

The Social Science Blues

by Eric Turkheimer

At the dawn of the new century, Robert Plomin was gloomy, though at first it is hard to imagine why. He had just led one of the greatest intellectual transformations in the history of behavioral science. In the seventies, as Plomin completed his Ph.D., behavioral genetics was an outcast in the social sciences. Although there was already a robust genetic literature about the behavior of farm animals and dogs, the idea that the most complex aspects of human behavior might be substantially influenced by genes was anathema. The few scientists who ventured into the domain were ostracized.

Only twenty years later, as Plomin contemplated the future of his field from his chair at the Institute of Psychiatry in London, behavior genetics was thoroughly established as one of the foundations of scientific psychology. Twin and adoption studies had sprouted everywhere, many of them under Plomin's leadership. The idea that schizophrenia or bipolar disorder has a genetic basis was accepted by nearly everyone; it was the doubters who were on the fringes of the field. Moreover, the field had largely been liberated from its old ties to racism, eugenics, and genetic determinism. Behavior genetics had joined the academic establishment: routine, expected, moderate, even anodyne. Genes and environment worked together, inextricably, in the genesis of human behavior.

Robert Plomin was not just a leader of this transformation: he was *the*

leader. Plomin was always a moderate in nature-nurture battles. Indeed, his moderation showed the way for the acceptance of heritability into the mainstream of developmental psychology and psychopathology, and later into sociology, economics, and political science. He mostly avoided the thorny social problems associated with behavior genetics. He never went out of his way to either endorse or attack Richard Herrnstein and Charles Murray, Arthur Jensen, or any of the other major hereditarian theorists of the time. His CV is studded with important contributions to the study of the environment. Like many scientists who are described as behavior geneticists, Robert Plomin was never a geneticist in the biological sense; he was a psychologist, arguably the most successful of his generation.

Yet there he was in London in the late nineties, in the middle of one of the greatest careers in this history of psychology, despairing. He contemplated retirement. What could have been the matter? Here are his words in *Blueprint: How DNA Makes Us Who We Are*: "Even though I am an incorrigible optimist, a decade ago I was getting depressed about these three false starts and their implications for future attempts to find the DNA differences responsible for the heritability of psychological traits." Twin and adoption genetics, as profoundly influential as they had been, always had a flaw: they were abstracted from DNA, and therefore from biology itself. The methodological details had

been worked out in the 1920s, when genetics was still in its infancy and DNA completely unknown. The cleverness of the designs and their elaborate statistical analyses explain their great popularity with social scientists, but even the most successful twin and family studies can be shallow and uninformative in their substantive conclusions. Even after myriad twin analyses of complex human behavior, it would be difficult say what exactly had been learned about intelligence, personality, or mental illness, other than that they are all more or less heritable. For better or for worse, twin studies are social science, and Robert Plomin was a social scientist; he wanted more.

As the new century began, however, the potential for vindication presented itself. The Human Genome Project was being completed, and soon, behavior genetics would no longer rely on distal inferences from twins. It was more and more possible to collect human DNA from large samples at low cost. The source of Plomin's gloom, the need to "find the DNA differences responsible for the heritability of psychological traits" (p. 122), would finally be addressed head-on. The field held its breath as DNA was collected from schizophrenics and controls, the intelligent and the slow, the introverted and the extroverted. The great era of behavioral genomics was on the horizon.

But it never arrived. As Plomin recounts in part two of *Blueprint*, titled, "The DNA Revolution," attempts to find the DNA responsible for the heritability of behavior failed. Month after month, journals would report new findings of specific genes for behavioral phenotypes, but they never replicated. One

Blueprint: How DNA Makes Us Who We Are. By Robert Plomin. MIT Press, 2018.

amazing genomic methodology after another was developed in biological genetics and applied to medicine, where it succeeded, and then to human behavior, where it failed. This was the moment of Plomin's despair. He had, with great intellectual courage, staked his reputation on the existence of actionable scientific knowledge of the DNA-based genesis of twin-based heritability. As reports of associations between DNA and behavioral phenotypes slowly faded into nonreplication, one can understand the scientific doubts Plomin was experiencing. The path out of the gloomy social scientific swamp appeared to be blocked.

