group differences in terms of race. Sometimes it is the powerful who engage in such practices, in controversial books such as *The Bell Curve* (Herrnstein and Murray 1994). Sometimes, however, it is members of politically and economically marginalized groups who do so, as a calculated move in political struggles with those who dominate them.

Perhaps no more complicated set of questions has been raised about race in the twenty-first century than those that have emerged following the completion of the Human Genome Project (HGP) in 2003. The goals of the project were as follows:

- to identify all the approximately 20,000–25,000 genes in human DNA
- to determine the sequences of the 3 billion chemical base pairs that make up human DNA
- to store this information in databases
- to improve tools for data analysis
- to transfer related technologies to the private sector
- to address the ethical, legal, and social issues that may arise from the project (http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml)

As anthropologist Nadia Abu El-Haj (2007) has shown, some molecular biologists quickly mobilized the information produced by the HGP to attempt to develop forms of medical treatment based on the identification of genes associated with particular diseases. Some formed private biomedical research companies that promised to help create a future of *personalized medicine*: therapies based on knowledge of individuals' genomes that were precisely tailored to a particular individual's degree of genetic risk for a particular disease.

In recent years the cost of sequencing individual genomes has been dropping; Tattersall and DeSalle predict that "with the $1000 genome on the horizon, we will soon have the ultimate tool for individualized medicine" (2011, 184). However, the cost has been high enough that many researchers have used genetic data from other members of populations to which individuals belong as a surrogate, or stand-in, for an individual's particular genome. For example, if your mother's brother suffers from a particular disease with a genetic component, researchers may conclude that you and other biological relatives have an increased risk for that disease. That is, your biological family becomes a surrogate, or stand-in, for genetic risk factors that potentially are faced by individual family members. As Abu El-Haj explains, some biomedical researchers in the United States use "racial" groups as surrogates for individuals who consider themselves members of such groups. The thinking is that if a genetic disease marker shows up in the genomes of some people said to be members of a particular "race," then this may be an indication that other people classified in the same "race" might also be at risk for the disease.

Does this pragmatic use of race in medical research mean that the researchers are committed to the doctrines associated with scientific racism? Abu El-Haj (2007, 284) says no, for two reasons. First, the old race concept focused on the classification of *phenotypes*, whereas the new race concept classifies *genotypes*. The transition from a phenotypic to a genotypic view of race came about, she says, as a consequence of changing historical understandings of sickle-cell disease in the United States. In the first part of the twentieth century, sickle-cell anemia was identified as a disease of "black" people—of African Americans. But later, as we will shortly discuss, research in population genetics traced its cause to molecular genes: the presence of an abnormal "sickling" hemoglobin allele at a particular locus on a chromosome. "At the meeting point between these two definitions of the disease . . . the commitment to race as a molecular attribute took form," leading over time to "the correlation of disease risk and racial difference" (Abu El-Haj 2007, 287).

Second, nineteenth-century race science aimed to discover how many races existed and to assign all individuals to their "true race." The commercial technologies used by biomedical researchers regularly distinguish human populations in terms of the continents from which their ancestors presumably came. But all these technologies assume that everyone has a mixed ancestry of some kind; the goal is to measure how much of which ancestry markers are present in each population, thereby determining the degree of risk that members of that population face for genetic diseases associated with particular ancestries. As Abu El-Haj (2007) says, ancestry markers "are not used to discover one's 'true' race. . . . Instead, ancestry markers are used, for example, to understand the Puerto Rican population's risk for asthma" (288). That is, if genome analysis determined that some ancestral population contributed genes to contemporary Puerto Rican populations that enhanced their risk for developing asthma, this information would be crucial in devising personalized drugs precisely keyed to individuals with different risks for asthma.

Third, Abu El-Haj (and others) have pointed out that many African Americans view medical research and drug trials in which they are involved to be nothing less than a form of long-overdue biomedical justice. Anthropologist John Hartigan recently reviewed studies showing that, starting in the 1980s, the U.S. government began to respond to pressure from racial minorities protesting the fact that most medical research focused on white males only. The exclusion of groups like African Americans in such research, however, was the result of