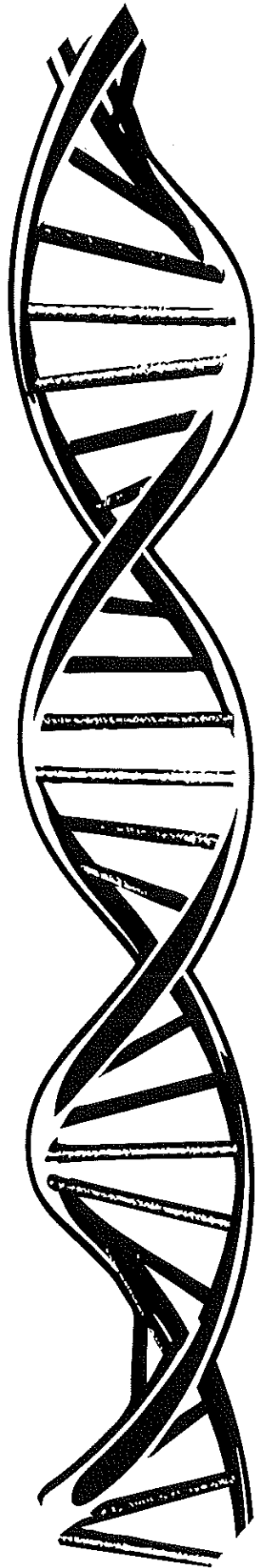


sociology and the gene

by kate ledger



Sociologist Guang Guo had long studied the effects of family environment on children's education when he began to feel the tools of the discipline were coming up short.

His research relied on surveys, twin studies, and "hard-core statistical analyses," he says, but 10 years ago, as a new faculty member at University of North Carolina at Chapel Hill, he began to feel sociology, like a range of other fields around him, wasn't addressing a vital question.

"Almost all the social sciences, including economics, basically assume individuals are the same at first," he says, "then we attribute subsequent differences to social environment." What didn't sit right with him was "the tendency ... to treat the individual as a black box."

Amid a great explosion of genetic information in the late 1990s, Guo realized it would soon be possible to address that black box differently. "I followed the literature [in genetics]," he recalls. And, astounding some of his colleagues, he headed back to undergraduate lectures, taking classes that included molecular genetics, human genetics, and genetic epidemiology. His intent was to gain a handle on biological information that could complement and refine his study of social influences. "If there are genes [for a behavior]," he wanted to know, "what do they mean for sociology?"

Today, with a genetic vocabulary at his disposal, Guo has become one of a new generation of sociologists across the country using genetic data to advance sociological research. The approach is so new, in fact, there isn't quite a name for it yet. Guo's colleague at Chapel Hill, sociologist Michael Shanahan, who recently assembled a panel of researchers for an upcoming conference on the topic, acknowledges, "I'm calling



Dr. Francis Collins, director of the National Human Genome Research Institute, announced the successful completion of the human genome project in 2003.

it genetically informed sociology."

There are indications this tack is taking off. A recent special issue of the *American Journal of Sociology* (AJS) included an array of studies incorporating genetic information, and an issue of *American Sociological Review* published an article last year (by Guo) describing genes and delinquency. What's more, new genetic data is becoming available in sociological studies. The National Longitudinal Study of Adolescent Health (known as Add Health), not coincidentally run at UNC, will soon make available additional genetic information to complement other surveys on another 15,000 individuals.

The world was abuzz in 2003 when scientists announced the completion of the Human Genome Project, which identified more than 20,000 human genes and sequenced more than 3 billion chemical base pairs that comprise DNA. At the time, few sociologists considered such a development relevant to their work. Many even bristled as the medical research community attributed gene after gene not only to disease states but to an ever-widening array of traits, from aggressiveness to religiosity.

But according to medical sociologist Bernice Pescosolido at Indiana University, the vast accumulation of data began to reveal dead-ends of understanding about how genes influence the way humans live.

