WHY SCIENCE IS WRONG ABOUT LIFE AND EVOLUTION

"THE INVISIBLE GENE" AND OTHER ESSAYS ON SCIENTISM.

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PREFACE - AN OVERVIEW

This book presents a general case against the scientific vision of life and in parallel considers some of the consequences of the common allegiance to that vision. That vision as Nobel laureate James D. Watson wrote confidently, is that "life is simply a matter of chemistry" [Watson 2017, p.xii]. The cited chemistry (or molecular interactions) can also be thought of as the dynamics of material, and thus a common expression for science's model of life is "scientific materialism". I suggest herein that this materialism constitutes the most basic and influential modern scientific perspective. Furthermore, I suggest that materialism and the associated allegiance to it form the foundation of what could be termed the religion of science or scientism.

The book consists of four essays on contemporary scientism. The first two directly challenge the scientific vision of life and the latter two critique two popular extensions of the associated scientism.

I get started here with what this book and its essays *do not* involve.

1. This book does not invoke quantum mechanics. In particular it doesn't use the ambiguity associated with quantum mechanics (really the associated interpretations) to try to generate uncertainty about science's understanding of life.
2. This book does not resort to sophisticated philosophical arguments in order to generate doubt about the scientific vision. I don't care about the so-called "hard problem" of consciousness. Moreover, I am totally unqualified to give, and disinterested in, such arguments.
3. This book does not hype paranormal phenomena in order to argue against the materialist vision. While the book considers and acknowledges some such phenomena, short of extrapolating positive near-death experiences (in which we might assume that we are all booked for bliss in the end), the sober take on paranormal phenomena is that they appear to be rare and/or of little net import.
4. This book is not a nuanced effort. For example, given the extent of blind obedience to scientific materialism, you can readily find intellectuals anchored in scientism writing serious critiques of other

brands of scientism. One might also claim that the uncertainty between the relative contributions of nature and nurture constitutes a serious challenge to the scientific understanding. Additionally, you might take some recent reassessments of the structure of the biological tree as constituting a big deal. Mostly fighting over words and of course egos - so what?

The most important point of this book - and the topic of chapter one - is that the reliance on a deoxyribonucleic acid (DNA) basis for the specification of life and its evolution should have been seriously questioned all along and now is over a decade into a spectacular failure. That presumed DNA basis naturally provides the foundation for behavioral genetics and personal genomics, but the associated searches are failing to find anything beyond an optimistic "almost nothing". If our DNA (or genome) provides only a little of our innate individual characteristics - including our physical gender, a few disease susceptibilities, features of our appearances, and a sort of a bio-historical fingerprint - then science is wrong about life; DNA would not be "the language of life" (and good luck finding a bio-code to replace it); and this would constitute a profound mystery in and of itself.

People have argued about the plausibility of science's materialist (or molecular-only) basis for the evolution of life. These arguments have tended to suggest a need for some extra input or steering to support the existence of a life-friendly Earth; the outcome of evolution; and more particularly, the existence of humans. Thus, they suggest that the evolution of life had some additional, perhaps divine, input. I think of such arguments as essentially Evolution II. Thus the resulting spectrum of life is the same and so is its molecular-only basis. Although on the one hand as humans we are still biochemical puppets (and thus without free will or a self for that matter), but on the other hand there was something divine or extra behind our existence and DNA. It is worth noting that the reliance on a questionable DNA basis appears to be stronger in the Intelligent Design camp than it is in genetics.

I don't see much significance with these design arguments. The big question appears to be whether DNA can fulfill its enormous expectations, beginning in the behavioral realm where there are easy to find super-puzzling innate phenomena. If the current failures in the DNA searches - sometimes termed the missing heritability problem - continue, then science's materialist model of life is incomplete and so would be its support for a biochemical-only description of its evolution. There would be more

to it, and of course us, and perhaps in a supreme intellectual irony, traditional religions could be onto something with some of their perspectives (although apparently not ones implying an intelligently designed genome).

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The essays in this book will introduce this situation as well as critique the contemporary science-forged intellectual landscape. The first chapter or essay of the book, "The Invisible Gene", considers the extraordinary presumptions and also faith with regards to the functioning of DNA. It then walks thru some of the milestones of failure in genomic searches. This DNA questioning will be returned to in later essays as it is the central message here. The second essay, "How Could Science Have Overlooked This?", considers some materialism-confounding phenomena that have been neglected by science. These include some unusual but accepted behavioral phenomena that are highly implausible in terms of genetics. Considered therein are descriptions of some musical prodigies and also transgender children. The latter half of chapter two then considers some paranormal reports from Charles Tart's *The End of Materialism*; from Elizabeth L. Mayer's fine *Extraordinary Knowing*; some experiences of the author; and also some points raised in Mark Gober's *An End to Upside Down Thinking.* While I tend to favor non-taboo challenges to materialism, serious consideration of paranormal reports is certainly appropriate as they provide additional mysteries for the curious and also conundrums for materialism (as well as genetics).

