environmental factors operate to affect the trait. They merely indicate that different genetic and environmental factors are present and exerting influence to relative degrees.

Many studies suggest that antisocial behavior peaking in adolescence (so-called juvenile delinquency) is more heavily influenced by the environment, specifically, peer pressure. In comparison, antisocial behavior that shows up in early childhood and continues throughout life may be more heavily influenced by genes.

Criminality: a legal description, not a trait

Antisocial personality disorder may propel an individual into crime but not everyone who commits a crime is antisocial. Nor are all crimes committed impulsively. A case in point is the civil rights activist of the 1960s who deliberately violated the law to protest Whites-only lunch counters. Criminality is not an official diagnosis in DSM-IV-TR; rather, it is a popular label for breaking the law, being arrested, or being convicted of a crime.

Criminality has been a target of study in behavioral genetics for two major and distinct reasons. First, crime is an issue of significant public concern. Second, the official records from the criminal justice system are an abundant source of data.

Yet research into criminality is problematic because, as many sociologists have pointed out, criminality is not an objectively measurable trait such as blood pressure or height. Rather, it is a social construct. There probably is not any behavior that is criminal across all contexts. Child sacrifice was acceptable in ancient Carthage, but in modern societies infanticide is a repugnant criminal act. In Industrial Age England, a poor wretch in the city could be put to death for stealing linen scraps from a factory, but a member of the gentry did not face penalties for enclosing commons land. Until 2003 in the United States, it was a crime (in some states but not in others) to engage in consensual homosexual sex in
the privacy of one’s home. Today it is against the law to possess small amounts of marijuana in the United States, but it is not a crime in neighboring Canada.

Furthermore, enforcement of the law is selective. Traffic cops are much more likely to pull over Black or Latino drivers than White drivers. Blacks and Latinos also are much more likely to be pursued on drug charges than Whites, even though the latter violate drug laws in far greater numbers. The criminal defendant who can afford private attorneys stands a better chance of avoiding conviction than the defendant who must rely on court-appointed lawyers.

In sum, cultural variables determine which deeds and which persons are labelled criminal. “Criminality” per se is not an intrinsic trait, and this is important to keep in mind when reading about genetic research in this area.

**Research into criminality**
A highly publicized study of criminality was published in 1965. Chromosomal analysis of 197 men in a Scottish high-security prison found that seven of them had an extra Y chromosome. (The standard pattern is for women to have two X chromosomes and for men to have one X and one Y). The 7/197 ratio at the Scottish hospital led the researchers to suggest that an extra Y chromosome might cause aggressive behavior and mental “subnormality.”

Later studies showed that XYY men were taller, lower in intelligence, at greater risk for severe acne, and more likely to be imprisoned, on average, than XY men. However, these studies did not support the association between XYY and aggressive behavior. It also was discovered that XYY men are relatively common: about 1 in every 1,000.
The XYY chromosome has been found in many men leading normal, law-abiding lives. One plausible theory is that XYY men may be more likely to end up in jail because their lower average intelligence depresses their ability to find gainful work and to make wise choices.

While the XYY/crime connection is indirect at best, another chromosome combination is strongly linked to criminal behavior. Geneticists like to point out with a smile that if you have a single Y chromosome you are much more likely to commit a criminal offense than if you do not have one. Indeed, males make up a much larger proportion of the prison population than females.

Much of more recent research into the genetics of criminality has focused on an enzyme in the brain called MAO (monoamine oxidase). MAO's job is to break down excess neurotransmitters. Insufficient amounts of MAO can lead to the accumulation of neurotransmitters and this can interfere with the proper relay of messages between nerve cells and between nerve cells and muscles.

Low levels of MAO are correlated with mental retardation. They also are correlated with the behavior problems of addiction, reduced inhibition, lack of self-control, and aggression. Several studies have found a relationship between low MAO levels and criminality. This has led to a theory that people who have low MAO levels react more impulsively to circumstances and are therefore more
likely to commit a crime.

In the 1980s, a Dutch family came to the attention of researchers. The reason was that, over several generations, male members of this family had been prone to violent and aggressive outbursts. These men had committed various criminal acts such as raping a sister, stabbing a man with a pitchfork, committing arson, and attempting to run over another man with a car.

In the early 1990s, researchers began focusing on a gene on the X chromosome that coded for a version of the MAO enzyme called MAOA. They discovered that the aggressive males in the Dutch family shared a particular allele for this gene. However, this notorious allele appears to be confined to the Dutch family. Criminals outside the family have different alleles, some leading to low MAOA levels and others not.

