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Scientists and Students, Preachers and Pickers Scrutinize the Genome Project's Impact on Society

Does evangelist Billy Graham believe that genes control human behavior? What does Francis Collins, director of the National Human Genome Research Institute, expect the Human Genome Project to do for mankind?

Like most of us, University of Alabama undergraduates had no idea. So they asked.

The undergraduates are students in a new seminar called *Decoding Ourselves: The Impact of the Human Genome Project on Science and Society*. It's the brainchild of Guy Caldwell, an assistant professor of biological sciences who is supported in part by an HHMI undergraduate biological sciences education grant. Caldwell, whose research examines the basic cellular and genetic mechanisms underlying neurological diseases, was named a Basil O'Connor Scholar by the March of Dimes for his work on the molecular basis of brain birth defects.

His seminar students interviewed diverse people—biomedical scientists and bartenders, rock musicians and rabbis—about the implications of genetic research for individuals and society. "Should genetic testing of job applicants be allowed?" they asked. "What about testing of children up for adoption?"

One student asked John Wolfe, a bass "picker" for the rock band Red Label Revolver: "Now that the human genome has been decoded, does genetic discrimination pose enough of a threat to society to slow or stop genetic research?" Wolfe replied: "The reality of discrimination is that it occurs in every facet of human behavior. It shouldn't slow progress."

Collins, who directed the international project that mapped and sequenced the human genome, was one of several biomedical researchers the students interviewed. He said: "The study of the human genome will allow us to diagnose and treat diseases more efficiently, but it may not eliminate most diseases. One of the most promising fields to emerge from the Human Genome Project is pharmacogenomics, which will enable us to tailor-make drugs according to an individual's genetic makeup."

Preston Parrish, executive vice president of the Billy Graham Evangelistic Association, told the students: "The human genetic code is a stunning demonstration of the matchless wisdom and creative power of Almighty God. Understanding its function holds the potential for both benefits and dangers. Among the benefits is the possibility of knowing earlier about likely medical and behavioral problems, enabling us to be better prepared to cope with their challenges. Even this possibility, however, presents serious ethical issues that must be addressed in a manner consistent with God's standards. Among the dangers is the tendency to blame behavioral problems on genetics to an extent that dismisses our personal responsibility for our choices and actions."

The interviews were one cornerstone of the class. Required reading included the classic February 15, 2001 issue of the journal *Nature*, in which the human genome was published, and British science writer Matt Ridley's critically acclaimed book, *Genome: the Autobiography of a Species in 23 Chapters*. Students heard and questioned guest lecturers such as Katherine Wenstrom, director of the Division of Reproductive Genetics at the University of Alabama School of Medicine and expert on genetic testing, and David Winer, scientific director and stem cell researcher at Reproductive Biology Associates, a private Atlanta in vitro fertilization clinic.

The class also used an Internet message board where students debated some of the stickiest issues raised by the decoding of the human genome. Ashley Ragsdale, a junior biology major and HHMI undergraduate research intern, asked: "Do you think genes cause people to become homosexual, thrill-seeking or anxiety-ridden, or do you think that genes merely bias the psyche so that different individuals react to similar experiences in different ways?" Sarah Adair, also an HHMI intern and junior microbiology major, replied: "Our coping mechanism is genetically determined whether or not it is conditioned by our environment." Ragsdale disagreed. "I think that our coping mechanisms are merely reactions to external or environmental stimuli. How can we have a controlled reaction to something that cannot be controlled?"

Caldwell's goal is to help students understand the science of the Human Genome Project and to examine its potential consequences. "Nothing is more

personal than our own DNA—our genetic makeup—and the consequences of understanding it are enormous, for the individual and for society," he said. "I hope this course helps students broaden their perspective of humanity and what defines it, to counteract fear with knowledge."