The third chapter or essay, "The Spirit of Scientism - Steven Pinker", considers the work of Steven Pinker - in particular his 2013 *The New Republic* essay "Science Is Not Your Enemy" and then portions of his subsequent book, *Enlightenment Now.* In so doing the chapter argues that this is typical of the superficial and arrogant pitch for an idealized entity science. The extent of Pinker's confident vision facilitated the expansion of my critique into some neighboring domains. It is worth noting that you can be highly educated, a big follower of science, and also quite clueless as Pinker appears to be in a number of areas.

The fourth chapter, "Not Awakening - Sam Harris and Scientific Buddhism", is somewhat of an indirect critique of scientism's influence as it focuses on Sam Harris' *Waking Up.* Derivative of the modern tendency to worship science has come the associated appeal of science-ification, including the reframing of the religion-affiliated practice of meditation. *Waking Up* captures a good chunk of this process and is mostly nonsense. The

concluding fifth chapter then attempts to tie together some of the earlier points and adds a bit.

I previously wrote a book, *A Hole in Science: An Opening for an Alternative Understanding of Life*, which looked at some problems facing materialism and, secondarily, possible explanations from the premodern reincarnation-based (or transcendental) perspective. This book's essays on the other hand, consider the gross problems facing the materialist vision and also the distortions associated with the prevalent acceptance of it. A point of overlap between this book and *A Hole in Science* is in the critique of materialism, and in particular the unfolding heritability showdown. Herein I will attempt to limit redundancy with the earlier book.

This book is written in simple terse fashion and it is not a good idea to try to breeze through it. The basic points here are significant, largely overlooked, of course heretical, and perhaps overdue. If science's understanding of our individual specifics continues to fail - as I expect it will - this would contradict materialism, as well as derail the great expectations of personal genomics and behavioral genetics. Such a DNA failure would also contradict the assumptions of one of the most sacred modern scientific/intellectual beliefs, that being a molecular/physics-only basis for the evolution of life.

I close off this rather wordy Preface with a simple example of the kind of challenges facing the scientific paradigm. A February 2014 *Scientific American* article, "Remembrance of All Things Past" [McGaugh and LePort], reported on the remarkable autobiographical memories observed in a number of individuals. The associated syndrome is called hyperthymesia. That article opened with an excerpt from an e-mail that the lead author James McGaugh had received from a woman named Jill Price:

> As I sit here trying to figure out where to begin explaining why I am writing you ... I just hope somehow you can help me. I am 34 years old, and since I was 11 I have had this unbelievable ability to recall my past ... I can take a date, between 197[6] and today, and tell you what day it falls on, what I was doing that day, and if anything of great importance ... occurred on that day I can describe that to you as well.

The authors then followed up and extensively tested Price's recall of events and her memory was eventually proved faulty in one case - the day of the week of one of the previous 23 Easters (and Price happens to be Jewish). Along the way she "corrected the book of milestones for the date of the

start of the Iran hostage crisis at the U.S. embassy in 1979". During tests she:

> correctly recalled that Bing Crosby died at a golf course in Spain on October 14, 1977. When asked how she knew, she replied that when she was 11 years old, she heard the announcement of Crosby's death over the car radio when her mother was driving her to a soccer game.

Price demonstrated an "immediate recall of the day of the week for any date in her life after she was about 11 years old". Yet she also "has trouble remembering which of her keys go into which lock" and moreover "does not excel in memorizing facts by rote". The remainder of McGaugh and LePort's article chronicled their subsequent confirmation of similar memories in about 50 people. Such memories were found to be "highly organized in that they are associated with a particular day and date" and that it occurred "naturally and without exertion".

For a little relevant exercise here readers might pause and write down a year from the last decade. Next, you can then write down a month and also a date within that month. In so doing you have specified the calendar date of a day that occurred in the last 10 years. Perhaps something like April 11, 2013. Now for the interesting part - try figuring out which day of the week that day occurred on (we will go easy here and skip trying to recall the associated personal and global events). Even seemingly simple day of the week deciphering is very implausible in a "naturally and without exertion" biological fashion.

This stunning hyperthymesia phenomenon must have an explanation and given its effortless nature, scientifically that strongly suggest a DNA basis. That would mean that such people should have a specific DNA pattern that somehow fell out of our evolutionary history that allows them to be able to effortlessly recall their lives and significant events, in a date and day-of-the-week fashion. This point is followed up by the authors, who also manage to sidestep acknowledging the scientific jaw-dropping implications of these memory whizzes. This is a little introduction to the type of miracles expected of DNA and evolution (not to mention brains). I suggest that such miracles would be highly implausible even if the last decades' worth of scouring our DNA had found significant connections between DNA and innate behavioral characteristics.

The punchline here, though, appears to be that very few people - certainly amongst those educated - appear to doubt the underlying *its-in-the-*

DNA logic of genetics and evolution, and thus the prevailing logic of life. How could so much hubris be wrong? Welcome to our Scientism Era.

