Chapter 1

History of Behavior Genetics

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Hermann Ebbinghaus (1908) said of psychology that it had a long past, but only a short history. The same may be said of behavior genetics. One cannot specify an exact date at which behavior genetics came to be regarded as a distinct scientific discipline, but for convenience let us say 1960, the publication date of Fuller and Thompson's textbook of that title.

This chapter considers both the long past and some aspects of the short history of behavior genetics. We begin with the long past: the recognition since antiquity that behavioral traits are in part inherited, and the controversy concerning the extent to which this is so, a discussion often going under the label of the *nature–nurture controversy*.

The Long Past of Behavior Genetics

From Ancient Times to the Renaissance

Ancient Times

Where does the long past start? Perhaps with the domestication of dogs for behavioral as well as physical traits, a process which probably took place at least 15,000 years ago (Savolainen, Zhang, Luo, Lundeberg, & Leitner, 2002) – although one must suppose that in its early days this was more an evolution of a subgroup of wolves to fit a niche around human habitation than a process deliberately undertaken by man (Morey, 1994). In any case, about 5000 years ago in Egypt and the Near East, it appears that deliberate animal breeding was well established (Brewer, Clark, & Phillips, 2001); several distinctive varieties of cattle and dogs are portrayed in ancient Egyptian art.

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Greeks, Romans, Hebrews

By classical times, 3000–1500 years ago, many varieties of dogs with distinctive physical and behavioral characteristics were recognized. More than 50 breeds are named in surviving Greek and Roman documents, falling into such categories as scent- and sight hounds, shepherd dogs, guard dogs, war dogs, and pets (Brewer et al., 2001).

The ancient Greeks held that humans inherited qualities, including behavioral ones, from their ancestors. Thus in Book IV of Homer's *Odyssey*, Menelaus greets two young visiting strangers, "Ye are of the line of men that are sceptred kings … for no churls could beget sons like you" (Homer, trans. 1909, p. 49). And later (p. 53), to one of them, "Thou has said all that a wise man might say or do, yea, and an elder than thou; – for from such a sire too thou art sprung, wherefore thou dost even speak wisely." A similar notion was expressed in the Hebrew scriptures: "I am the heir of wise men, and spring from ancient kings" (Isaiah 19:11, *New English Bible*).

A few hundred years later, the Greek philosopher Plato in Book V of the *Republic* – his prescription for an ideal state – took both inheritance and instruction into account in the development of the "Guardians," the ruling elite. He begins with the question, "How can marriages be made most beneficial?" He discusses the breeding of hunting dogs and birds, noting that "Although they are all of a good sort, are not some better than others?" "True." "And do you breed from them all indifferently, or do you take care to breed from the best only?" "From the best" (Plato, trans. 1901, p. 149). From there Plato goes on to generalize to the class of elite humans in his ideal state – to the desirability of matching the best with the best, and rearing their offspring with special attention.

Plato recognizes that good ancestry is not infallibly predictive and recommends applying, at least in early youth, a universal education to the citizens of his state; demoting, when inferior, offspring of the elite class of guardians and elevating into the ranks of the guardians offspring of the lower classes who show merit.

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We need not debate the pros and cons of Plato's particular social proposals; people have been arguing about them ever since his day. We only need observe that well over 2000 years ago the interplay of nature and nurture – and its social implications – was being discussed.

Middle Ages

What of the contrary view, the notion that all men are born equal? A major impetus to such an idea came from the medieval Catholic Church (Pearson, 1995). All men are sons of God, and therefore of equal value in His sight. Or, from another perspective, as the fourteenth-century English proverb had it, "When Adam delved and Eve span/Who was then a gentleman?"

The Renaissance

Ideas concerning the inheritance of behavior were present in Shakespeare's day. The Countess of Rossilon in *All's Well That Ends Well* says, about a wise daughter of a wise father, "Her dispositions she inherits" (Act I:i). The nature–nurture controversy itself appears to have got its label from Prospero's remark in *The Tempest* about his subhuman creature, Caliban, "A devil, a born devil, on whose nature nurture will never stick" (Act IV:i).

The Nature–Nurture Controversy in the Modern Era

Although ideas about the roles of nature and nurture in human and animal behaviors have been with us for thousands of years, the modern form of the controversy traces back fairly directly to the seventeenth-century philosopher John Locke and the nineteenth-century naturalist Charles Darwin.

