A "Blueprint" for Genetic Determinism: An Appraisal of Robert Plomin's *Blueprint: How DNA Makes Us Who We Are*

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In 2018, behavioral geneticist Robert Plomin published *Blueprint: How DNA Makes Us Who We Are* (Plomin, 2018a). In this book, Plomin argued that DNA is the main factor that determines differences in human behavior, that most environmental influences on behavior should be counted as genetic influences, that true environmental influences are mostly random and "we cannot do much about them," and that the molecular genetic "polygenic risk score" method is a "new fortune-telling device" that uses a person's genetic profile to "predict psychological traits like depression, schizophrenia and school achievement" (p. vii). Plomin's book "interweaves my own story and my DNA in order to personalize the research and to share the experience of doing science" (p. xii). He described the polygenic risk score method as a molecular genetic technique that finds statistically non-significant individual "SNP" hits (single nucleotide polymorphisms), and combines them to produce a polygenic (composite) risk score. Others have described polygenic risk scores as "generally constructed as weighted sum scores of risk alleles using effect sizes from genome-wide association studies as their weights" (Janssens, 2019, p. R143). Several commentators, however, have pointed to potential problems including non-causality, environmental confounds such as population stratification, and other confounds and limitations as they relate to the polygenic risk score method (Baverstock, 2019; Comfort, 2018a; Meyer et al., 2020; Mostafavi et al., 2020; Richardson & Jones, 2019).

Plomin's thesis was that "the DNA differences inherited from our parents at the moment of conception are the consistent, lifelong source of psychological individuality, the blueprint that makes us who we are" (p. ix). Behavioral genetic researchers don't like to be called "genetic

determinists," which might explain why Plomin made occasional statements that "the environment is important" (p. 32), and that "genes are not destiny" (p. 92). And yet, in *Blueprint* he repeatedly conveyed the message that genes *are* destiny, and that environmental influences are not important.

A leader of the behavioral genetics field since the early 1980s, Plomin, who has lived in and worked the U.K. since the 1990s, was awarded the American Psychological Association's (APA) "Award for Distinguished Scientific Contributions" in 2017, in part for having led "the transformation of behavior genetics from an isolated and sometimes vilified scientific outpost to a fully integrated mainstay of scientific psychology" (APA, 2017). He has conducted "quantitative genetic" twin and adoption studies since the 1970s, and since the early 1990s he has also conducted molecular genetic studies in an attempt to discover genetic variants that he believes underlie "general intelligence" (IQ) and other areas of behavior.

In 2019, psychologist and behavioral genetic researcher Eric Turkheimer published a review of *Blueprint* (Turkheimer, 2019). Turkheimer is known as a critic, from within behavioral genetics, of some of his field's theories and claims. "The great era of behavioral genomics was on the horizon" 20 years ago, Turkheimer wrote, "but it never arrived" (p. 45). Countless studies (and accompanying media reports) have appeared over the past few decades reporting the discovery of genes that influence behavior, but they could not be replicated, leading to what he characterized as the current "failure of the gene-finding project" (p. 46).

Nevertheless, Turkheimer wrote, *Blueprint* is "hardly the product of a gloomy author," but is instead "a declaration of victory of nature over nurture, a celebration of the vindication of Plomin as a scientist and of behavioral genetics as a field of study" (p. 46). Because Plomin relied on the polygenic risk score method, in Turkheimer's view he had abandoned "the original

task of figuring out which gene does what on a biological level," because "polygenic scores achieve their predictive power by abdicating any claim to biological meaning" (p. 46).

Turkheimer took the former gene-environment "interactionalist" Plomin to task for his new stance that "DNA makes us who we are," a phrase Plomin used in *Blueprint's* title, and repeated in a similar form, no fewer than 25 times in the book. Turkheimer pointed to a sentence by Plomin that "may in fact be the worst ever written by an important behavior geneticist" (p. 47). According to Plomin, "Put crudely, nice parents have nice children because they are all nice genetically" (Plomin, 2018a, p. 83). This led Turkheimer to ask, "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" (Turkheimer, 2019, p. 47).

Major Problem Areas in *Blueprint*

I will now describe some important problem areas in *Blueprint* (while skipping over numerous less important problem areas), with an emphasis on areas that were not covered, or were mentioned only briefly, by other reviewers.

Plomin as Historian

In *Blueprint's* Prologue, Plomin misrepresented the history of genetic research in the area of human behavior. He wrote that genetic researchers, using twin and adoption studies, started accumulating evidence in favor of genetics in the 1960s, and that environmental theories had been dominant until then. For example, "From Freud onwards, the family environment, or *nurture*, was assumed to be the key factor in determining who we are" (p. vii, italics in original). He also claimed that "genetics had been ignored in psychology" until the early 1970s (p. xi):

> "One of the best things in life is to find something that you love to do, and I fell in love with genetics when I was a graduate student in psychology at the University of Texas at Austin in the early 1970s. It was thrilling to be part of the beginning of the modern era of genetic research in psychology. Everywhere we looked we found evidence for the importance of genetics, which was amazing, given that genetics had been ignored in psychology until then."

