

COGNITIVE AND BEHAVIORAL GENOMICS, EVOLUTION, AND RACE – WHAT LIES AHEAD?

The Duke Interdisciplinary Working Group on Cognitive & Behavioral Genomics and Society

Submission for the PCF 2007-2008

Awarded July 1, 2007

New Application for the Provost's Common Fund 2007-2008

COGNITIVE AND BEHAVIORAL GENOMICS, EVOLUTION, AND RACE – WHAT LIES AHEAD? The Duke Interdisciplinary Working Group on Cognitive & Behavioral Genomics and Society

Co-conveners:

- Robert Cook-Deegan, M.D. (Public Policy)
- Priscilla Wald, Ph.D. (English & Women's Studies)
- Gregory Wray, Ph.D. (Biology)

Introduction

When the Human Genome Project was completed in 2003, scientists proclaimed that all human DNA was 99.9% identical. This phrase seemed to be included in almost every news story about the Human Genome Project, with its hopeful implication that we would be united by our overwhelming genetic similarities rather than divided by our slight differences. However, much of genomic research is devoted to exploring genomic differences, or “human genetic diversity.” Scientists are investigating differences between individuals, which might explain why one person develops a disease and another does not; and differences between populations—how and why certain variants of genes are more frequent in one population than another, and what that means. While the study of genetic diversity in the context of disease susceptibility is for the most part viewed as a benefit, similar investigations related to human personality, intelligence or behavior have raised serious concerns, especially when this research is linked to studies of genetic variation between population groups. When group differences in behavioral, cognitive, or desirable physical traits are alleged, the scientific findings and their interpretation, including selection for traits during human evolution, can be highly controversial. The concerns do not rely on a belief that human evolution has ceased, but are instead based on a history of claimed superiority or inferiority of entire human groups that map poorly to plausible scenarios of natural selection but have nonetheless been widely believed in one culture or another. Studying human behavioral and physical traits is prone to interpretation through a lens of social constructs that lends itself to stereotyping and generalization beyond the limits of evidence. Significant advances in recent years in characterizing human genetic diversity have accelerated investigations into the genetic basis of complex traits including cognition, memory, learning and attributes of human behavior such as emotion and addiction. With this direction in genomic research comes a need for increased attention to the ways in which scientific findings are framed, interpreted, how those findings resonate in popular culture, and how popular culture influences the science.

Information on normal variation in human genes that regulate aspects of brain function could greatly enhance our knowledge of the molecular mechanisms underlying diseases that affect cognitive function and behavior and shed light on the reasons for favorable or adverse responses to treatments in individuals. Such research could also greatly enrich our understanding of complex human traits, and for all these reasons, it is important that this research proceed. However, information on genetic diversity in different populations can become socially combustible, particularly when associated with intelligence or behaviors considered “desirable” or “undesirable.” Information uncovered from these studies needs to be interpreted in light of knowledge of social sensitivities, and of interpretive biases, particularly since notions of genetics embedded in popular culture can influence interpretation of research findings, making this type of science prone to misinterpretation. Even if the results are factually accurate, interpretation of such facts is almost never complete, and when only one or two of many possible alternate interpretations are suggested, the science can be misunderstood or misused. Interpreting research findings or framing the inquiry in a way that ignores the history of perceptions embedded in popular culture and the relevant social context can lead to social conflagration. If the traits under study are cognition, athletic ability, appearance, or other valued human attributes, the potential for interpretive misadventure is even more apparent.

Proposal

Genomics research in the areas of cognition, intelligence and personality, supported by advances in functional brain imaging, can be expected to uncover information that may stigmatize some populations through misinterpretation. Alternately, some genotype-phenotype differences among populations may be scientifically robust, but discomfiting to groups faring worse on measures of socially valued traits (although

it is clearly the case that these differences cannot be very large relative to normal human variation, nor can all socially valued traits vary in the preferred direction of any one group). In the American Psychological Association's 1995 task force report on intelligence (produced in response to the controversy surrounding *The Bell Curve*), the authors conclude that "the study of intelligence does not need politicized assertions and recriminations; it needs self-restraint, reflection, and a great deal more research. The questions that remain are socially as well as scientifically important."¹ Such reflection is especially crucial in this time of accelerated discovery in cognitive and behavioral genomics. We believe Duke University is well positioned to engage in interdisciplinary discussion and research on societal concerns about cognitive/behavioral genomics research that appear likely to be reported with increasing frequency.