John Locke

Locke may be considered to be the chief ideological father of the nurture side of the controversy. In *An Essay Concerning Human Understanding* (Locke, 1690/1975), he invoked the metaphor of the mind as a blank sheet of paper upon which knowledge is written by the hand of experience. In the opening paragraph of his book *Some Thoughts Concerning Education*, he said, "I think I may say, that of all the Men we meet with, nine Parts of ten are what they are, good or evil, useful or not, by their Education" (Locke, 1693/1913, Sect. 1). Locke's political view that all men are by nature equal and independent, and that society is a mutual contract entered into for the common good, had an immense influence via Jefferson, Voltaire, Rousseau, and the other theorists of the American and French revolutions.

Indeed, one may view many of the events of the nature–nurture controversy since Locke's day as a series of challenges to the prevailing Lockean position, with those steeped in that tradition rising indignantly to battle what they perceived to be threats to inalienable human rights of liberty and equality.

Locke himself, however, was not nearly as alien to hereditarian concepts as some of his followers have been. He rejected the concept of inborn ideas, but not of all innate characteristics. In a marginal note on a pamphlet by one Thomas Burnet, Locke wrote "I think noe body but this Author who ever read my book [*An Essay Concerning Human Understanding*] could doubt that I spoke only of innate Ideas . . . and not of *innate powers* . . . " (see Porter, 1887). Elsewhere in *Some Thoughts Concerning Education* Locke wrote,

> Some Men by the unalterable Frame of their Constitutions are *stout*, others *timorous*, some *confident*, others *modest*, *tractable*, or *obstinate*, *curious* or *careless*, *quick* or *slow*. There are not more Differences in Men's Faces, or in the outward Lineaments of their Bodies, than there are in the Makes and Tempers of their Minds. (1693/1913, Sect. 101)

John Stuart Mill

Many of Locke's successors in the English liberal tradition came out more strongly than Locke did on the side of nurture. John Stuart Mill wrote in his *Autobiography* (1873, p. 192),

> I have long felt that the prevailing tendency to regard all the marked distinctions of human character as innate, and in the main indelible, and to ignore the irresistible proofs that by far the greater part of these differences, whether between individuals, races, or sexes, are such as not only might but naturally would be produced by differences in circumstances, is one of the chief hindrances to the rational treatment of great social questions, and one of the greatest stumbling blocks to human improvement.

Charles Darwin

During roughly the same period as Mill, Charles Darwin gave the nature side of the controversy its modern form by placing behavior, including human behavior, solidly in the framework of biological evolution. In addition to his major treatise *The Origin of Species* (1859), Darwin in such works as *The Descent of Man* (1871) and *The Expression of the Emotions in Man and Animals* (1872) made it clear that human behavior shared ancestry with that of other animal forms, and was subject to the same evolutionary process of hereditary variation followed by natural selection of the variants that proved most successful in their particular environments.

In *The Descent of Man* (1871, pp. 110–111) Darwin wrote,

> So in regard to mental qualities, their transmission is manifest in our dogs, horses, and other domestic animals. Besides special tastes and habits, general intelligence, courage, bad and good temper, etc. are certainly transmitted. With man we see similar facts in almost every family; and we now know through the admirable labours of Mr. Galton that genius, which implies a wonderfully complex combination of high faculties, tends to be inherited; and on the other hand, it is too certain that insanity and deteriorated mental powers likewise run in the same families.

Francis Galton

Darwin's younger cousin Francis Galton agreed with Darwin and disagreed with Mill. In his book *Inquiries into Human Faculty* (1883, p. 241) he concluded,

> There is no escape from the conclusion that nature prevails enormously over nurture when the differences of nurture do not exceed what is commonly to be found among persons of the same rank of society and in the same country.

Galton is not saying that environment never matters. However, he is saying that the ordinary differences we observe among people in the same general social context are mostly due to heredity.

Galton was a central, crystallizing figure in behavior genetics' "long past." His emphasis on the measurement of individual differences and their statistical treatment became a core theme in the development of the field. His studies of "hereditary genius" and "the comparative worth of different races" (Galton, 1869) foreshadowed recent controversies about IQ. He proposed the study of twins as a way of getting at the relative effect of nature and nurture. And his promotion of eugenics – that is, the encouragement of the more useful members of society to have more children and the less useful to have fewer (as in Plato's scheme for an ideal state) – has generated on occasion a good deal of heat. Here is a recent example (Graves, 2001, p. 100): "Galton's scientific accomplishments are sufficient for some still to consider him an intellectual hero. Whereas for others (this author included) he was an intellectual mediocrity, a sham, and a villain."

The Twentieth Century

Vigorous disagreements on the relative impact of nature and nurture on behavior continued into the twentieth century. On the whole, twentieth-century psychology was heavily environmentalistic, emphasizing the crucial role of learning in shaping behavior. The high-water mark of this tradition was the famous claim of John B. Watson (1925, p. 82):

> Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select – doctor, lawyer, artist, merchant-chief, and yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors.