In fact, twin and adoption studies conducted by psychologists go back to the 1920s and earlier (see for example Hirsch, 1930; Thorndike, 1905), and a belief in the power of heredity has a long history. By making these claims, Plomin overlooked the worldwide eugenics movement of the first half of the 20th century, German psychiatric genetics (Joseph & Wetzel, 2013), compulsory sterilization laws, top psychologists' claims that intelligence was largely innate and fixed, and so on.

In the first four decades of the 20th century, hereditarian and eugenic theories were mainstream, and leading British and American psychologists played a major role in promoting eugenic theories and policies (Chase, 1980; Gould, 1981; Kamin, 1974). The field of psychology (and especially its psychometrics subfield) has always held that genetic factors play a role in causing differences in cognitive ability (IQ) and other behavioral characteristics, although the emphasis, meaning, and especially the weight given to genetic influences changes from era to era.

In an era when Plomin claimed that genetics "had been ignored in psychology," Edward Thorndike, listed by the APA in 2002 as the #9 "most eminent psychologist" of the 20th century

(APA, 2002; Plomin was #71), performed a 1905 twin study of "mental traits." In a much earlier version of the IQ hereditarian "blueprint" argument, Thorndike concluded, "It is highly probable from the facts given…that the similarity of twins in ancestry and conditions of conception and birth accounts for almost all of their similarity in mental achievement—that only a small fraction of it can be attributed to similarity in training" (Thorndike, 1905, p. 8). Cyril Burt was a knighted British psychologist and eugenicist, whose IQ hereditarian publications (and likely fraudulent twin studies) appeared for decades prior to the 1970s (Hearnshaw, 1979; Tucker, 1997). In 1923, a leading American psychologist wrote that intelligence testing had demonstrated the "definite intellectual superiority of the Nordic race," while warning American "citizens" not to "ignore the menace of racial degeneration" (Brigham, 1923, p. viii, 187). No "dog whistles" were needed in this era, as it could be openly proclaimed by leading psychologists in scholarly works that "science" had found that, due to heredity, the "Nordic race" was intellectually/genetically superior to all other "races." Nineteen years later, the question of whether "defective" American children should be put to death for eugenic and other purposes in a "euthanasia" program similar to Germany's was openly debated by two doctors in the July, 1942 edition of the *American Journal of Psychiatry* (Joseph, 2005; Kanner, 1942; Kennedy, 1942). Between 1944 and 1965, the *AJP* published a eugenics- and compulsory-sterilization-friendly annual report with the title, "Review of Psychiatric Progress: Heredity and Eugenics" (e.g., Kallmann, 1965). In 1937, the eugenically oriented British-American psychologist Raymond Cattell (#16 on the APA's "most eminent psychologist" list) published the IQ hereditarian book *The Fight for Our National Intelligence* (Cattell, 1937). Towards the end of his career, in 1972 Cattell wrote about the desirability of promoting what he called "genthanasia," which he described as the "phasing out" and "ending" of genetically "moribund cultures" (Cattell, 1972, p. 221).

The general post- World War II era view on the nature-nurture issue in American psychology is found in a 1958 article by Anne Anastasi, who later became APA president. Anastasi wrote that the "heredity-environment question" was a "dead issue," because "it is now generally conceded that both hereditary and environmental factors enter into all behavior" (Anastasi, 1958, p. 197). In the U.K., psychologist H. Maddox wrote in a 1957 edition of the *British Journal of Educational Psychology* that genetic influences were perhaps *over*-emphasized: "The British tradition in psychology has stressed the biological and hereditary determinants of behavior to the relative neglect of social and cultural determinants" (Maddox, 1957, p. 166).

Plomin wrote that "thirty years ago [circa 1988] it was dangerous professionally to study the genetic origins of differences in people's behaviour and to write about it in scientific journals" (p. xi). In the wake of the social struggles of the 1960s in a sense it *was* "dangerous" to come out in favor of eugenics, or to promote genetic explanations of racial group differences in IQ, criminal behavior, and other areas. However, even though Plomin conflated the non-eugenic and eugenic aspects of behavioral genetic research, outside of the racial-differences or eugenics context it was not dangerous or unusual to study or write about genetic influences on behavior.

Ignoring Critics and Colleagues Alike

In *Blueprint*, behavioral genetic concepts and methods, including twin studies, adoption studies, "heritability," genetic and environmental variance-partitioning "biometrical model-fitting" techniques, and "general intelligence" (IQ) were presented as valid concepts and methods. Plomin did not mention the names, arguments, or publications of the critics, or the fact that these concepts, techniques, and methods have always been controversial. Nor did he mention

the name of any of his behavioral genetics colleagues or mentors in the book's main body, even as celebrity/historical names were sprinkled throughout the text, including Bill Clinton and his "ne'er-do-well half-brother" (p. 72), W.C. Fields, Mark Twain, Brian Wilson, Aristotle, and Benjamin Franklin.