MAOA came up again in a 2002 study of 500 males. It was found that the men with genotypes leading to low levels of MAOA were significantly more likely to be antisocial as adults, but only if they had been maltreated and abused as children. The men with genotypes leading to low levels of MAOA who had not been maltreated did not become antisocial, nor did those men with genotypes leading to high levels of MAOA who were maltreated. The study is significant because it demonstrates the critical role of gene-environment interaction.

The myth of “genes for criminality”

When the Scottish XYY research was first published, news accounts unfortunately tended toward the sensational. Many members of the public came to the frightening conclusion that this chromosomal combination creates Frankenstein-like supermales. In similar fashion, press coverage of research on the Dutch family’s unusual MAOA allele tended to exaggerate findings, leading many to believe that a “gene for criminality” had been discovered.

In the words of a pair of scientists writing on this topic, “Notions such as ‘genes for crime’ are nonsense.” They add: … the following kind of notion is reasonable: There may be partially genetically influenced predispositions for certain behavioral tendencies, such as impulsivity, that in certain experiential contexts, make the probability of committing certain kinds of crimes higher than for individuals who possess lesser degrees of such behavioral tendencies.

Note the phrase “certain experiential contexts.” Given one set of unfolding circumstances, a particular genotype might tip a person toward socially approved behaviors. Given another set of circumstances, that same genotype might tip the person toward socially unacceptable behaviors. Imagine a person who storms into a house on fire to rescue victims trapped inside. Now imagine another
Many genes, both known and unknown, contribute to the traits that together characterize the illness known as schizophrenia. The trampoline-like “reaction surface” illustrates the range of possible phenotypes given genetic and environmental inputs over a lifetime.

Illustration © Irving I. Gottesman. Used with permission.
person who storms into a locked home to burgle it. It is not hard to further imagine one person who could do both deeds in response to different stimuli.

Geneticists describe this collection of possible outcomes as a *norm of reaction* or *reaction range*. These terms describe the variety of phenotypes that result from a given genotype across each possible environment. It is visually depicted as a trampoline-like surface that dips up or down depending on the pressure of various genetic and environmental inputs.

It is possible today to sketch the norm of reaction for a plant, as we know from the study with yarrow cited in Chapter 3 and scores of similar botanical experiments. Plants can be grown in conditions that each vary by only one factor such as a gene or a degree of sun, soil, light, or nutrient. It is not yet possible to sketch the norm of reaction for a human behavior. Humans cannot be constrained and bred the way plants can. Their genetic makeup and their environments vary to far greater degrees. Behavior is far more difficult to define and measure than plant heights or flower petal numbers.

Add in developmental interactions that occur in a human life and the elements that must be included in a norm of reaction become infinite. However, it may eventually become possible to sketch the norm of reaction for the most significant environmental and genetic factors that operate together to influence a person’s behavior.

**Trevor’s defense**

Based on available evidence from the field of behavioral genetics, one can state emphatically that genes do not equal fate. The lawyer’s legal scheme for Trevor dashes against this rock. A defense to the manslaughter charge based on genetics would very probably fail to acquit Trevor. It might even backfire.

When Trevor drove his car at very high speed, leading it to flip and fatally injure his passenger, he was acting impetuously and without regard to the possible consequences. Given his history of reckless behavior, he might try the “I couldn’t help myself” defense. However, the criminal law tends to presume that free will prevails in most circumstances, so this is not an argument that judges or juries typically accept. Adding a genetic explanation to this excuse is not likely to improve Trevor’s prospects.

Some defendants have tried to argue that they were not in charge of their behavior when they committed their crimes because they were intoxicated or under medication. These excuses rarely work, because one can choose to drink and one can choose to restrict one’s own behavior while under medication (for example, by choosing not to drive while medicated). Sometimes these kind of mitigating factors lead to reduced charges or reductions in punishment, but they rarely allow the defendant to completely evade the legal consequences. For Trevor to argue that he could not help driving
too fast because he was under the influence of his genes is therefore not likely to help him too much. Courts operate on the assumption that people must take responsibility for what they do regardless of underlying biological processes.

The main exception is **insanity**. In 1982, John Hinckley successfully used an insanity defense in court to escape conviction for his attempted assassination of President Ronald Reagan. The public was outraged. As a result, the insanity plea is much harder to win today. But many defendants avoid insanity pleas for another reason. The saying “out of the fire, into the frying pan” applies here: with an insanity plea you might avoid prison, but you’ll end up instead in a hospital for the mentally ill where your sentence may be indefinite.

Another problem for Trevor is that even if he has a genetic excuse, he lacks an environmental excuse to go with it. Say, for example, that Trevor can claim to have a genotype that leads to low levels of MAOA. A study cited earlier in this chapter suggests that adult antisocial behavior is more likely only if you have this MAOA profile and were abused as a child. Trevor cannot honestly claim to have been abused (though his lawyer might try this argument). In any event, reckless driving does not fall squarely into the category of antisocial behavior. At present, research provides Trevor with no other plausible genetic-environmental explanation for his behavior.