We propose to establish an interdisciplinary group at Duke to investigate areas of research in cognitive and behavioral genomics that may have serious social and ethical consequences. In this working group we hope to bring together scholars from a broad range of fields at Duke University including population genomics, evolutionary biology, cognitive neuroscience, brain imaging, psychology, anthropology (both cultural and biological), sociology, English, philosophy, history, political science, African and African American Studies, Women's Studies, Public Policy Studies, and other social sciences and humanities to:

- Acquaint experts in the humanities and social sciences and those studying popular culture with the state of the science and where it is heading.
- Acquaint experts in population and human genetics, evolutionary biology and biological anthropology with history and social science relevant to the interpretation of cognitive/behavioral genomics.
- Enable experts in these areas to understand the complexity of interpreting evolutionary biology arguments in population genomics, including the limitations and scope of such interpretations.
- Identify areas of science "worth watching" and educate the scientific community about why such research could be potentially controversial in light of historical and social context.
- Develop a set of principles concerning the interpretation of data within the scientific community and its translation in popular culture.
- Prepare resources (a set of expert commentators and scholarly material) for journalists and others in media to facilitate careful interpretation of such information, especially when the inevitable social controversies erupt.

Proposal Goals

1. To establish an **Interdisciplinary Working Group** of experts and scholars at Duke who will engage in sophisticated and explicit discussions to educate each other, identify the major issues of concern, and frame specific questions. This group will consist of members from the IGSP Centers of Population Genomics & Pharmacogenetics, Center for Evolutionary Genomics, Center for Genome Ethics Law & Policy, the Center for the study of Race, Ethnicity, and Gender in Social Sciences, the Brain Imaging and Analysis Center, the Center for Cognitive Neuroscience, the Divinity and Law Schools, the medical school and Arts and Sciences. The working group will meet twice per semester, and will assemble a list of pertinent scholarly works and create a **briefing book** for a conference to be held in the spring of 2008.

2. To hold a **Conference** (20-25 participants) at Duke University in the early spring of 2008 that will include the working group, other Duke participants, and 5-7 invited experts from a range of disciplines. This conference will be a logical extension of the working group's activities. The primary objective of this conference will be to build consensus on issues of concern, how the debate is likely to be framed in popular culture *a priori*, and develop a set of principles about issues related to interpretation of cognitive/behavioral genomics in the scientific community and popular media. We will explore, among other things, the following questions:

- How should the research question be framed?
- Can we prepare alternative interpretations of findings soon after they are reported?
- What does it mean to say that the "science is good" in a study? Are there guidelines or conventions that can define the stringency and power of analysis required for the design of studies involving socially sensitive phenotypes? Should there be more stringent requirements for demonstrating the cause and effect relationship, specifically for phenotypes that are socially sensitive?

- How do we account for contradictory studies when translating findings to a general audience, especially if one study creates more excitement in the media?
- How can we overcome publication bias, namely the tendency to preferentially publish studies with positive or more exciting outcomes?

The output of this meeting will be a **summary report** or **statement of findings**, which will be submitted for publication. The findings of this workshop will be used to plan a national media workshop.

3. To host a **National Media Workshop** at Duke University in late 2008 to bring the insights and findings from previous activities to members of the national press, television, radio, scientific press, internet portals such as science blogs, and other media that influence popular culture. These invitees are the early mediators interpreting research for the broader public.

This meeting will acquaint media representatives with perspectives of scientists, sociologists and humanities scholars, while also acquainting scientists and academic scholars with perspectives of those in the public media. One outcome of the meeting would be a social network of reporters who know scientists from diverse disciplines to contact when controversies erupt. These academics can be used as resources to generate alternative explanations, to identify overly speculative elements of press reports or scientific publications, and to point to other experts in the network. The primary output of this meeting will be a **set of questions** that those reporting new scientific findings can use to probe: (1) the limitations of a study, (2) the actual scope of its interpretations, (3) supporting and contradicting evidence, (4) evidence for direct cause and effect relationships and (5) the implicit framing of the research question.**

Background

The concerns about population genomics research in the areas of human cognition and intelligence were recently highlighted by studies describing the normal genetic variants of two genes which, when mutated, cause reduced brain size. In these studies, the investigators showed that the frequencies of the nonmutated variants differed in different population groups, and hypothesized that these variants may determine brain size. In two studies published in *Science*, Bruce Lahn and colleagues reported that two genes, *microcephalin* and *ASPM2*, were under strong selective pressure during human evolution.^{2 3} Furthermore, these studies suggested that these genes continued to remain under selective pressure (adaptive evolution) in modern humans and that the variants (polymorphisms) of these genes associated with bigger brain size, were likely to be more common in Asian and European populations than population groups from Sub-Saharan Africa. Lahn and colleagues state: “The specific function of Microcephalin in brain development makes it likely that selection has operated on the brain. Yet, it remains formally possible that an unrecognized function of Microcephalin outside of the brain is actually the substrate of selection. *If selection indeed acted on a brain-related phenotype, there could be several possibilities, including brain size, cognition, personality, motor control, or susceptibility to neurological and/or psychiatric diseases.*” (Emphasis added.) This speculation that favored variants may confer a selective advantage for certain brain functions related to cognition or intelligence generated much debate both in the scientific community and in the popular media.

