



What should babies be screened for, and who should share in the data?

SOCIETY

Genetic determinism redux

Nathaniel Comfort questions a psychologist's troubling claims about genes and behaviour.

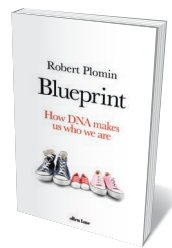
It's never a good time for another bout of genetic determinism, but it's hard to imagine a worse one than this. Social inequality gaps, exacerbated by climate change, driving hostility towards immigrants and flares of militant racism. At such a juncture, yet another expression of the discredited, simplistic idea that genes alone control human nature seems particularly insidious.

And yet, here we are again with *Blueprint*, by educational psychologist Robert Plomin. Although Plomin frequently uses more civil, progressive language than did his predecessors, the book's message is vintage genetic determinism: "DNA isn't all that matters but it matters more than everything else put together." "Nice parents have nice children because they are all nice genetically." And it's not just any nucleic acid that matters; it is human chromosomal DNA. Sorry, microbiologists, epigeneticists, RNA experts, developmental biologists: you're not part of Plomin's picture.

Crude hereditarianism often re-emerges after major advances in biological knowledge: Darwinism begat eugenics; Mendelism begat

worse eugenics. The flowering of medical genetics in the 1950s led to the notorious, now-debunked idea that men with an extra Y chromosome (XYY genotype) were prone to violence. Hereditarian books such as Charles Murray and Richard Herrnstein's *The Bell Curve* (1994) and Nicholas Wade's 2014 *A Troublesome Inheritance* (see N. Comfort *Nature* **513**, 306–307; 2014) exploited their respective scientific and cultural moments, leveraging the cultural authority of science to advance a discredited, democratic agenda. Although *Blueprint* is cut from different ideological cloth, the consequences could be just as grave.

The scientific advance this time is the genome-wide association study (GWAS). Invented in 1996, GWAS has gained massively in predictive power with the advent of 'polygenic scores', a statistical tool that



Blueprint: How DNA Makes Us Who We Are
ROBERT PLOMIN
Allen Lane (2018)

in recent years has lured social scientists to the genome, with the promise of genetic explanations for complex traits, such as voting behaviour or investment strategies. As Plomin notes, it was something they had been trying to do for a long time.

Plomin's predecessors tried to get monogenic risk scores. For example, Henry Goddard, an educational psychologist who from 1906 to 1918 directed the New Jersey Training School for Feeble-Minded Girls and Boys in Vineland, claimed he had found the gene for low intelligence. With Charles Davenport, a prominent US eugenicist, whispering in his ear, Goddard suggested that learning disabilities resulted from a single Mendelian recessive gene. Scanning the swathes of pedigrees he had collected (progressive-era 'big data'; see *Nature* **558**, 28–29; 2018), he identified what seemed to be a unit character: an apparent recessive "gene for" learning disability. When he factored in behaviours thought to result from that condition — such as criminality and promiscuity — the alleged association went sky-high. Goddard's pedigrees bloomed with antisocial traits, which he believed were passed down ▶



EDWIN REMSBERG/WMPICS/REDUX/EVINE

Free, healthy school meals have been shown to improve educational attainment

► the generations as a Mendelian recessive gene. He never seems to have questioned whether a single gene for such a complex trait made sense biologically. It doesn't.

No one is so foolish as to believe in a single gene for learning disability any more. As has been well established, the genetic contribution to complex traits is spread over many genes, each contributing a minuscule sliver of the variability for the trait. Polygenic risk scores sum and weight these many tiny effects, creating what some researchers have called a “monogenic equivalent”—a “gene for” by proxy.

A polygenic score is a correlation coefficient. A GWAS identifies single nucleotide polymorphisms (SNPs) in the DNA that correlate with the trait of interest. The SNPs are markers only. Although they might, in some cases, suggest genomic neighbourhoods in which to search for genes that directly affect the trait, the polygenic score itself is in no sense causal. Plomin understands this and says so repeatedly in the book — yet contradicts himself several times by arguing that the scores are, in fact, causal.