Legal scholars note that people are more likely to be excused for a crime if the conditions that caused them to commit the crime are relatively rare, not violent, not likely to be repeated, and treatable. Unfortunately for Trevor, these conditions do not hold with a genetics-based defense. First, large numbers of people carry low MAOA genotypes, the DRD4 allele, and other DNA markers and genes that have been associated, albeit tenuously, with various manifestations of impulsivity. If Trevor has one or more such alleles, it would not be rare. Second, Trevor’s action resulted in a violent death. Third, if Trevor is not punished for his reckless driving it is reasonable to assume he will drive that way again. Fourth, it would be a real stretch to argue that medications available for impulsive disorders, such as the drug Ritalin for ADHD, guarantee a lighter foot on the gas pedal.

Legal scholars also speculate that bringing behavioral genetics into criminal cases will have less impact on trials than
it will on case decisions made by prosecutors and judges. If Trevor claims “my genes made me do it,” he may be sending the message that he cannot be reformed. This could motivate the prosecutor in criminal court to try the case instead of dropping it or plea bargaining (dropping serious charges if Trevor pleads guilty to a lesser charge). It also could impel the judge to give Trevor a harsher sentence once convicted.

**Potential research consequences**

Trevor may not be able to make use of genetics for his legal defense, but scientists may be able to make use of Trevor for behavioral genetic research. If he is convicted of manslaughter, information from his DNA will be entered into a database of convicted felons. Trevor’s genotype will be profiled at more than a dozen loci where the number of tandem repeats varies. As of 2003, every U.S. state except Mississippi and Rhode Island had such a database networked into the FBI’s **CODIS** (Combined DNA Index System), profiling more than 1.4 million offenders. The trend is for states to expand their DNA collections to include not only convicted felons, but also people convicted of misdemeanors as well as arrested suspects. It also has been proposed that the U.S. Justice Department establish a DNA database containing samples of anyone suspected of associating with terrorism.

Existing databases are proving to be highly useful tools by which law enforcers catch repeat offenders. DNA from a crime scene is compared to DNA in the databases. If a match occurs, this is evidence that is considered scientifically reliable and that is admissible by the courts.

Under current law, the tissue samples from which DNA is profiled (such as blood or saliva) are off limits to researchers, but they are tempting treasure troves and the law is subject to change. A major concern over opening sample collections to research is that they are not reflective of the population at large. For a variety of complex factors, the population of those arrested and convicted is disproportionately male, minority, and poor.

The possibility exists that a researcher conducting genome scans on samples collected for a criminal database might find an allele that occurs more than randomly and claim (or be misreported in the media as claiming) to have found a “gene for” criminal behavior. What the researcher might actually have found is an allele that is more common among, say, poor whites from the Bayou who couldn’t afford good lawyers, Mexicans caught up by immigration violations, or African Americans who faced racist juries. Such a claim could lead to discriminatory actions against others of the same demographic group who share the allele.

Another consequence of genetic research that relies on arrest or conviction...
as synonyms for the criminal phenotype is that it will disproportionately focus on those who have committed “blue collar” crimes (assaults, property theft, petty drug offenses, etc.) compared to subjects who have committed “white collar” crimes (tax evasion, information theft, large-scale drug dealing, etc.). This is because those committing the latter type of crime are caught less often. Such research would inevitably reinforce the stereotype that the working class is more deviant than the professional class.

Treatment concerns
Genetic research into impulsivity will have substantial social value if the concerns described above can be overcome and if the research leads to treatment that prevents people from killing, stealing, and hurting others. The most likely form of treatment to come out of this research is medicines that compensate for improper levels of proteins and other compounds (such as electrolytes) that result from problem alleles. In the near future we can expect to see a wide range of behavior-modulating medicines developed as a direct result of gene research.

Another possible form of treatment is environmental intervention. We already know about some of the key non-genetic factors that promote healthy development and, as one part of that, good self-control: prenatal care, adequate nutrition, reduced exposure to toxins, improved education and work opportunities, and so forth. Behavioral genetic research may help us understand how specific environmental stimuli interact with specific genomes. This information could be used to try to prevent an individual’s environment from undermining genetic mechanisms related to self-control.

In theory, gene therapy could someday be used to treat problem behavior. But so far gene therapy experiments to cure single-gene disorders have met with limited success. This means that gene therapy to treat polygenic behavior traits remains a very remote prospect.