The year 1928 saw the publication of the *Twenty-Seventh Yearbook* of the National Society for the Study of Education. It was entitled *Nature and Nurture*, and it contained the reports of two adoption studies of IQ. One, by Barbara Burks, emphasized the effects of nature. The other, by Freeman, Holzinger, and Mitchell, came down on the side of nurture. The nature–nurture controversy continued, but students of the effects of heredity and environment on behavior were gathering data. When enough had been gathered for a textbook to be written, the short history of behavior genetics could begin.

The Short History of Behavior Genetics

Most of the short history of behavior genetics, as it applies to the study of both humans and other animal species, will not be discussed in this chapter. It is a tale of steady scientific progress on a variety of fronts, despite occasional controversies, confusions, and setbacks, and it is a tale told in the other chapters of this handbook. The reader who wants a quick sense of the scope of scientific progress in the field of behavior genetics during the last 40-odd years, and the prospects opening up in it today, can achieve this by scanning through the chapter introductions and summaries, and the editor's final chapter. The reader who aspires to a more solid grasp of this short history will need, of course, to proceed more systematically through the book, as well as following up some of its many references.

The remainder of this chapter addresses two other aspects of behavior genetics' short history. First, we look briefly at some institutional features of the field: its principal scholarly and scientific organization, the *Behavior Genetics Association*; the discipline's key journal, *Behavior Genetics*; and some major centers of behavior genetics research. Following this, we look at the social context of behavior genetics, at instances in which the scientific and scholarly pursuits of the field have become entangled with public political and social concerns. These instances include a series of controversies concerning the genetic or environmental bases of differences in psychological characteristics between groups defined by race, sex, or social class. Controversies about group differences have roots in behavior genetics' long past and have persisted into its short history. They are far from central in the activities of most working behavior geneticists, but they represent an important part of the public face of the field.

The Institutional History of Behavior Genetics

The Behavior Genetics Association

After some informal discussions in the late 1960s, and the circulation of a mailing to a list of persons who had recently published in the area of behavior genetics, an organizational meeting took place at Urbana, Illinois, in March 1970. R. H. Osborne, then editor of the journal *Social Biology*, was chosen to act as president pro tem, and five committees were appointed to lay the groundwork for a Behavior Genetics Association (or Society – there was some argument about a suitable name). In April 1971, the fledgling organization held its first formal meeting, at Storrs, Connecticut. In addition to scientific sessions, a draft constitution was discussed to be submitted to the initial membership via mail ballot for approval. Nominations and an election followed, and at the time of the second annual meeting at Boulder, Colorado, in April 1972, the Behavior Genetics Association (BGA) was officially underway, and its first set of officers took office: Theodosius Dobzhansky was president, John Fuller was president-elect, R. H. Osborne served as past president, the secretary was Elving Anderson, the treasurer was John Loehlin, and the two executive committee members-at-large were Seymour Kessler and L. Erlenmeyer-Kimling.

The association proved viable. Table 1.1 shows the successive presidents of the BGA and the location of its annual meetings. Note that a special extra international meeting was held in Jerusalem in 1981, and that thereafter the regular annual BGA meeting was periodically held in countries outside the USA: in England (twice), the Netherlands (twice), France, Australia, Spain, Canada (twice), and Sweden.

Over time, the association grew in size. Forty-four persons responded to the initial mailing indicating interest in such an association. There were 69 paid-up members at the time of the first annual meeting at Storrs. By the time of the 34th annual meeting in Aix-en-Provence, France, in 2004, the BGA had 270 regular and 109 associate members (the latter chiefly graduate students). Approximately two-thirds were from North America and one-third from other continents.

Table 1.1 BGA Presidents and Annual Meetings

Year	President	Site of meeting
1971	R. H. Osborne [pro tem]	Storrs CT
1972	Th. Dobzhansky	Boulder CO
1973	John L. Fuller	Chapel Hill NC
1974	Gerald E. McClearn	Minneapolis MN
1975	J. P. Scott	Austin TX
1976	Irving I. Gottesman	Boulder CO
1977	W. R. Thompson	Louisville KY
1978	Lee Ehrman	Davis CA
1979	V. Elving Anderson	Middletown CT
1980	John C. Loehlin	Chicago IL
1981	Norman D. Henderson	Purchase NY/Jerusalem
1982	John C. DeFries	Ft Collins CO
1983	David W. Fulker	London, England
1984	Steven G. Vandenberg	Bloomington IN
1985	Sandra Scarr	State College PA
1986	Ronald S. Wilson	Honolulu HI
1987	Peter A. Parsons	Minneapolis MN
1988	Leonard L. Heston	Nijmegen, Netherlands
1989	Robert Plomin	Charlottesville VA
1990	Carol B. Lynch	Aussois, France
1991	Lindon J. Eaves	St. Louis MO
1992	David A. Blizard	Boulder CO
1993	Thomas J. Bouchard, Jr.	Sydney, Australia
1994	Glayde Whitney	Barcelona, Spain
1995	James Wilson	Richmond VA
1996	Nicholas G. Martin	Pittsburgh PA
1997	Nicholas G. Martin	Toronto, Canada
1998	Norman D. Henderson	Stockholm, Sweden
1999	Richard Rose	Vancouver, Canada
2000	John Hewitt	Burlington VT
2001	Matt McGue	Cambridge, England
2002	Nancy Pedersen	Keystone CO
2003	Andrew Heath	Chicago IL
2004	Michèle Carlier	Aix-en-Provence, France
2005	H. Hill Goldsmith	Hollywood CA
2006	Laura Baker	Storrs CT
2007	Pierre Roubertoux	Amsterdam, Netherlands