Plomin deploys a standard feint in hereditarian psychology, insisting on the trivial so-called first law of behavioural genetics: that no psychological trait is entirely unaffected by genetics. But he insists that “genetics is the main systematic force in life”, often mediating both gene–environment effects and even

environmental effects, such as breastfeeding and TV-watching on school achievement. If all you have is a polygenic score, everything looks like a gene. *Blueprint* is uncritical DNA boosterism, and Plomin “unabashedly a cheerleader” by his own admission.

Polygenic scores do suggest some things to cheer about. We should applaud the broad-based shift across biomedicine from monogenic to polygenic causation. This approach analyses behaviour in a much more complex, surgical way than the crude stabs of Goddard's ilk. The method is finding wide application, from precision medicine to field biology. For example, polygenic scores have been shown to improve risk predictions for prostate, ovarian and breast cancers. They can point to traits that might have been influenced by local adaptation, and gauge the pace of evolutionary change.

Plomin adopts the language of personalized medicine to call for DNA-driven advances in education policy — “personalized learning”. He argues that we should think of personality traits as we do autism or attention-deficit hyperactivity disorder: as existing on spectra. He urges psychologists to move away from the language of disorders

and to talk instead of graded “dimensions” — personality traits, such as introversion or agreeableness. “All children have special needs,” he once told the newspaper *The Guardian*. In a book so filled with retrograde ideas about genes, I was pleasantly surprised to find this strong, welcome biological support for the idea of neurodiversity.

In fundamental ways, however, Plomin's argument is just old hereditarian wine pipetted into thousands of tiny polygenic bottles. In 1969, educational psychologist Arthur Jensen dropped a pseudo-statistical bombshell in the *Harvard Educational Review*. He argued that genetics was responsible for the notional IQ gap between African Americans and white people (not bias baked into the test or environmental effects) and that remedial education was pointless. Jensen's arguments and much of his ‘data’ were old, part of a dark tradition of hereditarian social science that would subsequently emerge in books such as *The Bell Curve*. *Blueprint* uses language, imagery, rhetoric, conclusions and numbers that will be familiar to readers who have, like me, slogged through all these works. A sobering theme of most, *Blueprint* included, is their aspiration of shaping social policy.

Like much of that literature, *Blueprint* plays fast and loose with the concept of heritability. Sometimes Plomin treats it (correctly) as a variable property of a population in a given environment. As population geneticist

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Richard Lewontin pointed out in a scathing critique of Jensen's approach in 1970, in times of plenty, height is highly heritable; in a famine, much less so (R. C. Lewontin *Bull. Atom. Sci.* 26, 2–8; 1970). But elsewhere, Plomin, like Jensen, treats heritability wrongly as a property inherent in a trait.

Blueprint does depart from much prior hereditarian social science in not explicitly mentioning race — the hot-button issue of many earlier works. It instead looks at class. Plomin uses a data set of mostly white British twins, most of whom attended English grammar schools. Yet, given Plomin's extensive experience and his footnotes, the absence of any explicit mention of race (to disavow it, say, or to allude to intersectionality) is conspicuous.

The most troubling thing about *Blueprint* is its Panglossian DNA determinism. Plomin foresees private, direct-to-consumer companies selling sets of polygenic scores to academic programmes or workplaces. Yet, as this “incurable optimist” assures us, “success and failure — and credit and blame — in overcoming problems should be calibrated relative to genetic strengths and weaknesses”, not environmental ones. All is for the best in this best of brave new worlds.

Plomin likes to say that various components of nurture “matter, but they don't make a difference”. But the benefits of good teaching, of school lunches and breakfasts, of having textbooks and air-conditioning and heating and plumbing have been established irrefutably. And they actually are causal: we know why stable blood sugar improves mental concentration. Yet Plomin dismisses such effects as “unsystematic and unstable, so there's not much we can do about them”.

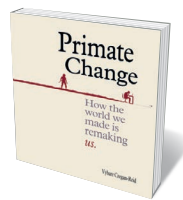
Ultimately, if unintentionally, *Blueprint* is a road map for regressive social policy. Nothing here seems overtly hostile, to schoolchildren or anyone else. But Plomin's argument provides live ammunition for those who would abandon proven methods of improving academic achievement among socio-economically deprived children. His utopia is a forensic world, dictated by polygenic algorithms and the whims of those who know how to use them. People would be defined at birth by their DNA. Expectations would be set, and opportunities, resources and experiences would be doled out — and withheld — a priori, before anyone has had a chance to show their mettle.