Another medical intervention that could theoretically be used to avoid unwanted behavior is pre-implantation diagnosis and selection. In couples that have a family history of a single-gene disorder, the DNA of embryos created through in vitro fertilization can be analyzed for one or more disorders and/or traits; those without problem alleles can be selected for implantation into the mother. The procedure also is increasingly being used to select for gender. Given the complex and indirect relationship between genes and behavior, it is doubtful that this procedure could ever be used to select for behavior in any but the most approximate senses.

Past efforts to curb undesirable behavior through medical intervention give rise to fears about genetics-based efforts of the same kind. The history of the surgical procedure lobotomy is rele-
vant here. A lobotomy is a slice into the brain. This reduces transmission of nerve messages between parts of the brain, which subdues behavior drastically and permanently.

In the late 1930s, the lobotomy came into vogue as a way to treat seriously mentally ill patients. This happened primarily through the promotional efforts of a single highly enthusiastic neurologist. The target population for the surgery soon expanded to include prison inmates, problem children, difficult family members, and political troublemakers. Tens of thousands of lobotomies were performed in the U.S. and around the world. In 1949, the surgeon who first developed a lobotomy procedure for use on humans was awarded the Nobel Prize in medicine. This gave a huge boost to the procedure’s respectability and popularized it even more. But within a few years lobotomies fell out of favor due to the many ethical objections, the growing awareness of the operation’s terrible side-effects, and the lack of evidence that the procedure worked. Also, by this time new drugs had emerged for treating uncontrollable behavior. The temporary ascendancy of this misguided treatment shows what can happen when the medical profession and the public jump too quickly on the bandwagon of unsubstantiated research.

The story of ADHD treatment is less dramatic, but equally pertinent to any discussion about medical treatment of behavior. Earlier in this chapter we described the dramatic rise in the number of ADHD diagnoses in recent decades and the equally dramatic rise in the number of children being prescribed drugs for this condition. Many ADHD patients say — and their parents, doctors, and educators report — that with medication they are better able to focus and concentrate and less likely to act out inappropriately. These behavior changes allow them to do better in school, develop more friendships, and otherwise function like their non-ADHD peers.

On the other hand, some children exhibit side effects from these drugs such as nervousness, insomnia, depression, respiratory problems, blood pressure abnormalities, and cardiac complications. Research has yet to prove whether ADHD medications are safe for long-term use, especially with children who are still growing.
There are non-medical treatments for ADHD and these include placing affected children in smaller groups and more structured environments; teaching caregivers the strategies that work best for dealing with children who have a hard time staying focused; and providing children with behavior modification therapies. These treatments are time-consuming, more expensive in the short run, and more difficult to evaluate, which explains why they get short shrift compared to pharmacological solutions.

The moral of the story is that medication can easily become the first response to any perceived social problem. Genetic research could well increase the number of drugs used to treat behaviors. This gives renewed urgency to such questions as:

- What standards will be used to decide when a behavior is normal or in need of treatment?
- How do we select among different ways to treat the behavior?
- Who will have access to a behavior-modering treatment that improves quality of life?
- What rights does a person have to refuse behavior-modering treatment?
- Will our increased ability to control behavior reduce ranges of behaviors tolerated by society?
- What are the societal consequences when the range of acceptable behavior is restricted?

Other research concerns
Research into impulsive behavior, especially criminality, has been a flashpoint for controversy into behavioral genetic research in general. Many people believe that scientific facts often get hijacked (and pseudo-facts invented) to reinforce existing stereotypes and injustices. By this line of reasoning, any research into the genetics of criminality will do more harm than good.

Some people complain that because science is so revered in our culture, genetic explanations for behavior get more respect than other explanations. Sociologists raise an interesting point in this context. They note that the vast majority of variation in human behavior is cultural, not genetic. The clothing people
wear — sandals or stilettos, skirt or sari, ball cap or beret — depends upon the point in time, geography, and society in which they live, not their genes. The same can be said for human variation in music making, games, eating patterns, and every other category of behavior both mundane and special.

Another relevant concern, touched upon earlier in this chapter but important enough to review here, is that what we perceive to be human traits are social constructions, not empirical facts. European colonialists of the 16th century viewed skin color as a defining human trait (humans had light skin). During the Inquisition the Spanish viewed religion as a human trait (humans were Catholic). In the early twentieth century, scientists considered attraction to sea faring (so-called thalassophilia) a human trait. The point is that some traits that dominate behavioral genetics research today — “impulsivity” for example — may turn out to be misdirections.

Notes
1 See Brophy, K., et al. (2002).
3 Karen LeBacqz, Professor of Theological Ethics, Pacific School of Religion, statement at meeting of the Hastings Center Behavioral Genetics Working Group, May 2002.
5 See Kluger, A. N. et al. (2002).
7 Caspi, A. et al. (2000).
11 Caspi, A. et al. (2002).
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