In his October 29th, 2018 "Gloomy Prospects" blogpost (Turkheimer, 2018), Turkheimer wrote that in *Blueprint*, Plomin took credit for his "First Law of Behavior Genetics." According to Turkheimer's 2000 "First Law," "All human behavioral traits are heritable" (Turkheimer 2000, p. 160). In *Blueprint*, Plomin cited a 2016 article that he (Plomin) and his colleagues wrote as the source of the "First Law" (p. 195). He did not mention Turkheimer's name, even though he credited Turkheimer as the developer of the First Law in this 2016 article (Plomin et al., 2016, p. 4).

As Turkheimer wrote in this 2018 blogpost, Plomin "endorses a hard-line hereditarianism," but "doesn't bother to actually defend his ideas from even the most obvious objections. Faced with arguments or data that might contradict him, he ignores them, demagogues them, or, as he mostly does with me, pretends that the inconvenient ideas were actually his all along."

Ignoring the Most Controversial and Crucial Assumption in Twin Research

Behavioral genetic claims rely heavily on the "classical twin method," which compares the behavioral resemblance or psychological test-score correlations of reared-together MZ (monozygotic, identical) and reared-together same-sex DZ (dizygotic, fraternal) twin pairs. MZ pairs are said to share a 100% genetic resemblance, whereas same-sex DZ pairs are said to share an average 50% genetic resemblance.

Genetic interpretations of the usual twin method finding that MZ pairs behave more similarly than DZ pairs are based on the long-controversial "equal environment assumption" (or "EEA"). This assumption states that MZ and DZ pairs grow up experiencing roughly equal environments, and that the only behaviorally relevant factor distinguishing these pairs is their differing degree of *genetic* relationship to each other (100% vs. 50%). Critics have argued since the 1930s that the EEA as it relates to behavioral twin studies is obviously false (Joseph, 2015; Stocks, 1930), since when compared with same-sex DZ pairs, MZ pairs grow up experiencing

- Much more similar treatment by parents and others, including being dressed alike
- More similar physical and social environments, including spending more time together and attending classes together
- More similar treatment by society due to their sharing a very similar physical appearance
- A greater tendency to model their behavior on each other
- Identity confusion and a much stronger level of emotional attachment

If the EEA is false, twin method results cannot be interpreted in favor of genetics because the potential influences of genes and environments are entangled. In *Blueprint*, Plomin did not mention the EEA, or the fact that genetic interpretations of his own "Twins Early Development Study" (TEDS) twin studies, which he discussed throughout the book, were based entirely on the validity of the EEA.

Adoption Studies

Plomin wrote that in behavioral genetic adoption studies, birthparents "share nature but not nurture with their children" (p. 13). Researchers conducting these studies typically find that adopted children correlate higher with their biological as opposed to their adoptive relatives, and

conclude that genetic factors explain this finding based on the assumption that birthparents share genes but not environments with their adopted-away offspring. However, even children adopted away at birth share several environmental factors in common with their birthmothers. This always includes the prenatal environment, usually includes skin color and "race" (frequently leading to oppression or privilege), and often includes similar physical appearance, social class, culture, religion, and so on.

Additional biases and environmental confounds in adoption research include attachment rupture and its impact on an abandoned/rejected child's developing brain (Newman et al., 2015), late separation from the birthparent, late placement after separation, selective placement (Kamin, 1974; Richardson & Norgate, 2006), and range restriction (Stoolmiller, 1999). The proper name for this area of research, therefore, is the "study of abandoned and rejected children." Plomin's claim (p. 13) that these studies are able to "disentangle nature and nurture" is not supported by the evidence.

In Plomin's own 1998 "Colorado Adoption Project" adoption study of personality (Plomin et al., 1998), he and his colleagues found an average personality test-score correlation of .01 (that is, zero) between birthparents and their 240 adopted-away 16-year-old biological offspring, a correlation that Plomin believed "*directly indexes genetic influence*, unlike the indirect comparisons between nonadoptive and adoptive relatives or between identical and fraternal twins" (Plomin et al., 1998, p. 211, italics added). Although he and his colleagues concluded in favor of genetic influences on personality (14% heritability, p. 215), a better explanation of the results is that Plomin's large and carefully planned 1998 adoption study found no genetic influences on personality—a result that stands in remarkable contrast to his later claim

in *Blueprint* that "DNA makes us who we are." (For a detailed analysis of this 1998 study, see Joseph 2013a).

Reared-Apart (Separated) Twin Studies

Plomin also cited so-called reared-apart (separated) twin studies in support of his positions, which included his own "Swedish Adoption/Twin Study on Aging" (SATSA) of the 1980s and 90s. He wrote in *Blueprint*, "The most dramatic test of genetic influence is to study MZ twins separated by adoption early in life. They share nature completely but do not share nurture at all, so their similarity is a direct test of genetic influence" (p. 18).