Source: BGA web site (June 27, 2007); http://www.bga.org

The Journal *Behavior Genetics*

In 1970, a decade after Fuller and Thompson's textbook, the scientific journal *Behavior Genetics* began with Vol. 1, No. 1. Its founding editors were Steven G. Vandenberg and John C. DeFries. They stated their hopes for the new journal in an editorial (p. 1):

> Research in behavior genetics continues to be undertaken at an accelerating rate. Nevertheless, no single journal has existed heretofore which was dedicated primarily to the publication of papers in this important area. Since manuscripts in behavior genetics have thus been published in widely scattered journals, a clear identification with this discipline has been lacking. It is our hope that *BEHAVIOR GENETICS* will fulfill this need.

The journal has largely lived up to their hopes. It never stood completely alone – for example, at the time there was an existing journal focused on twin research, *Acta Geneticae Medicae et Gemellologiae*, which published many behaviorally oriented papers. The journal *Social Biology* – whose editor, R. H. Osborne, played an important role in founding the Behavior Genetics Association – initially served as the official organ of the BGA. (*Behavior Genetics* assumed that role in 1974.) Other journals have since emerged – for example, the recent journals *Genes, Brains, and Behavior* and *Twin Research*. Many important papers in behavior genetics continue to be published in journals in the neighboring behavioral and biological sciences. Nevertheless, *Behavior Genetics*, as the official organ of the Behavior Genetics Association, remains a major defining force in the field.

It is instructive to compare Vol. 1 (1970) of *Behavior Genetics* with Vol. 35 (2005). The journal became a good deal bigger: from three issues in Vol. 1 (Nos. 3 and 4 were bound together) to six in Vol. 35 from 274 to 854 pages (and nearly twice the number of words per page because of larger pages). In Vol. 1, there were 24 papers, an editorial, and 2 "short communications." In Vol. 35 there were 66 papers, plus 142 abstracts from the Behavior Genetics Association meeting, and various BGA minutes, announcements, etc. *Behavior Genetics* continues to publish both substantively and methodologically oriented papers, featuring various animal species, but the mix changed from Vol. 1 to Vol. 35. In Vol. 1 there were 7 papers (27%) focused on human behavior, 16 papers (62%) involving rodents, mostly inbred mice, 1 paper on another species (*Drosophila*), and 2 papers primarily methodological (statistical) in character. In Vol. 35, there was an increased proportion of substantive papers involving humans, 28 (42%); proportionately fewer involving rodents, 14 (21%); an increase in those involving other animal species, 9 (15%) – mostly *Drosophila*, but one on rainbow trout. For many of the remaining 22% of papers, the species might be described as the computer: These were methodological papers, many involving a heavy dose of computer model-fitting or simulation.

Major Behavior Genetics Centers

Preeminent among academic centers for teaching and research in behavior genetics has been the Institute for Behavioral Genetics (IBG) at the University of Colorado at Boulder. Among the notable behavior geneticists who have served on its faculty are Gregory Carey, John DeFries, David Fulker, John Hewitt, Carol Lynch, Gerald McClearn, Robert Plomin, Steven Vandenberg, and James Wilson. It has also served as home for the journal *Behavior Genetics*, except for 1978–1985 when Jan Bruell edited the journal at the University of Texas and 2000–2002 when Norman Henderson edited it at Oberlin College. The IBG has also hosted several BGA annual meetings and a number of summer training institutes on behavior genetics methods.