Some scientists were wary of conflating claims of correlation between *ASPM2* and *microcephalin* to brain size, with claims about brain functions or natural selection. Francis S. Collins, director of the National Human Genome Research Institute said that “one should resist strongly the conclusion that it has to do with brain size, because the selection could be operating on any other not yet defined feature.”⁴ David Goldstein, of Duke University, called it “a real stretch to argue . . . that *microcephalin* is under selection and that that selection must be related to brain size or cognitive function. . . The gene could have risen to prominence through a random process known as genetic drift.”⁵ Other scientists pointed out that the evidence for positive selection was not strong and these findings could be reconciled with other evolutionary models that did not

** In this proposal, we are requesting funds for the working group activities, a conference, and follow-up to the conference, including some planning for the Media Workshop. For the Media Workshop itself, we will seek additional funding from a variety of sources, and have already had informal conversations with scholarly groups at other universities who may be interested in joining forces for this event. We are including the description of the Media Workshop in this proposal because it is part of our overall plan of research, even if it does not ultimately get funded by the Common Fund.

rely on selective pressure. Many groups pointed out that the variants of *ASPM2* and *microcephalin* may have been selected for other functions not related to the brain, and Lahn and colleagues acknowledge this as “formally possible.”⁶ These criticisms from other scientists indicate that speculation about advantageous brain functions as the primary explanation for selection appears premature and suspect until a causal network of considerably higher density is mapped out. Indeed, several studies, two of which were performed in collaboration with Dr. Lahn, have since demonstrated that that these variants do *not* correlate with performance on cognitive tests in people of many different ethnicities.^{7 8} Furthermore, in a recent study Roger Woods and colleagues⁹ reported no correlation between *ASPM* and *microcephalin* gene variants and brain volume in normal subjects as determined by magnetic resonance imaging (MRI).

In the popular media, discussion of these findings were sometimes framed in the context of a genetic basis for differences in intelligence between racial groups,^{10 11} reinvigorating the debate about “race and intelligence” that has persisted in various forms for over a century. Some blogs and conservative media outlets began to tout these findings as genetic proof of racial differences in intelligence. In a blog called *Half Sigma* (“The new politics of common sense”), the author describes Lahn’s studies, and concludes with this statement: “Racial IQ differences have long been a taboo topic, but perhaps modern genetics will force the taboo to be broken, because it now looks like individual brain genes that differ between the races are being discovered.”¹² In language less explicit, but nonetheless implying conclusions far beyond the actual findings of Lahn’s research, Columnist John Dearlove wrote in the *National Review*, “but if different human groups, of different common ancestry, have different frequencies of genes influencing things like, for goodness’ sake, brain development, then our cherished national dream of a well-mixed and harmonious meritocracy with all groups equally represented in all niches, at all levels, may be unattainable. . .to believe that all genes show up with the same frequencies in all human common-ancestry groups — you have to believe that, to assure the peace of mind of 21st-century American idealists, evolution came to a screeching halt 50,000 years ago. No scientifically literate person believes that, and the results written up in *Science* last month in any case flatly disprove it, as will the multitude of similar results no doubt soon to follow.”¹³

Concern about how the Lahn studies might be interpreted is based in part on a decade-old controversy about human behavioral genetics that broke along racial lines. Richard J. Herrnstein and Charles Murray published *The Bell Curve* in 1994.¹⁴ *The Bell Curve* argued that intelligence was largely heritable, and that differences in IQ between racial groups could not be explained by environmental factors. It argued further that social interventions, such as education, were powerless to change group differences, and thus futile. The book became a bestseller and was simultaneously denounced as “scientific racism.” The popular media and scientific community were divided over support and criticism of the validity of the science, the methodology, and its interpretations. Despite heavy criticism that the research presented in *The Bell Curve* was largely pseudo-science, the book received much attention in the popular media with discussions on various television public affair programs and prominent news magazines.

