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output per worker, is a fragile measure because averages delete the exceptional, and the exceptional is sometimes decisive. Clark's extensive attention to technological innovation is alas inattentive to investigation of natural processes that gave rise to the telegraph, the light bulb, the internal combustion engine, plastics, and countless other industrial products. His oversight is so entire that he doesn't review economic data on the steam engine as the prime mover of the industrial revolution's first phase.

Manipulating natural processes is the key to the Industrial Revolution. The steam engine embodies this process because it utilized improvements in numerous technologies, such as iron smelting and metal working, but above all gave the world the first version of controlled use of enormous power. What then is the implication for Clark's central thesis that the Industrial Revolution arose from a work ethic genotype? The exciting investigations of Bryan Sykes on British genealogical

genotypes (mtDNA haplogroups) is one area of a growing map of the world-wide distribution of human reproductive groups over the past 50,000 years. One might even imagine compiling a haplogroups database of individuals who substantially contributed to the Industrial Revolution. But since such data cannot as yet be interpreted for behavioral traits, the exercise would provide no evidence for Clark's thesis.

Behavioral Genetics (5th edition)

Robert Plomin, John C. DeFries, Gerald E. McClearn, Peter McGuffin. (2008). Worth Publishers, New York, 505 pp., US\$115.95, ISBN 10 | 4292 0577 6

Reviewed by Timothy C. Bates, University of Edinburgh, United Kingdom

The purpose of *Behavioral Genetics* 5th edition (BG) is to cover the knowns and unknowns of behavior genetics, conveying the excitement of the field, its prospects, and something of the methods. Like the important *American Psychologist* (AP) paper 'Intelligence: Knowns and Unknowns' (Neisser et al., 1996), BG is designed to convey a consensus, in this case across fields as diverse as autism and xenophobia. Establishing and communicating this consensus is especially important for behavior genetics when many students are relatively unaware of the existence of biological differences. To meet this bold purpose the book needs to be accessible to those new to genetics while remaining accurate, and this goal is met admirably. The text is suffused with a calm and even handed approach that allows it to address its pedagogical task far better than most texts. It has been honed across the decades, including a complete rewrite (3rd edition), and, now, two rounds of fine-tuning. This polish pays off: the book reads very well, is well indexed, and integrated.

Core topics are addressed in several places, reinforcing common themes and ensuring that those dipping into one section will gain a sense of context and the relationship of one finding to others. Information is presented in multiple forms: graphically, in textual descriptions, statistical tabulations, and even anecdotal presentations and insider-glimpses to the research process — all crafted to communicate the research and enable the reader to come to an informed decision. The book also uses autobiographical sidebars and photos of researchers. Those who have been in the field for a number of years will appreciate the varying dates of these pictures, forming as they do a family photo album for behavior genetics. Neither is this mere nostalgia: many in the social sciences are used to learning material through its history, past and present,

and again, the pedagogical model of accurate presentation of material in compelling formats is enhanced. If the primary strength of BG lies in its virtues of prudent and temperate communication of the consensus, then in these sketches we can glimpse the fortitude that many in the field have displayed in winning this nascent status.

In study after study, BG makes clear how much of what is known about behavior has flowed from behavioral genetic studies, and how these studies continue to do much of the heavy lifting in parsing behavior into its component parts, often in extremely sophisticated ways, thanks especially to the developers of long-term twin and adoption studies, and the wider use of software such as *Mx* (Neale et al., 2002). If nothing else, BG helps dispel the notion that heritability can be disposed of now that the

real genes are known, and a brief glance at the frequency of pseudo-functional gene names such as *KIBRA* (Kidney and Brain) and the ubiquitous KIAA genes of unknown function reminds us that we do not yet understand our genome.

Much has changed in this field since the last edition in 2000, in both the behavioral and molecular fronts. Organisms like the zebrafish that at the time of the 4th edition were 'likely to be next vertebrate after the mouse to be sequenced' now litter the past covers of *Nature* and *Science*. Exciting latent ideas such as a map of the more common variants of the genome have been realized and are accessible for anyone with a web-browser, as well as other advances in assessing copy number variants and the advent of cheap Single nucleotide polymorphisms (SNP) testing and SNPchips

which have paid off in many hundreds of papers. BG amply covers the use of these developments, integrating them to the logic and practice of linkage and association studies; but it would be a mistake for a book such as this to focus excessively on the state of play in 2008 when next few years will see the sequencing of 1000 individual humans, and consortium studies of 60 to 100,000 subjects for most major disorders. Genome-wide searches for gene variants of low effect size dependent on studies of this magnitude have seen the field lurch into an area of consortia and big science. BG strikes a balance between exciting new methods still in flux, and the powerful foundation of our science that remains constant. This foundation, from Darwin and Mendel through Watson and Crick, and the mechanisms of molecular genetics is covered very accessibly. The logic of behavioral analyses is made clearer here than in any other text, supplemented by the addition of excellent chapters on modeling by Mike Neale and Shaun Purcell, along with a bibliography of relevant websites. This said, there is a definite gap in the market for a book that takes the user through the tools of behavior genetics, making the transition from interest to competence.

If there are weaknesses in BG, I would identify its lack of coverage of recent human molecular evolution as a source of variation. Evolution is largely considered as a historical process that has ended for humans. However, there is currently a tremendous interest in the information contained in the human genome reflecting selection pressures. Group differences (Tang et al., 2005) and signals of positive selection (Sabeti et al., 2006) and the tools designed for this type of analysis are not covered. A

more minor, but important gap is coverage of the assumptions and extensions of the twin method. A common belief among those who reject behavior genetic data is that the assumptions of the twin method are invalid, or that all behavioral differences must reflect incredibly complex gene \times environment interactions. There have been several powerful advances in this area, for instance testing the equal environments assumption using an assumption-free model (Visscher et al., 2006), and more theoretical work on the likely (low) impact of interactions on variance (Hill et al., 2008).

The explosion in genetic research has opened a large market for researchers expert in a given phenotype, but who are also able to translate this knowledge into the large-scale phenotyping, and statistical or wet-lab techniques of molecular genetics. Even without moving to this scale, there are a wealth of twin, family, and other data already collected which can answer very exciting questions about such diverse topics as voting habits (Hatemi et al., 2007) and happiness (Weiss et al., 2008), through to Autism (Ronald et al., 2006). But there is a wealth of this data remaining to be analyzed in major datasets worlds wide. Exposure to this book will be eye opening for many in the social sciences, and there is a thesis idea on almost every page. Undoubtedly it will continue to encourage people into our field as it has in past editions.

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