Critics, however, have described the many flaws and biases found in these six published studies, and have shown that most twins in these investigations were only *partially* reared apart (Farber, 1981; Joseph, 2015, 2020; Kamin, 1974). In the SATSA, for example, Plomin and colleagues defined twin pairs as "reared-apart" if they had been "separated by the age of 11." The twins, who averaged 65.6 years of age, had been "separated" from each other for an average of only 10.9 years at the time of testing (Pedersen et al., 1992, p. 347).

Plomin stood by the standard behavioral genetic assumption that reared-apart MZ (identical) twins "do not share nurture at all," a faulty assumption because even perfectly separated reared-apart MZ twins share many behaviorally relevant cohort influences such as common age (birth cohort effects), common sex, common physical appearance, common culture, common skin color (contributing to oppression or privilege), common pre- and perinatal environment and healthcare, and so on (Joseph, 2015, 2019).

The Most Important Question Is Interpretation, Not Replication

Behavioral genetic studies are well replicated, Plomin emphasized (pp. 32-33), but he failed to address the long-controversial assumptions underlying these studies. If a key assumption is false, such as the twin method's EEA, genetic interpretations of hundreds or even thousands of studies finding similar results will *all* be wrong (as likely occurred in the 2015 Polderman et al. twin study meta-analysis, which Plomin discussed on page 29). The most important question independent analysists should ask about a behavioral genetic study is not whether its results have been replicated, but how its results *should be interpreted*.

Are Environmental Influences Actually Genetic Influences?

The "nature of nurture" argument, which was a major component of Plomin's polygenic rick score "DNA fortune teller" claim, states that "what look like environmental effects are to a large extent really reflections of genetic differences," which "implies that parents don't make much of a difference in their children's outcomes beyond the genes they provide at conception" (pp. 82-83). Plomin's justification for counting most environmental influences as genetic influences is that "we select, modify and even create our experiences in part on the basis of our genetic propensities," meaning that "the environmental effect of parenting on children's psychological development actually involves parents responding to their children's genetic differences" (p. ix). Therefore, "children make their own environments, regardless of their parents" (p. 83).

Plomin promoted the general theme that parental and other environmental influences are not important. As he put it, true environmental effects are "mostly random—unsystematic and unstable—which means that we cannot do much about them" (p. xii). He even rejected the metaphor that "parents are…like gardeners, providing conditions for their children to thrive." In

Plomin's view, "parents are not even gardeners, if that implies nurturing and pruning plants to achieve a certain result" (p. 215).

The "nature of nurture" argument is based on what we have seen are problematic genetic interpretations of the results of twin studies and adoption studies, and largely ignores decades of research from other social and behavioral science areas that record the importance of environmental influences. It also overlooks or denies the behavior-shaping influences of culture, class, religion, nation, region, the mass media, peer groups, and so on. "It is quite striking," wrote psychiatrist (and at times Plomin collaborator) Michael Rutter, "that behavioral genetics reviews usually totally ignore the findings on environmental influences. It is almost as if research by non-geneticists is irrelevant" (Rutter, 2006, pp. 11-12).

Do children "create" family environments containing physical, sexual, and emotional abuse? If children who are forced to endure such abuse experience depression, low self-esteem, and even suicidal behavior as adolescents and adults, should we conclude that this is caused by their DNA? And what about children who grow up in neglectful, cold and distant, or psychologically invalidating family environments? Do children and adults of color "create" psychologically harmful racist environments? How does the oppression of women factor in? The list of examples is endless.

The bottom line is that Plomin's "nature of nurture" argument makes no sense, since it portrays children as being able to create their environments on the basis of their inherited behavioral blueprints, while simultaneously portraying *parents* as possessing an amazing ability to override *their own* behavioral blueprints by "responding to their children's genetic differences." Even in this mythical parent-child "Battle of the Blueprints," the family environments created by the parents would certainly prevail because parents possess power and

authority in addition to their rigid DNA behavioral blueprints, and because they have experienced many more years of "random" and "unsystematic" behavior-shaping events. Children would be largely unable to "select, modify, and create" their family environments for the simple reason that they would be no match for the "DNA blueprint plus random-environmental-event determined" behavior of their parents.

The claim that "the environment is to a large extent genetic" forms the basis of the most important behavioral genetic positions (the validity of the EEA and the twin method, for example), and genetic "heads I win, tails you lose" arguments of this type were a central aspect of the famous yet severely flawed Minnesota Study of Twins Reared Apart (Bouchard et al., 1990, pp. 227-228; Joseph, 2015).

Plomin's original "nature of nurture" article, followed by "open peer commentary," was published in a 1991 edition of *Behavioral and Brain Sciences* (Plomin & Bergeman, 1991). Plomin wrote in *Blueprint* that "most" of the peer commentaries "were hostile or disbelieving" (p. 44), but by my count only 8 of the 24 commentaries fit that description, and fifteen were written by behavioral geneticists or people supportive of their work.