The lag before the scientific community reacted effectively to the media roll-out of *The Bell Curve* demonstrated that the failure to anticipate and address the controversy in the early weeks and months after the book came out allowed the initial, and loudest, stage of the debate to be framed by the authors of the book, and to proliferate in the popular media. Relative absence of expert commentary in the mainstream media in the initial coverage about the deficiencies in research methods used and in the studies cited to support the authors’ claims created a sense of plausibility for the general public. One of the components of the proposed study is to document how *The Bell Curve* was characterized in the public media after its release, in hopes of learning lessons about how to interpret socially volatile findings emerging from human behavioral and cognitive genomics.

Even before *The Bell Curve*, the labeling of groups based on studies of association has had a long history. The idea that brain/skull physiology is related to intelligence can be traced back to the early nineteenth century.¹⁵ Phrenologists claimed that the shape of the skull could predict aspects of personality, and was often used as a predictor of intelligence and to “scientifically” justify claims of racial superiority, an idea co-opted by proponents of racial hygiene. Craniometry, (studies measuring skull size), started in the early 1800s, and was used primarily to compare the size of the human skull to other animals. Craniometry is still used in the archaeological study of the evolution of human species. From the start, some craniometry researchers followed commonly held theories of racial intelligence. In 1839, Samuel Morton published results of

comparative measurements of skull size in different racial groups, and reported that the mean cranial capacity of Whites was greater than that of Blacks.^{16 17} A number of similar studies with racial comparisons of brain size and volume have appeared over the last century, with controversial work published as recently as 1995 by J. Phillippe Rushton. In his book, *Race, Evolution and Behavior*, Rushton reports a supposedly one-to-one correlation between average brain volume, IQ scores and other personality traits in different racial groups, thus propagating the notion of a “biological”/genetic basis for intelligence in different ethnic groups.¹⁸ Rushton’s book received much attention but was criticized by the scientific community for lack of direct evidence and extreme speculation.

This brief history illustrates how preconceived ideas of “racial” intelligence are reinforced by viewing the science through a procrustean prism; how easily speculation may be equated to “fact” in the popular media; and how quickly such “facts” pervade public discussion in the cyber-age, propagated by groups with specific ideologies or political viewpoints.

Alignment with the strategic priorities of Duke University--“Making a Difference”

Interdisciplinary Collaboration Cutting across the boundaries of traditional disciplines, we will have the unique ability to investigate controversial questions surrounding the impact of behavioral/cognitive genomics research on population groups and society at large. Indeed, the issues we plan to study cannot be analyzed or understood without a broad, interdisciplinary team. This area of study is complex, multifaceted, and socially sensitive, but if we are to promote scholarship that enlightens, and avoids the polarization that frequently occurs when sensitive topics arise, we need the insights of a variety of disciplines.

Centrality of Humanities and Interpretative Social Sciences The knowledge of scholars in the social sciences and humanities is essential for a meaningful investigation of the concerns raised by behavioral/cognitive genomics. The question that we want to address is not whether the “science” is right or wrong, as much as how it should be framed and interpreted. We are concerned about overly grand claims about the significance of the science, particularly when those claims are so obviously close to cultural sensitivities. The social sciences, history, media studies, and critical studies in Literature, English and other units in the humanities, are critically important to our analysis.

Intellectual Merit and Impact on University’s Intellectual Mission Educating a diverse group of scholars on the array of issues surrounding cognitive/behavioral genetics in human populations, will lead to further research and enable us at Duke University to address these social/ethical issues with greater nuance and sophistication. We are optimistic that a subset of projects that arise from these interactions will result in publications in peer reviewed journals, and anticipate that these interactions will create new arenas of multidisciplinary research at Duke University.

Knowledge in the Service of Society This project is intended to have social benefit that is intimately linked to academic excellence in at least three respects. First, we hope that it will mitigate social harm that can arise from simplistic interpretation of controversial science. Second, we believe it will improve the understanding of issues of race and social difference highly relevant to town-gown relations. Finally, a sophisticated discussion of biology, race, social science, and popular culture among both students and faculty furthers the core mission of the university to generate and disseminate knowledge, but also links it to the use of that knowledge outside academe, in Durham and in the national media. As part of this mission, the scholarly works and reports that result from these workshops and discussions will be made publicly available.

Long Term Goals and sustainability The Provost Common Fund will help jumpstart the activities of the interdisciplinary group by enabling us to organize and host the Conference at Duke in the early spring of 2008. The IGSP Center for Genome Ethics, Law & Policy will coordinate these efforts, and will contribute administrative support to the project. The National Media Workshop will extend and consolidate these efforts. In addition, we are optimistic that the activities of the working group will lead to collaborative research projects throughout Duke. The objectives of this proposal and the interdisciplinary projects we expect to develop are complementary to those of the newly established Institute for Brain, Mind, Genes and Behavior (IBMGB), and we will engage members of this institute to foster additional collaborations.