But *Blueprint* is hardly the product of a gloomy author. Quite the opposite: it is a declaration of victory of nature over nurture, a celebration of the vindication of Plomin as a scientist and of behavior genetics as a field of study. What happened between 2000 and 2019 to brighten Plomin's outlook so radically? Were the genes for schizophrenia and intelligence finally discovered? Are we at last on our way to understanding why, at a biological level, all differences in human behavior are substantially heritable? Alas, no. What happened is that Robert Plomin gave up on the search for individual genes that explain heritability and decided to be satisfied with much less. There were two stages to Plomin's scientific redemption.

The first of them was another technical innovation from biological genomics, called genome-wide association studies, or GWAS. In GWAS, instead of preselecting individual genes to test for association with complex outcomes, geneticists search the entire genome for tiny correlations between complex phenotypes and individual bits of DNA called single nucleotide polymorphisms, or SNPs, with stringent statistical corrections for the millions of tests that are conducted. At first, GWAS was yet another failure. It rapidly became clear that the magnitude of associations between SNPs and behavior were so tiny as to require gargantuan samples, in the tens and even hundreds of thousands, to detect them. Although those samples were eventually compiled, and "significant" associations found, it still

didn't fulfill Plomin's dream of locating the DNA responsible for statistical heritability. GWAS has had some successes in complex medical disease, but it hasn't discovered anything resembling genes for schizophrenia or intelligence. A decade after the completion of the Human Genome Project, the prospects for a true genomics of human behavior remained gloomy.

Then, yet again, a technical innovation, this one more statistical than biological, presented itself. Especially in the study of normal continuous traits as opposed to psychiatric disorders—an enterprise known as social science genomics—investigators became less concerned with the action of individual genes and more interested in statistical composites of DNA called polygenic scores, which can be used as predictors in social science research. Polygenic scores, finally, pulled Plomin out of his gloom. The best polygenic scores predict pretty well. A polygenic score can predict about 40 percent of the phenotypic variance in height, which is technically impressive if not theoretically surprising. (Who doubted that height was genetic in a fairly straightforward way?) The most robust polygenic scores for behavioral differences account for 10 to 15 percent of the phenotypic variance. Most do far worse: for personality, for example, they are still close to zero. They will no doubt get better, although how much better is anyone's guess.

In any case, polygenic scores achieve their predictive power by abdicating any claim to biological meaning. SNPs are summed willy-nilly across chromosomes. At first, part of the procedure involved experimenting with how many SNPs to include in the sum: only the genome-significant ones at $p < .05 * 10^{-8}$, or all at $p < .05$, or some other threshold? But as Plomin describes, the field has rapidly drifted in the direction of just including all of them, large effect or small, significant or not. At this point, the original task of figuring out which gene does what on a biological level has been abandoned. Polygenic scores have returned behavior genetics to its origins as social science.

GWAS and polygenic scores are perfectly sound on their own terms. They do what they are supposed to do: GWAS finds DNA with tiny correlations with phenotypes, and polygenic scores sum those effects in ways that are sometimes useful. A generation of young scientists is exploring how polygenic scores and other GWAS products can be integrated into the investigation of traditional social science questions. Like all social science, and, in particular, like the twin genetics of the previous generation, genomic social science at its best is informative and descriptive, illuminating and even enlightening. At its most frustrating, it is local, contextual, nonreplicable, and causally refractory. None of its conclusions are revelatory: no one is about to use polygenic scores to figure out why children excel or fail in school or become addicted to drugs. But unless one has just had it with social science in general, genomic social science works well enough; it's good to have a new way to ask the old questions at slightly higher genomic resolution.