"They thought they were going to unlock the genome

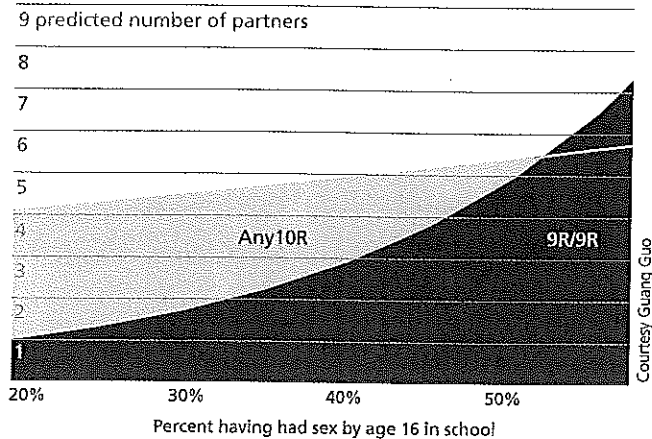
and we were going to have all the answers," she says. In fact, geneticists quickly discovered that the social environment often interacts with genetic factors, promoting the expression of a gene or dampening it. Moreover, she adds, it became clear that some genes, as a blueprint for human life, weren't necessarily a pre-determined, fixed code but could be altered in an individual through such events as childhood trauma. "Social environment actually changes genes, and that, I think, is something that [geneticists] didn't anticipate, the plasticity of the genome itself."

Suddenly the questions being raised by geneticists and medical scientists were doubly pertinent to sociology. Yet even though a handful of social scientists began publishing on the

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topic, few discussions were on the table about how this new biological information could affect the field. In 2006, three sociologists—Peter Bearman at Columbia University, Sara Shostak, now at Brandeis University, and Molly Martin, now at Penn State University—organized a conference to prompt that kind of talk. Shostak, who was then a fellow at Columbia, says the three saw the conference as an opportunity to engage an

Genes, partners, and sex among teenagers



9R/9R usually has a protective effect against sexual behavior, not so, though, in some kids.

interdisciplinary topic that had "kind of been verboten up until that point."

The conference itself, funded by the Robert Wood Johnson Foundation and held at Columbia, was attended by 10 participants from around the country and what surprised them all was that "even within this narrow subset of sociologists there was a remarkable range of modes of engagement," says

sociologists do. "I had several sociologists say to me that they don't agree with sociobiology [the application of evolutionary principles to sociological problems], and this shocked me, because this line of work has very little to do with sociobiology ... That revealed to me that there's a lot of misinformation and misunderstanding about what we're doing."

And then, he adds, there are those in the field who challenge this line of research altogether, asking, "how can you look for the genetic basis for socially constructed behaviors?" The answer, he says, is that "even socially constructed behaviors have components which reflect the basic workings of the mind. And really, how could you have socially constructed behavior which in no way reflects the workings of the human mind? That's impossible."

Some concerns have been raised about whether genetically informed sociology will lead to racial essentialism or perceptions of innate differences between people. Further, some sociologists have voiced concern that such studies will be used by the public as proof of genetic determinism—as Shanahan puts it, "further evidence to blame the victim." He acknowledges that the information could be used by some people in this way, but he insists, however, the point of such sociological studies is to show how "genetics are absolutely conditioned by social experiences. We're providing a new line of evidence that's very compelling, arguing for the improvement of people's social experiences."

All the while, more and more evidence from research in a wide range of fields suggests genes and the environment interact to create behavior. Genes may exert influence by shaping social processes, for example, predisposing people to create certain types of networks. In turn, social factors like stress

may turn certain genes on or off, for instance, triggering disease. And variations of certain genes may be affected differently by the same environmental influences. All of it suggests the increase in genetic information has created an important role for sociologists. For the field itself, says Pescosolido, "I have no doubt this is a watershed moment."