The "nature of nurture" is not a behavioral genetic "big finding," as Plomin claimed, but is in reality a false and illogical claim.

The Environment "Doesn't Make a Difference"

The entire discussion in Chapter 8, where Plomin wrote that parents, schools, and life experiences "matter," but "don't make a difference," is confusing and contradictory. If something doesn't make a difference, it doesn't much matter. It certainly "mattered" and "made

a difference to" American football coaching brothers Jim and John Harbaugh that they grew up with a father who was a career football coach.

A major theme of Plomin's previous writing had been that, in addition to genetics, "behavioral traits are substantially influenced by non-genetic factors" (Plomin & Rende, 1991, p. 177). The moderate pre-*Blueprint* Plomin wrote things like, "As the pendulum of fashion swings from environmentalism to biological determinism it is important that it be caught mid-swing, because behavioral genetic research clearly demonstrates that both nature and nurture are important in human development" (Plomin, 2004, p. 144).

Let's compare two quotations. The first is found in *G Is for Genes*, a 2014 book Plomin co-authored with Kathryn Asbury (Asbury & Plomin, 2014, p. 96). The second is found in *Blueprint* (p. ix).

Plomin, 2014

"The truth is that next to nothing is determined by genes, and our environments are hugely powerful."

Plomin, 2018

"The DNA differences inherited from our parents at the moment of conception are the consistent, lifelong source of psychological individuality, the blueprint that makes us who we are."

What happened between 2014 and 2018? Did the "hugely powerful" impact of the environment disappear in those years, or did Plomin decide to greatly downplay its influence to make the case for his DNA blueprint position.

"Contradictions and Logical Non Sequiturs"

In a December 14th, 2018 *Scientific American* article promoting his book, Plomin wrote,

> "We would essentially be the same person if we had been adopted at birth and raised in a different family. Environmental influences are important, accounting for about half of the differences between us, but they are largely unsystematic, unstable and idiosyncratic—in a word, random" (Plomin, 2018b)

The logic of Plomin's position in the first sentence leads to a conclusion that someone would turn out to be "essentially the same person" whether they were placed with a poor family living in a Brazilian *favela*, or whether they were placed with an aristocratic British family living in a London-area estate.

As psychologist Scott Barry Kaufman wrote in his January 18th, 2019 *Scientific American* blog (Kaufman, 2019), it is "impossible to make this claim based on what we currently know about genetics. Not only that, but these two sentences contradict themselves. First he says we would be the same, but then in the *very next sentence* he says of course we wouldn't be the same" (italics in original). Although Kaufman in general is an admirer of Plomin's work, he wrote that many of Plomin's 2018 statements were "riddled with contradictions and logical non sequiturs, and some of his more exaggerated rhetoric is even potentially dangerous if actually applied to educational selection."

Academic Achievement

On the question of whether sex differences influence academic achievement, Plomin wrote,

> "How much do boys and girls actually differ in school achievement? The answer is that sex differences account for less than 1 per cent of the variance. In other words, if all you know about a child is whether the child is a boy or a girl, you know practically nothing about their propensity to achieve at school." (Plomin, 2018a, p. 30)

While the lack of a relationship between gender and school achievement may be true currently in the U.K. and the U.S., it is completely false historically. In the past (and in some countries currently), when women were discouraged or prohibited from getting a good education, a child's gender *was* a good predictor of his or her propensity to achieve at school. This is because, in previous eras, social conditions and political policies were very different, and massive social and political struggles were needed to change them.

In 1920, after decades of social struggle, the United States ratified the 19th Amendment to its Constitution, which granted women the right to vote. Knowing whether American adults had two X chromosomes, or only one X chromosome, would have told us a lot about whether they had the "propensity" to vote in U.S. presidential elections held prior to 1920, whereas the number of X chromosomes would have told us "practically nothing" about American adults' propensity to vote, for example, in the *1964* presidential election. Paradoxically, behavioral genetic "predictions" usually reflect the influences of the environment (or in the case of gene discovery predictions, don't come true), and not the direct actions of genes.

Plomin's Interpretation of His Own Polygenic Risk Scores

Plomin offered several explanations for why some of *his own* polygenic risk scores did not match his reality. For example, his schizophrenia score was in the 85th percentile, even though "I don't feel at all schizophrenic, in the sense of having disorganized thoughts,

hallucinations, delusions or paranoia" (pp. 149-150). Rather than offer this result as evidence that polygenic risk scores cannot be trusted—as he easily could have—he seemed to suggest that his high score was the result of creative thinking and genius. "A nicer way of thinking about my higher than average polygenic risk score for schizophrenia," Plomin wrote, "is to contemplate possible aspects of what at the extreme is called schizophrenia. The best example is a possible link between schizophrenia and creative thinking. Aristotle said, 'no great genius was without a mixture of insanity'" (p. 151).