Like most cases of melancholy, Plomin's millennial gloom originated in a realistic view of a harsh reality: human behavioral science, genetically informed or not, never partakes of the bracing certainty of the natural sciences. The lesson to be drawn from the failure of the gene-finding project is that the gap between the biological action of individual genes and complex, uncontrolled behavior in humans is in a real sense permanent. Social science, and therefore social scientists, are not going to be rescued by genomics; to the contrary, genomics will only become more and more ensnared in the frustrations of social science. The best tonic for Plomin's melancholy would be an unblinking acceptance of the inherent frustrations of human science. Polygenic scores may be a retreat from the dream of a behavioral science finally based in biology, but it is a prudent retreat, one that offers real benefits to both genetically informed social scientists and biological geneticists who are ready to confront the scientific ambiguities of human behavior.

Plomin, however, is not ready to face that reality and accept polygenic scores

as rough but useful tools in the age-old slog of human social science. He wants them to provide vindication of the entire behavior genetic research program, to be a demonstration that behavior genetics is real (not social) science, and, while he's at it, to ensure final victory of nature over nurture. Having promoted statistical prediction over biological explanation or clinical discovery as the ultimate goal of behavioral science, Plomin has to convince the reader that polygenic prediction is more revolutionary than it actually is. The best polygenic scores predict about as well as a parental phenotype, which is interesting and useful for the working social scientist but hardly (as Plomin likes to repeat) a game changer. Finally, Plomin conjures DNA as a "fortune teller," capable of knowing who we are and forecasting what we will become. This fortune-teller can predict only about 10 percent of the variance on a good day, but Plomin rhapsodizes about its effectiveness, trumpeting the polygenic scores that work pretty well and ignoring the ones that don't work at all. He repeats over and over that DNA "makes us who we are."

All the scientific bluster about DNA fortune-tellers is unbecoming in someone with an intellectual pedigree as interactionist as Plomin's, and it leaves one wondering why so many social scientists start with a commitment to

complex gene-environment interplay but wind up committed to blunt hereditarian overstatement. The obvious explanations—provocation for its own sake, hawking books, settling scores—are beneath a scientist of Plomin's stature, although there is some of all that in *Blueprint*.

The deeper reason, however, is that Plomin doesn't want to pass from the scene as a social scientist. How are social scientists from the previous generation remembered? Not for deriving the equations that explain personality, finding the cure for depression, or isolating the gene for success in school—because those things don't exist, any more than fortune-tellers do. The empirical contributions of great social scientists don't build on those of the previous generation or provide a foundation for the next; they fade into the great undifferentiated sprawl of human science, history, philosophy, and art. The senior social scientist leaves a mark with either methodological innovation or large-scale philosophical synthesis, neither of which has ever been Plomin's forte, or finds satisfaction in filling out the rich quasiscientific portrait of the human condition that has accumulated since the Enlightenment. Plomin has done that with unparalleled success for most of his career, but finally, it wasn't enough. He wants to go out a scientist.

It wouldn't matter if the topic weren't behavior genetics; it would be just another overstated valedictory by a great social scientist, with little price to be paid. But overstating the science of human behavioral genetics comes with the greatest price imaginable: it encroaches on human freedom and justice. Plomin knows, and I think sincerely believes, that he ought not to declare outright that poor people have genes that make them poor or that oppressed groups are oppressed because of their genetic inferiority. He says that genes are probabilistic, not deterministic, without ever making an effort to square that idea with his contention, tossed off as if it was nothing, that our DNA is what makes us who we are. Plomin tells us, in a sentence that sounds innocuous but that may in fact be the worst ever written by an important behavior geneticist, "Put crudely, nice parents have nice children because they are all nice genetically" (p. 83). And not-so-nice parents? Criminals, beggars, the unintelligent, the miserable, and the insane? What of them and their children? He can't have it both ways. Genetic determinism is a cheap nostrum for an unhappy social scientist late in a career, but its side effects are poisonous.

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