What's clear is that "thinking with genes" offers a new perspective on topics that have long interested sociologists. And in fact, the approach is not unlike that of twin studies, says Jeremy Freese, a sociologist at Northwestern University. Ultimately, genetic data provides "more direct evidence" of similarity between people than twin studies and answers some of the concerns sociologists have raised about them. He adds that using genetics involves a highly statistical and complicated approach. "There might be five variants of a gene on a spot, and you have to sort of think about what might be a plausible relationship between those different variants and the outcome," he says

In his *AJS* publication, Guo addressed the much-studied

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Shostak. They emphatically agreed at the end, however, that they wanted to get the word out in a way that would "move this conversation [about genetics] into the center of the discipline."

Bearman approached *AJS* with the idea for a special issue, and agreed with the plan to put out an open call for papers. Despite their conviction that the time was ripe to put out a sociological volume on genetics, the three editors were nevertheless astounded when their call for submissions was answered by a deluge of papers. "We were staggered by the reaction," Shostak recalls.

Their peer-reviewed issue, published in October 2008, piqued the interest of the *Chronicle of Higher Education*, which highlighted gene-related studies as the new hackle-raising of the old nature v. nurture debates. According to many who had papers in the issue, however, tensions among sociologists have been less palpable than the article suggested.

Shanahan acknowledges that he's encountered some confusion since his piece appeared about what genetically informed

topic of teenage sexuality, investigating various influences that encourage male adolescents to have sex with numerous partners. He used survey data from Add Health, which queried 22,000 students across the country from all types of environments twice during high school. Homing in on white male respondents, he began by looking at genetic information that had been collected from the survey subjects. In particular, he was looking at variants of a gene called *DAT1*, known to affect how the brain processes the neurotransmitter dopamine. Through years of animal and human studies, researchers had found that dopamine affects sexual aggressiveness as well as behaviors like impulsivity and recklessness.

Guo and his collaborators found that one particular variant of the *DAT1* gene, called *9R/9R*, conferred a "protective effect" against sexual behavior. When the researchers looked at environmental factors affecting the group of adolescents with the *9R/9R* gene, however, they found the gene's influence was negated in two circumstances: when kids attended schools with a student culture of early sexual activity and when they had low cognitive abilities.

He acknowledges that further studies replicating this line of inquiry will indicate whether this finding, which used a statistically small sample, still stands. But using genes as a starting place was important because his group wouldn't otherwise have noted IQ to be a significant environmental factor. "Social influence can be illuminated by studying the gene propensity," he says.

Guo's next studies will investigate peer influence on binge drinking in college students. Beginning with another risk-taking gene, he'll look at the effect of randomly assigned roommates. "Peer influence is difficult to study," he notes, because individuals tend to choose their friends. With randomly assigned roommates, that choice may be eliminated. "The idea is that roommates in college influence each other, but the influence may be moderated by genetic propensity." His hypothesis is that an individual without the gene wouldn't be swayed to binge drink. For this study, Guo himself collected DNA saliva from 2,500 students and even published a paper in *Sociological Methodology* about how to incorporate DNA collection in a traditional social science study.

Shanahan studied factors involved in whether students pursue post-secondary education. His study, also using Add Health data, investigated connections between a dopamine-related gene known as *DRD2* and students' social capital (that is, their accessibility to helpful resources like parental support or a strong school curriculum). While the *DRD2* gene hasn't been linked to specific attributes, its associated behaviors (according to some biology literature, lack of response to rewards and punishment, impulsive behavior, and disruptiveness) make kids less likely to comply with classroom decorum. Shanahan asked whether *DRD2* put students at risk for dropping out, and then whether such factors as quality of school,



Courtesy photo

"Social environment actually changes genes," says medical sociologist Bernice Pescosolido.

parental involvement with school, and communication between the student and parents, might override that genetic propensity. In fact, he discovered that boys, both black and white, with *DRD2* were less likely to continue to post-secondary schooling. (There was no difference with girls.)