To paraphrase Lewontin in his 1970 critique of Jensen's argument, Plomin has made it pretty clear what kind of world he wants.

I oppose him. ■

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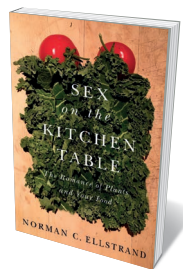
Books in brief



Primate Change: How the World We Made Is Remaking Us

Vybarr Cregan-Reid OCTOPUS (2018)

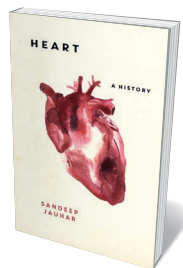
Nature and nurture commingle to fascinating effect in this study of how the environment humans have so thoroughly altered is altering us physiologically. Humanities scholar Vybarr Cregan-Reid ventures from the African forest apes of 20 million years ago to the rise of *Homo sapiens* and the impacts of successive revolutions — agricultural, industrial, urban and digital — on our anatomy. Our grossly sedentary, technologically dominated, polluted present, he argues, constitutes a collective assault on bodies unevolved to cope, leading to ‘mismatch’ conditions such as myopia and obesity.



Sex on the Kitchen Table

Norman C. Ellstrand UNIVERSITY OF CHICAGO PRESS (2018)

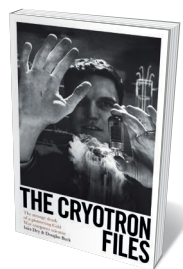
The sex life of an avocado might seem anything but lurid. Geneticist Norman Ellstrand, however, reveals it as a riot of romantic yearning and ‘sex switching’. In his foray into the nexus of food, science and plant reproduction, we enter that alternative universe in which olives and quinces are really vehicles for seeds, the tomato (the ‘love apple’ of yore) is self-fertile and cultivated bananas are female-sterile. You'll become reacquainted with the pistil, and wonder at the sugar beet's rise “from a cascade of geopolitical incidents”. Nutrition might never seem the same again.



Heart: A History

Sandeep Jauhar ONEWORLD (2018)

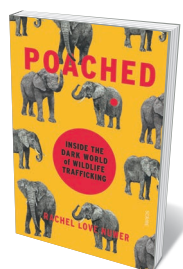
Cardiologist Sandeep Jauhar's exploration of that marvellous muscle, the heart, meshes cutting-edge science, memoir and history. He pictures a cadaver's heart as “a squat volcano tipped on its side”. He extols physician William Harvey's great 1628 treatise *On the Motion of the Heart and Blood in Animals*. He records the troubled dawn of open-heart surgery, pioneered by experimentalists such as C. Walton Lillehei in the 1950s. And he recounts with raw immediacy his mother's death from cardiac arrest. A moving narrative echoing to the beat of “this organ, prime mover and citadel”.



The Cryotron Files

Iain Dey and Douglas Buck ICON (2018)

This extraordinary chapter in the annals of cold-war science is both thrilleresque and tragic. At its centre is Dudley Buck, a gifted electrical engineer and US government agent whose prototype microchip, the Cryotron, was key to a covert scheme to create the first supercomputers. As journalist Iain Dey and Buck's son Douglas reveal, Buck and his colleague Louis Ridenour, a physicist, died suddenly in 1959, after a visit from high-level Soviet researchers. Any discussion of Soviet contact-poison hits is speculative; what is not is Buck's substantial contribution to modern computer science.



Poached

Rachel Love Nuwer DACAPO (2018)

From the hacked corpses of bull elephants in Botswana to fast-declining pangolin populations, wildlife trafficking is an ongoing threat to conservation gains. Rachel Nuwer, a conservation biologist turned science journalist, traces at first hand the front lines across the globe in her hard-hitting, wince-inducing report. Examining the forces driving demand, the trade itself and countermeasures, she takes us from Africa's killing fields to the corridors of regulatory behemoths, and finds gleams of hope in Chad's National Elephant Action Plan and pangolin rescue efforts in Vietnam. [Barbara Kiser](#)