Psychiatric Disorders are Simultaneously Non-Existent and Highly Heritable

In *Blueprint's* Chapter 6, Plomin called for ending the idea that specific behavioral or psychiatric disorders exist, arguing that they are caused not by genes specific to each disorder, but are instead influenced by "generalist genes" falling into "three broad genetic clusters." This means that we will have to "tear up our diagnostic manuals based on symptoms" (p. 68). Plomin predicted the "demise" of psychiatric diagnoses, since "there are no disorders to diagnose and there are no disorders to cure" (p. 165). At the same time, he cited research claiming that psychiatric disorders are "under substantial genetic influence" (p. 5) and can be predicted by polygenic risk scores. He wrote positively of the Psychiatric Genomics Consortium, a "remarkable collaboration" of international researchers attempting to identify genes associated with the major psychiatric disorders (p. 125). What Plomin failed to explain is how psychiatric disorders can be studied, predicted, "substantially genetically influenced," and the subject of Psychiatric Genomics Consortium gene searches if they do not exist.

If it is true that DNA "inherited from our parents at the moment of conception…makes us who we are," it follows that MZ twin concordance rates for schizophrenia and other psychiatric disorders should approach 100%. (Concordance means that both twins are diagnosed/labeled

with the same disorder.) In fact, MZ concordance rates for the major psychiatric disorders are well below 100%. Most textbooks report the schizophrenia MZ concordance rate at roughly 50% (Kaplan & Sadock, 1996), and the pooled rate for the better-performed studies appearing after 1960 is less than 25% (Joseph, 2013b, 2017). A 2018 Danish study by Rikke Hilker and colleagues found a very un-blueprintlike 12 of 81 MZ pairs (14.8%) concordant for schizophrenia, meaning that when one twin was diagnosed with schizophrenia, 85% of the time his or her identical-DNA co-twin was not so diagnosed (Hilker et al., 2018, Table 2).

Four Decades of Unfulfilled Gene Discovery Claims and Predictions

"The DNA revolution began around a decade ago," Plomin wrote in *Blueprint* (p. 118). Previously, decades of studies had failed to produce the expected genes for behavior, and he was ready to give up and take up sailing in his retirement (pp. 122-123). For Plomin, his earlier failed attempts to identify genes that underlie intelligence, which go back to the early 1990s (for example, Plomin, McClearn, et al., 1994), reminded him of "the cartoon about a scientist with a smoking test tube who asks a colleague, 'What's the opposite of Eureka?'" (p. 122).

Although in *Blueprint* he spoke of failed behavioral gene discovery attempts prior to 2015, Plomin had been claiming gene discoveries as early as 1978, when he and a colleague wrote that "evidence has accumulated to indicate that inheritance of bipolar depression involves X-linkage in some instances" (DeFries & Plomin, 1978, p. 479). In a 1994 article appearing in the prestigious journal *Science*, Plomin and colleagues reported that genetic linkages and associations had been found for reading disability, sexual orientation, alcoholism, drug use, violence, paranoid schizophrenia, and hyperactivity (Plomin, Owen, & McGuffin, 1994, p. 1737). Four years later, Plomin and Rutter informed psychologists that genes associated with behavioral dimensions and disorders were "beginning to be identified" (Plomin & Rutter, 1998,

p. 1223). In the 2008 (fifth) edition of the textbook *Behavioral Genetics*, Plomin and colleagues reported gene associations or discoveries in the areas of attention-deficit/hyperactivity disorder (ADHD), reading disability, schizophrenia, panic disorder, personality, and antisocial behavior (Plomin et al., 2008).

When Plomin's claims and predictions later fell through, his tendency since the late 1980s has been to replace failure, "misery" (p. 123), non-replication, and "getting depressed" (p. 122) with the frequent use of published words and phrases such as "breathtaking pace," "exciting," "on the cusp," "spectacular advances," "dawn of a new era," "revolutionary advance," "revolutionary genetic research," "begun to revolutionize," "genetic advances are just around the corner," "momentum of genomic science," "missing heritability," "golden post-genomic era," "the future looks bright," "threshold of the post-genomic era," and "accelerating pace."

In an apparent attempt to explain earlier failures, Plomin wrote in *Blueprint*, "When the [gene] hunt began twenty-five years ago [circa 1993] everyone assumed we were after big game – a few genes of large effect that were mostly responsible for heritability" (p. 120). If we look at Plomin's writings of that time, however, he often described a search for many genes of small effect. In a 1990 article published in *Science*, he wrote, "The normal range of behavioral variation is orchestrated by a system of many genes, each with small effects" (Plomin, 1990, p. 186). In his 1991 "Annual Review of Psychology" contribution, he wrote that "behavioral dimension and disorders are likely to be influenced by many genes, each causing small effects" (Plomin & Rende, 1991, p. 177). And two years later he wrote,

> "The alternative view espoused here is that major genes will not be found for behavior either in the population or in the family. Rather, for each individual, many genes make small contributions to variability and vulnerability. In this view, the genetic quest is to find not *the* gene for a behavioral trait but the many genes that affect the trait in a probabilistic rather than predetermined manner." (Plomin, 1993, p. 478, italics in original)

Plomin also discussed in *Blueprint* a "very disappointing" 2005 molecular genetic study of intelligence he co-authored (Butcher et al., 2005), which led him to think that "my luck had run out" (p. 122). The original 2005 Butcher et al. study, however, reported a "replicated" finding of four genetic loci associated with "mild mental impairment." The theme of this publication was discovery, not disappointment.