Next in line as a center of behavior genetics activity would probably be the University of Minnesota, whose faculty has included important behavior geneticists like Elving Anderson, Thomas Bouchard, Irving Gottesman, Leonard Heston, Gardner Lindzey, David Lykken, Matthew McGue, Sheldon Reed, Sandra Scarr, and Auke Tellegen. A third center, at least in the early days, was the University of Texas at Austin, with Jan Bruell, Joseph Horn, Gardner Lindzey, John Loehlin, Delbert Thiessen, and Lee Willerman. A current major behavior genetics center is at the Virginia Commonwealth University; its faculty includes Lindon Eaves, Kenneth Kendler, Hermine Maes, and Michael Neale. Other important U.S. centers include Washington University in St. Louis (Robert Cloninger, Andrew Heath, & John Rice) and Penn State (David Blizard, Gerald McClearn, & George Vogler). Outside the USA, Kings College, London, has recruited an eminent group of behavior genetics researchers, including Peter McGuffin, Robert Plomin, and Michael Rutter. The Vrije Universiteit in Amsterdam also has a substantial behavior genetics contingent, including Dorret Boomsma and Danielle Postuma. Stable international coalitions are becoming increasingly common, greatly facilitated by the Internet. Notable examples include collaborations between groups at Indiana University and the University of Helsinki, Penn State and the Karolinska Institute in Stockholm, and several U.S. groups with the Queensland Institute for Medical Research in Australia.

Beside the institutions mentioned above, dozens of other universities and research institutes, including many outside the USA, have developed and maintained strong programs in human or animal behavior genetics on the strength of one or two distinguished researchers on their faculties. Almost half the presidents of the BGA, for example, would represent this category. The hosting of an annual BGA meeting (see Table 1.1) also tends to reflect a strong local program.

Public Controversies – Group Differences

The possibility that there might be genetic differences in psychological traits between groups defined by race, sex, or social class has led to a good deal of public uproar and not a little confusion. It has provided an inflammatory intersection between the scientific discipline of behavior genetics and Western attitudes of equality stemming from religious, political, and philosophical roots. Racist, sexist, and classist ideas (as references to such group differences are sometimes called) tend to drive traditional Lockean ideologists up the wall, so that clear thinking has not always prevailed in this area.

A few general points should be noted. First, the main business of behavior geneticists has always been individual differences, not group differences, so that for the day-to-day research of most behavior geneticists, questions about group differences are at best an unwelcome distraction. Second, as Lewontin (1970) made clear, a demonstration that individual differences are due to genes does not imply that group differences are genetic. He used the analogy of genetically varied seeds raised in a greenhouse in two pots under identical regimens, except that one pot lacked a crucial trace nutrient present for the other. The heights of the plants are subsequently measured. The variation of height within each pot, except for random measurement errors, is entirely genetic, since the plants within each pot vary genetically,

but are treated exactly the same. The average difference in plant height between the two pots is entirely environmental, because it stems from the presence or absence of the critical nutrient. Clearly, this example implies that group differences may be different in their genetic and environmental origins from individual differences. However, it is sometimes forgotten that *may* does not imply *are*. There remains the empirical question for any particular trait and any particular group difference in any particular population: To what relative extent are genetic and environmental differences between the groups *in fact* involved? There also remains the social question: How much (if at all) does this matter?

The empirical question is not necessarily an easy one to answer. For one thing, it may well have different answers for different traits and different groups (Loehlin, 2000). If one were to demonstrate that profiles of cognitive ability differ for genetic reasons between Asian Americans and European Americans, it would not imply that a difference in average intellectual performance between European Americans and African Americans has a genetic origin. To make matters worse, the social excitement and media hoopla surrounding the issue of group differences has discouraged most behavior geneticists from addressing such matters empirically. It is not as though informative research designs do not exist. One listing of promising areas of research on racial-ethnic ability differences listed ten possible approaches, ranging from studies of race mixtures and cross-racial adoptions to piggy-back studies on educational or nutritional programs which were being undertaken for other reasons (Loehlin, Lindzey, & Spuhler, 1975, pp. 251–254).

Jensen

Less than a decade into behavior genetics' short history, the educational psychologist Arthur Jensen published a long article in the *Harvard Educational Review* entitled "How much can we boost IQ and scholastic achievement?" (Jensen, 1969). Jensen noted the fact that compensatory education programs had not lived up to their advance billing and concluded that this might partly reflect the genetic contribution to IQ, which he estimated at a fairly high 80%. Almost in passing, he noted the possibility that the persistent IQ gap between U.S. blacks and whites might in part be genetic in origin. He did not say that this had been demonstrated to be the case, but suggested that the matter should be looked into empirically. Jensen's article, particularly the suggestion that there might be a genetic contribution to black–white IQ differences, created an immediate furor. There were numerous published critiques, not all judicious and carefully thought out. And this was not just a genteel academic debate – tires were slashed and public meetings disrupted. A graphic account of the goings-on may be found in Pearson (1991). The controversy about possible racial differences in mental abilities has continued to the present – the interested reader may wish to consult *Race Differences in Intelligence* (Loehlin et al., 1975), *Race, IQ and Jensen* (Flynn, 1980), *The Black–White Test Score Gap* (Jencks & Phillips, 1998), and *The New Know-Nothings* (Hunt, 1999). Rushton and Jensen (2005) provide a recent review emphasizing the genes: "Thirty years of research on race differences in cognitive ability," which, along with a number of critiques from various points of view, fills an issue of *Psychology, Public Policy, and Law* [Vol. 11(2), 2005].