Appendix

We hope to engage a wide range of faculty and researchers in this project. The following faculty members have either accepted an invitation or have been invited to join the Working Group. (* Indicates confirmed participation.) Others will be invited as we gather additional names.

Sherryl Broverman, Ph.D. (Biology)
Roberto Cabeza, Ph.D.* (Center for Cognitive Neuroscience)
Steven Churchill, Ph.D. (Biological Anthropology & Anatomy)
Phil Costanzo, Ph.D. (Psychology and Neuroscience)
Lauren Dame, J.D., M.P.H.* (Law)
David Goldstein, Ph.D.* (Molecular Genetics & Microbiology)
Kerry Haynie, Ph.D.* (Political Science, Co-Director, Center for the Study of Race, Ethnicity, and Gender in the Social Sciences (REGSS))
Karla Holloway, Ph.D. (English)
Sherman James, Ph.D.* (Public Policy & Sociology)
Paula McClain, Ph.D.* (Political Science)
Tim Strauman, Ph.D.* (Psychology and Neuroscience)
Keith Whitfield, Ph.D.* (Psychology and Neuroscience)

References

-
- ¹ Neisser, U., et al. (1995). *Intelligence: Knowns and unknowns*. Washington, DC: American Psychological Association. http://www.Irainc.com/swtaboo/taboos/apa_01.html
- ² [Mekel-Bobrov N, Gilbert SL, Evans PD, Vallender EJ, Anderson JR, Hudson RR, Tishkoff SA, Lahn BT.](#) Ongoing adaptive evolution of ASPM, a brain size determinant in Homo sapiens. 2005 *Science* 309 (5741):1720-2.
- ³ [Evans PD, Gilbert SL, Mekel-Bobrov N, Vallender EJ, Anderson JR, Vaez-Azizi LM, Tishkoff SA, Hudson RR, Lahn BT.](#) Microcephalin, a gene regulating brain size, continues to evolve adaptively in humans. 2005 *Science* 309(5741):1717-20.
- ⁴ *Brain May Still Be Evolving, Studies Hint* by Nicholas Wade *NY times* Sep9 2005
<http://query.nytimes.com/gst/fullpage.html?res=9B01E1DE1331F93AA3575AC0A9639>
- ⁵ Ibid.
- ⁶ See note 3.
- ⁷ Mekel-Bobrov N, Posthuma D, Gilbert SL, Lind P, *et al.* The ongoing adaptive evolution of ASPM and Microcephalin is not explained by increased intelligence. 2007 *Hum Mol Genet.* Jan 12; [Epub ahead of print]
- ⁸ Balter M. Bruce Lahn profile. Links between brain genes, evolution, and cognition challenged. 2006 *Science.* 314(5807):1872.
- ⁹ Woods RP, Freimer NB, De Young JA, Fears SC, Sicotte NL, Service SK, Valentino DJ, Toga AW, Mazziotta JC. Normal variants of Microcephalin and ASPM do not account for brain size variability. 2006 *Hum Mol Genet.* 15(12):2025-9.
- ¹⁰ Head Examined Scientist's Study Of Brain Genes Sparks a Backlash Dr. Lahn Connects Evolution In Some Groups to IQ; Debate on Race and DNA 'Speculating Is Dangerous' by Antonio Regalado *Wall Street Journal* June 16, 2006 http://online.wsj.com/public/article/SB115040765329081636-T5DQ4jvnwqOdVvsP_XSVG_lvgik_20060628.html?mod=blogs
- ¹¹ *Blacks genetically less intelligent than whites according to Wall Street Journal*, source: www.halfsigma.com June 17, 2006 http://www.halfsigma.com/2006/06/blacks_genetica.html
- ¹² Ibid.
- ¹³ *The Specter of Difference* by John Derbyshire *National Review* November 7 2005.
<http://www.olimu.com/Journalism/Texts/Commentary/SpecterOfDifference.htm>
- ¹⁴ *The Bell Curve: intelligence and class structure in American life* by Richard J. Herrnstein and Charles Murray. Published New York : Free Press, c1994.
- ¹⁵ <http://en.wikipedia.org/wiki/Phrenology>

¹⁶ *Crania Americana*; or, A comparative view of the skulls of various aboriginal nations of North and South America by Samuel George Morton. Published Philadelphia : J. Dobson ; London : Simpkin, Marshall, 1839.

¹⁷ *The Mismeasure of Man* by Stephen Jay Gould Published New York: Norton, c1996.

¹⁸ *Race, Evolution, and Behavior: a life history perspective* by J. Philippe Rushton. Published New Brunswick, N.J., USA: Transaction Publishers, c1994.