As an example of Plomin's use of the media to publicize his own tentative findings that later became "smoking test tubes," on May 14th, 1998 the *New York Times* published an article by Nicholas Wade, entitled "First Gene to Be Linked with High Intelligence Is Reported Found" (Wade, 1998). As Wade described it,

> "Dr. Plomin has sought to move the debate forward by arguing that if genes for intelligence exist it should be possible to track some of them down through the powerful new genetic scanning techniques that have recently become available. Searching through a small part of the human genome, the long arm of chromosome 6, he found that a particular variant of a certain gene was twice as common in his sample of children with ultra-high I.Q.'s than in those with average I.Q.'s The gene has a very small effect, accounting for about 2 percent of the variance, or 4 I.Q. points, Dr. Plomin said."

All this underscores the point that whatever Plomin said in *Blueprint* about his own or other researchers' past non-replicated gene-finding reports, at the time these false-positive reports were being published he wrote of excitement, discovery, and the beginning of a new era—similar to how he described polygenetic risk scores and the "DNA revolution" in *Blueprint*.

Plomin has a 40+ year track record of unfulfilled behavioral gene discovery claims and predictions (Joseph, 2015, Chapter 10). He again made bold new claims and predictions in *Blueprint* without mentioning this track record, and there is every reason to believe that Plomin's new polygenic risk score claims and predictions are a continuation of a four-decades-long trend.

Fears of Genetic Determinism Are not "Misplaced"

The implications of Plomin's claimed "DNA revolution" are enormous, and if true would require re-writing all human history. He avoided the potential eugenic and racial differences implications of his claims—while at the same time removing from history the crimes committed, and the pseudoscience promoted, in the name of genetics and eugenics—and wrote that the IQ genetics debate once raged due to earlier critics' "misplaced fears about biological determinism, eugenics, and racism" (p. 53). Why misplaced? Is Plomin aware of books such as *The Mismeasure of Man* (Gould, 1981), *The Legacy of Malthus* (Chase, 1980), *Murderous Science, Racial Hygiene: Medicine Under the Nazis* (Müller-Hill, 1998), *The Surgical Solution* (Reilly, 1991), and *The Nazi Doctors* (Lifton, 1986)? Few readers of these books would conclude that fears of biological determinism, eugenics, and racism are misplaced.

In the wake of massive worldwide protests in 2020 against racism and other forms of oppression and injustice, the Behavior Genetics Association (BGA) released a 2021 "BGA Diversity and Inclusion Plan." The Plan called for a "renewed urgency for scientific

organizations worldwide to acknowledge the role science has played in racism," and candidly stated, "The history of our field is inextricably linked with racism, including the misuse of behavior genetic research to support violent eugenic policies" (BGA, 2021). This statement, while commendable, failed to acknowledge people who earlier had protested against hereditarian "racial differences in IQ" theorists such as Arthur Jensen (1969), Hans Eysenck (1971), and Thomas Bouchard (Bouchard, 1995; Holden & Bouchard, 2009).

Psychologist Leon Kamin dedicated the second half of his life to exposing the links between behavioral genetics and racism/eugenics, and the faulty research underlying these links, to the detriment of his academic career (Joseph, 2018). For many years, beginning with the publication of his book *The Science and Politics of I.Q.* (Kamin, 1974), Kamin was villain #1 in the behavioral genetics world (Wright, 1998). In 1998, former BGA President Sandra Scarr called Kamin and other critics of behavioral genetics "politically driven liars," who were "despicable" "thugs with pens instead of microphones" (Scarr, 1998, p. 231). In light of its 2021 "Diversity and Inclusion Plan," the BGA might consider preparing a statement acknowledging the important anti-racist and anti-eugenics work of Kamin (1927-2017), the late evolutionary biologist Richard Lewontin (1929-2021), neuroscientist Steven Rose, psychologist Ken Richardson, and many others (see Lewontin et al.,1984; Richardson, 2017).

Plomin wrote in *Blueprint* that "no specific policies necessarily follow from genetic findings, because policies depend on values" (p. 105). However, early 20th century left-wing supporters of eugenics, and Plomin's stated support for the British Labour Party notwithstanding (Wilby, 2014), a set of politically conservative and right-wing beliefs, policies, and actions naturally flow from genetic determinist beliefs. Genetic determinism supports the idea that human beings, for the most part, are in their biologically destined places in society and in the

world. It helps justify inequality and huge income disparities, neoliberalism and neocolonialism, and supports the belief that changing or improving the environments of individuals, ethnic groups, economic classes, and nations won't accomplish much. "Ultimately, if unintentionally," historian of biology Nathaniel Comfort wrote, "Blueprint is a road map for regressive social policy" (Comfort, 2018a).