The Bell Curve

Twenty-five years after Jensen's article, a similar uproar arose, this time due to the publication of a book by the psychologist Richard Herrnstein and the sociologist Charles Murray entitled *The Bell Curve* (Herrnstein & Murray, 1994). Although much of the furor focused on race differences in cognitive skills, the authors did not in fact devote a great deal of attention to this topic and took a fairly mild position on it. After emphasizing via a version of Lewontin's metaphor that a genetic basis for individual differences does not imply a genetic basis for group differences, they said of U.S. ethnic differences in average IQ (p. 312):

> They may well include some (as yet unknown) genetic component, but nothing suggests that they are entirely genetic. And, most important, it matters little whether the genes are involved at all.

Their argument in support of the second sentence was that for an appropriate treatment of an individual it is his or her own IQ that is relevant (if IQ is relevant at all), not the average IQs of some group to which the individual may belong. One might add, however, that for long-term social policy, the fact that an average group difference has its source in genes or in the environment can sometimes matter, because it can affect the choice of a remedy to alter that difference – eugenics versus Head Start, for example.

Herrnstein on Social Class and IQ

The Bell Curve did not represent Herrnstein's first engagement with group differences and public controversy. In an article in *The Atlantic* (Herrnstein, 1971) and in a subsequent book, *I.Q. in the Meritocracy* (1973), Herrnstein elaborated on an idea by Cyril Burt (1961) that social class and occupational differences in IQ will be partly genetic in a society that features social mobility. If IQ is partly genetic, and higher IQ individuals tend to move up in social and occupational status, while lower IQ individuals tend to move down, then IQ differences between social classes and occupational

groups will come to be partly genetic. This is not a hereditary aristocracy – far from it – it is a dynamic phenomenon that depends on continued mobility up and down the social scale. An important question is, How much? Some evidence suggests that about 40% of IQ differences in occupation and income in Western societies are associated with genetic differences (Rowe, Vesterdal, & Rodgers, 1998; Tambs, Sundet, Magnus, & Berg, 1989). Phenotypically, there are substantial average differences in IQ between different occupational groups. For example, in the U.S. standardization sample for the 1981 revision of the Wechsler Adult Intelligence Scale, there was a 22-point difference between the average IQs of persons in professional and technical occupations and persons who were unskilled laborers (Reynolds, Chastain, Kaufman, & McLean, 1987). And yet there was nearly as much variation in IQ within these two occupational groups (standard deviations of 14.4 and 15.2) as in the U.S. population as a whole (standard deviation of 15.1). It is an interesting paradox that there may be real and significant differences in average IQ between different groups, yet individuals vary so widely within them that an individual's group membership is of almost no value for predicting his or her IQ.

The Glayde Whitney Affair

In his 1995 presidential address to the Behavior Genetics Association, Glayde Whitney, whose distinguished research career had mostly focused on taste sensitivity in mice, turned to humans and elected to address the topic of black–white differences in the frequency of criminal behavior. He pointed out the large discrepancies on the phenotypic level, such as a ninefold difference in murder rates between blacks and whites in the USA. Compared to a dozen other industrialized countries, the USA had the highest overall murder rate. However, based only on its white population, it ranked third from the bottom, with a lower murder rate than such countries as Switzerland, Denmark, Finland, and Sweden. Whitney argued that behavior geneticists should be willing to explore both genetic and environmental hypotheses about such differences; he also argued that the current intellectual climate in the USA made such discussion virtually impossible – and he made some critical remarks about the contribution of the political Left to this situation (Whitney, 1995).