Not only did certain environmental influences override the at-risk gene, but the most effective protective factors were the same between black students and white students, underscoring the importance of parents and quality schools in educational success. The study gives further fuel to the kinds of arguments sociologists typically make, Shanahan points out, while offering a "more nuanced view" of environmental influences related to successful schooling. Furthermore, without including the gene in the analysis, the study wouldn't enter the current stream of "public and scientific discourses about the role of genetics in behavior ... It's only when sociologists participate in these discussions [that] we get back to the importance of social context."

In the future, Shanahan is interested in studying telomeres, or small segments that exist at the tips of chromosomes. When studying molecular genetics several years ago, he learned that telomere attrition reveals biological aging. The phenomenon has continued to pique his interest.

"I thought, wow, an indicator of biological aging that is correlated, but probably not highly correlated, with chronological aging," he says. "So we could step back and then think

about how telomere attrition is related to social experiences." The limitation he's encountered at this point is finding a wet-lab capable of conducting such a high level and expensive study, even though "the conceptual models are all in place for doing this."

Pescosolido, at Indiana, is another sociologist who emphasizes the importance of laying claim to genetics discourse and analysis. Her work, done in collaboration with a psychiatric geneticist, looked at the *GABRA2* gene, which has been associated with an increased propensity for alcoholism. (She states that she's not well-versed in genetics, and in fact, was grateful during the collaboration for the help of a graduate student with a background in both sociology and biology who often bridged the languages of the two fields.)

In a study of more than 2,500 adults, the researchers looked for individuals with two copies of the at-risk *GABRA2* allele. They created codes for a range of fundamental causes like gender and race. Then they queried respondents about stress-factors that might increase the likelihood of alcoholism, including deprivation during childhood and daily hassles. They also asked about social support systems, such as marriage and friend networks.

Pescosolido and her team found that having two copies of the *GABRA2* allele did raise the likelihood of being diagnosed with an alcohol dependency in men, but not in women. But they found that genes and social influences worked together in interesting ways. Experiencing certain life stresses like material deprivation in childhood made people more likely to become alcoholic, whether or not they had the gene. They also found that having a strong family support system, even a family with alcoholics, could overpower the predisposition for alcoholism conferred by the gene; friend and co-worker networks didn't offer the same protective effect.

The authors point out that the gene and the environment play off one another. Social conditions may prompt one to drink; a genetic predisposition to alcoholism may push alcohol use out of control; yet, that genetic predisposition to alcoholism almost disappears with a strong family network. Such findings may play a role in treatment, the article points out. If recovering alcoholics are expected to return to problematic settings where a helpful support network doesn't exist, "then rehabilitation treatment is not likely to take. In the end, cultural context may be more powerful than medical solutions," she says.

Pescosolido, who has sat on agenda-setting panels at the National Cancer Institute and the National Institute of Mental Health, is accustomed to engaging as a sociologist with biological communities. Though she's aware of sociologists' long standing reservation that they'll be considered "the handmaids of medicine," she envisions her role differently. "I see myself in partnership with people who have the same interests in explaining the same social phenomena that I'm interested in."

More and more medical and genetics researchers are raising questions about context and the effects of environmental influences on topics like disease. Yet she's found that, while those researchers are interested in what sociologists have to say, they're often not aware of what the field has to offer.

Researchers were still calling Pescosolido in the late 1990s, for example, asking for an update of the Hollingshead Social Class Index, which went out of use in the 1970s. While it heartened her to know medical and public health researchers were interested in measuring social class, their awareness of sociology was based on outdated tools, suggesting they had no idea what the field is doing today. Recently, she's seen grant applications for medical studies that have added ethnographies in the last line, showing little sense of how they can be conducted. The fundamental interest, she notes, is there. In order to contribute to the next generation of studies, sociologists "have to get in on the ground floor."

"The Human Genome Project was the best thing that ever happened to sociology," she insists. The challenge will be to bring discussions of such factors as social networks, identity, and stratification to an increasingly gene-minded world. "Now that the medical sciences have gotten there, they're going to do it with us or without us," she says, "and it would be better if we showed them the strength of our explanations and brought our best tools to the table."

Kate Ledger is a freelance writer in St. Paul, Minn. She is the author of the novel *Remedies*.