Regardless of an author's intentions, claims about behavioral DNA blueprints help support the agendas of far-right white-nationalist groups (Panofsky et al., 2021), and it is the responsibility of researchers to address the potential misuse of their research by such groups. This issue was taken up in relation to *Blueprint* by Comfort (2018b), and by behavioral genetic researcher Kathryn Paige Harden (2018).

Summary and Conclusions

The genetic-determinist (hereditarian) conception of human beings and human differences presented in *Blueprint* is false because it is based on methods and assumptions that do not stand up to critical analysis. Moreover, behavioral genetic research has always relied on long-debated concepts such as IQ, stable personality traits, psychological testing, biometric model fitting, and so on. Going further, the twin and adoption studies that Plomin and other behavioral geneticists frequently cite fail to provide scientifically acceptable evidence that heredity plays any direct role in causing human behavioral differences.

The polygenic risk score method will likely become the latest in a long line of failed gene-finding methods in the area of human behavior, whose failures are usually only recognized after the latest-and-greatest method is said to have finally found the long-lost "genes for behavior." In his 2014 book *Misbehaving Science*, sociologist Aaron Panofsky described the behavioral genetic gene-discovery failure "coping strategy" of "technological optimism." By this

he meant the "optimism that the next level of technology will overcome past disappointments" (Panofsky, 2014, p. 177). Most likely, current excitement about polygenetic risk scores in behavioral genetics will fade when this method ends up becoming yet another "next level" method that failed.

What appears to matter most to Plomin now are "DNA fortune-telling" polygenic risk scores, and his belief that researchers have found genetic "gold dust, not nuggets. Each speck of gold was not worth much, but scooping up handfuls of gold dust made it possible to predict genetic propensities of individuals" (p. 187). It is probable that Plomin's "gold dust specks" are the latest version of the genes-for-behavior *fool's gold* that molecular genetic researchers—misled by twin studies, adoption studies, and heritability estimates—have been collecting for the past half century or so.

Although at times Plomin referred to a "century" of behavioral genetic research (p. 72), the story he presented in *Blueprint* seems clear. It began with Plomin's arrival on the scene as a young behavioral genetic psychologist in the early 1970s. Up to that point, most psychologists believed that environmental influences were the only thing that mattered, and genetics had been ignored in the field. Apparently free from genetic confirmation bias, he carried out the new and "dangerous" task of publishing psychological-genetic research. He made many counterintuitive heritability discoveries, so the *Blueprint* story went, including finding genetic influences on "divorce" and "television watching" (pp. 38-46). These discoveries, according to the story, were based mainly on controversy-free twin studies (some of which were based on twins "separated at birth") and adoption studies, using similarly controversy-free concepts such as IQ, personality, and heritability. In the process he helped develop the "First Law of Behavior Genetics," and produced a "big finding" that environmental influences previously thought to exert much

influence on human behavioral development "do not make a difference." Continuing the *Blueprint* story, in the 1990s Plomin and others began the search for behavioral genes at the molecular genetic level, although for many years the search was hampered by a mistaken focus on discovering "big game" genes of large effect. After two decades of gene-finding attempts that were "getting nowhere" (p. 120), he shifted focus to the identification many genes of small effect. In the period 2015-2016, Plomin helped launch the "DNA revolution" approach of calculating "fortune-telling" polygenic risk scores. His own "schizophrenia" polygenic risk score was surprisingly high, but creative thinking was the likely explanation. Others' fears that "DNA makes us who we are" claims could be terribly misused to harm people and groups were obviously "misplaced," since apparently no such misuse of genetic research had taken place in the past. Plomin's story ended with a "sales pitch" (p. 161) asking his readers to join the "millions of people [who] have already voted with their credit card by paying to have their genomic fortunes foretold, even before polygenic scores are available" (p. 184).

We have seen that there are problems with every aspect of this story, but the story does serve to depict Plomin as the pioneering discoverer of genetic influences on behavior, whose long career was crowned by his role as the beleaguered-yet-triumphant discoverer of blueprint-defining polygenes.

A much different story is that future historians of science may well see *Blueprint* as marking the beginning of the behavioral genetics field's decline. Turkheimer recognized the decades-long "failure" of the behavioral genetic "gene-finding project," whereas Plomin attempted to snatch victory from the jaws of defeat towards the end of his long and prolific career. Plomin has gone all-in with polygenic risk scores in an attempt to escape from the "genes

for behavior” corner he had painted himself into, but the only real “big finding” that his field of behavioral genetics has ever produced is, paradoxically, the finding that genes that cause human behavioral differences might not even exist.

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