Whitney's address was perhaps not a model of tact: for example, in addition to his comments about the Left, he noted that Richmond, Virginia, the city in which he was speaking as a guest, was the second-worst large city in the USA with respect to its murder rate. Nor did he address the question of how behavior geneticists were to go about deciding to what extent the group differences in criminality were genetic or environmental. Subsequent events within the Behavior Genetics Association proved, however, that he was clearly right about the difficulty of public discussion of such questions. An announcement was issued the next day by the BGA Executive Committee to the effect that Whitney was not acting as the official spokesman of the association, that presentations at BGA meetings should be strictly scientific, and that "members are not encouraged to express their personal political and moral views" (Heath, 1995, p. 590). A special December meeting of the BGA Executive Committee was scheduled to consider removing Whitney from the BGA Board of Directors, of which he was automatically a member as past president (e-mail announcement to the BGA membership, October 12, 1995). President-elect Pierre Roubertoux and Wim Crusio, a member-at-large of the Executive Committee, resigned from the association because it was unwilling to adopt sufficiently strong sanctions against Whitney. The incoming president-elect, Nicholas Martin, took over for Roubertoux as president, and later served his own term, accounting for his double appearance in Table 1.1, in 1996 and 1997 (Heath, 1996).

Lawrence Summers and Sex Differences

On January 14, 2005, Harvard President Lawrence H. Summers informally addressed a conference on "Diversifying the Science and Engineering Workforce" which was considering the reasons for a shortage of women at the highest levels in the scientific professions (Summers, 2005). With the avowed intention of provoking discussion, Summers proposed three hypotheses for his audience's consideration: (a) Many talented women prefer devoting some of their time to children and families rather than undertaking the 80-hour work-weeks required for reaching the top levels in elite research organizations; (b) there may be biological differences between the sexes, such as a greater variance for males on many traits, producing an excess of males at the extremes; and (c) subtle and not-so-subtle patterns of discrimination may exist that lead the present elite in these fields, mostly males, to choose others like them to join them. Summers thought it likely that all three of these factors contributed, and he guessed that they might rank in importance in the order given. Summers is an economist by training, not a behavior geneticist, but he cited some behavior genetic evidence against an overwhelming role of socialization in producing behavioral differences, and suggested that the effects in hypotheses (a) and (b) might have in part a biological basis. Summers' remarks aroused a firestorm in the press and in feminist circles, which in turn provoked assorted indignant rejoinders. It is not necessary to pursue these in detail here – a quick survey on the Internet will yield an ample sampling of widely varying views about Summers' remarks – views expressed with widely varying degrees of heat and light. Pinker (2002, Chap. 18) provides a readable survey of the considerable evidence that at least

some male–female psychological differences have a biological component – although, presumably, few are exclusively so, and many questions remain open empirically.

The Future?

One take-home lesson from the various controversies concerning group differences is that the nature–nurture controversy is not dead, even though it has been declared moribund on many occasions in recent decades. Although behavior geneticists have had an appreciable impact on public thinking about individual differences, the question of the relative genetic and environmental contributions to group differences has been both more socially explosive and much less successfully addressed empirically.

What does the future hold? This will depend, in part, on future behavior genetics research on these topics – some of it, perhaps, carried out by readers of this book. One may be fairly confident that nature–nurture controversies will not vanish completely anytime soon. However, one may hope that as knowledge expands, the cloud of misunderstandings on which these controversies feed will gradually shrink, and that one day we may have an agreed-upon body of facts on which to base social policy.

Conclusion

Yes, behavior genetics has had a long past, which extends into the nature–nurture controversies of the present day. It has also had a short but solid history of substantive accomplishment and institutional establishment. The date at which the short history will make the long past seem quaint and obsolete in the eyes of the general educated public remains to be determined. Readers of this book will help determine it.

References

Brewer, D. J., Clark, T., & Phillips, A. (2001). *Dogs in antiquity*. Warminster, England: Aris & Phillips.

Burks, B. S. (1928). The relative influence of nature and nurture upon mental development: A comparative study of foster parent-foster child resemblance and true parent-true child resemblance. In *27th Yearbook of the National Society for the Study of Education*, *Part 1*, pp. 219–316.

Burt, C. (1961). Intelligence and social mobility. *British Journal of Statistical Psychology, 14*, 3–24.

Darwin, C. (1859). *On the origin of species by means of natural selection*. London: John Murray.

Darwin, C. (1871). *The descent of man, and selection in relation to sex*. London: John Murray.

Darwin, C. (1872). *The expression of the emotions in man and animals*. London: John Murray.

Ebbinghaus, H. (1908). *Psychology: An elementary textbook* (M. F. Meyer, Trans.). Boston: D. C. Heath.

Flynn, J. R. (1980). *Race, IQ and Jensen*. London: Routledge & Kegan Paul.

Freeman, F. N., Holzinger,K. J., & Mitchell, B. C. (1928). The influence of environment on the intelligence, school achievement, and conduct of foster children. In *27th Yearbook of the National Society for the Study of Education*, *Part 1*, pp. 103–217.

Fuller, J. L., & Thompson, W. R. (1960). *Behavior genetics*. New York: Wiley.

Galton, F. (1869). *Hereditary genius: An inquiry into its laws and consequences.* London: Collins.

Galton, F. (1883). *Inquiries into human faculty and its development*. London: Macmillan.

Graves, J. L., Jr. (2001). *The emperor's new clothes: Biological theories of race at the millennium.* New Brunswick, NJ: Rutgers University Press.

Heath, A. C. (1995). Secretary's report: The 25th annual meeting of the Behavior Genetics Association, Richmond, Virginia. *Behavior Genetics, 25*, 589–590.

Heath, A. C. (1996). Secretary's report: The 26th annual meeting of the Behavior Genetics Association, Richmond, Virginia [Pittsburgh, Pennsylvania]. *Behavior Genetics, 26*, 605–606.

Herrnstein, R. J. (1971). I.Q. *Atlantic Monthly 228*(3), 43–64.

Herrnstein, R. J. (1973). *I.Q. in the meritocracy*. Boston: Little, Brown.

Herrnstein, R. J., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life*. New York: The Free Press.

Homer. (n.d./1909). *The Odyssey* (S. H. Butcher & A. Lang, Trans.). New York: Collier.

Hunt, M. (1999). *The new know-nothings*. New Brunswick, NJ: Transaction Publishers.

Jensen, A. R. (1969). How much can we boost IQ and scholastic achievement? *Harvard Educational Review, 39*, 1–123.

Jencks, C., & Phillips, M. (Eds.) (1998). *The Black-White test score gap*. Washington, DC: Brookings Institution.

Lewontin, R. C. (1970). Race and intelligence. *Bulletin of the Atomic Scientists, 26*(3), 2–8.

Locke, J. (1690/1975). *An essay concerning human understanding* (P. H. Nidditch, Ed.). Oxford: Clarendon Press.

Locke, J. (1693/1913). *Some thoughts concerning education* (R. H. Quick, Ed.). Cambridge: Cambridge University Press.

Loehlin, J. C. (2000). Group differences in intelligence. In R. J. Sternberg (Ed.), *Handbook of intelligence* (pp. 176–193). Cambridge: Cambridge University Press.

Loehlin, J. C., Lindzey, G., & Spuhler, J. N. (1975). *Race differences in intelligence*. San Francisco: Freeman.

Mill, J. S. (1873). *Autobiography*. London: Longmans.

Morey, D. F. (1994). The early evolution of the domestic dog. *American Scientist, 82*, 336–347.

National Society for the Study of Education (1928). *27th yearbook: Nature and nurture*. Bloomington. IL: Public School Publishing.

Pearson, R. (1991). *Race, intelligence and bias in academe*. Washington, DC: Scott-Townsend.

Pearson, R. (1995). The concept of heredity in the history of Western culture: Part One. *The Mankind Quarterly, 35*, 229–266.

Pinker, S. (2002). *The blank slate: The modern denial of human nature*. New York: Viking.

Plato (n.d./1901). *The Republic* (B. Jowett, Trans.). New York: Willey Book Co.

Porter, N. (1887). Marginalia Locke-a-na. *New Englander and Yale Review, 11*, 33–49.

Reynolds, C. R., Chastain, R. L., Kaufman, A. S., & McLean, J. T. (1987). Demographic characteristics and IQ among adults: Analysis of the WAIS-R standardization sample as a function of the stratification variables. *Journal of School Psychology, 25*, 323–342.

Rowe, D. C., Vesterdal, W. J., & Rodgers, J. L. (1998). Herrnstein's syllogism: Genetic and shared environmental influences on IQ, education, and income. *Intelligence, 26*, 405–423.

Rushton, J. P., & Jensen, A. R. (2005). Thirty years of research on race differences in cognitive ability. *Psychology, Public Policy, and Law, 11*, 235–294.

Savolainen, P., Zhang, Y., Luo, J., Lundeberg, J., & Leitner, T. (2002). Genetic evidence for an East Asian origin of domestic dogs. *Science, 298*, 1610–1613.

Summers, L. H. (2005). *Remarks at NBER conference on diversifying science & engineering workforce*. Retrieved September 18, 2005, from http://www.president.harvard.edu/speeches/2005/nber.html

Tambs, K., Sundet, J. M., Magnus, P., & Berg, K. (1989). Genetic and environmental contributions to the covariance between occupational status, educational attainment, and IQ: A study of twins. *Behavior Genetics, 19*, 209–222.

Vandenberg, S. G., & DeFries, J. C. (1970). Our hopes for behavior genetics. *Behavior Genetics, 1*, 1–2.

Watson, J. B. (1925). *Behaviorism*. New York: Norton.

Whitney, G. (1995). Twenty-five years of behavior genetics. *Mankind Quarterly, 35*, 328–342.