For those wishing to investigate profound mysteries and possible windows to deeper meaning including religious ones, I recommend turning your attention to the heritability situation. Take the remote and speculative esoterica of physics, along with the rambling diversions of philosophers, and place them on the back burner or down in the basement. Life is where the real mysteries are.

CHAPTER 1 - THE INVISIBLE GENE

A. Missing Heritability

A review of a recent popular book provides a nice introduction here. A professional reviewer wrote with regards to Siddhartha Mukherjee's 2016 genetics book, *The Gene: An Intimate History* [Mukherjee]:

> [This] is a book we should all read. I shook my head countless times while devouring it, wondering how the author - a brilliant physician, scientist, writer, and Rhodes Scholar could possibly possess so many unique talents. When I closed the book for the final time, I had the answer: must be in the genes [McCarthy].

The Gene is in fact a terrible book, both in its faithful message - "we know [our future is] … in our genes" and in its excessive novelistic style which probably accounted for the very limited endorsement by scientists. With the possible exception of a paragraph on page 487, at no point does the book hint at the decade-long, "absolutely beyond belief" failures in genomic searches. While reading reviews for *The Gene*, including approximately 500 customer reviews at Amazon, I could not find a single reviewer that bothered to question the loose logic of genetics or comment on the status of DNA searches. To their credit some reviewers did break from the common science-awed stupor and criticize the writing style of *The Gene* [Sludge 2018].

There is enormous momentum behind the DNA or genetic model of life. It is of course supposed to be "language of life" [Collins]. Thus one could easily put together a large book filled with glorious official claims about the workings of DNA. From the broad claims about its presumed role as the basis for the evolution of life down to the many behavioral contributions inferred for human beings and other species, DNA has become science's bedrock explanation for life. If the author of such a book could simply obtain a number of endorsements from scientists (preferably big shots) and place them on the back cover, that book could well become a bestseller. And few would question it as is apparent in the response to *The Gene*.

To briefly further this point I provide a couple of quotes here. Here is a one from the inside cover of J. Craig Venter's appropriately titled *A Life Decoded: My Genome: My Life,*

> Of all the extraordinary achievements of the past century, perhaps none can match the deciphering of the human genetic code, both for its technical brilliance and its implications for our future. It has charted a landscape in which we will discover the most intricate workings of our species, the particularities of our own genetic makeup, and the promise of novel approaches to health and medicine that will mark a new stage in human development, one in which inherited biology is no longer necessarily destiny. [Venter].

Then from the first page of the same book is the following from Richard Dawkins, "DNA neither cares nor knows. DNA just is. And we dance to its music". This is of course supposed to be beyond question.

Scientific materialism is the foundation for that certainty about DNA's role. If all of life is simply a function of chemistry then naturally the basis for heredity and biological design must itself come down to molecules. Given the nature of reproduction and some gross connections to DNA (beginning with the male-correlated Y chromosome) there certainly is a basis for starting down the road to what Mukherjee acknowledged is the "religion of genes" [Mukherjee, p.165]. But there are also some serious question marks facing genetic reasoning. One of DNA's jobs is to provide "[t]he entire behavioral information available to the newborn" [Mayr, p.253] which in a number of cases is simply astounding. One such example relates to bird migrations. Some migratory birds have been shown to demonstrate an innate knowledge of their migratory routes and this implies a DNA basis. But is it really plausible for a large molecule - deoxyribonucleic acid (DNA) - to have been shaped by natural selection to encode for the making of a brain equipped with migratory maps or guides? On this point even the Nobel laureate James D. Watson expressed astonishment [Watson 2003].

Temporarily shelving such questions, though, it is nice to see straightforward expressions from the underlying scientific materialism. A good example can be found in a May 2017 *Scientific American* article. That article presents recent developments in technologies used to observe the dynamics of molecules (involving x-ray based "molecular movies"). In the article the authors, Petra Fromme and John C. H. Spence, provided motivation for their own work via a quote from the late physicist (and Nobel laureate) Richard Feynman, "Everything that living things do can be understood in

terms of the jigglings and wigglings of atoms" [Fromme and Spence]. Those jigglings and wigglings are of course presumed to follow the predictions of appropriate equations. Together then life might be seen as a particular subset of the material universe, a subset that might be rather boring to physicists, but is perhaps of some interest to others. Such thinking is then the basis for materialism and with it the essentially uncontested claim that "Biology [is] physics" [Mukherjee, p.142].

In fulfilling its blueprint or recipe assignment, DNA is to provide the basis for inheritance and the associated variability, which were phenomena that Charles Darwin never understood [Mayr, p.89]. The prominent evolutionary biologist Ernst Mayr provided modern biology's answer:

> An understanding of the nature of this variability was finally made possible, after 1900, by advancements in genetics and molecular biology. One can never fully understand the process of evolution unless one has an understanding of the basic facts of inheritance, which explain variation. Therefore the study of genetics [and the encompassing DNA] is an integral part of the study of evolution. But only the heritable part of variation plays a role in evolution [Mayr, p.89].

DNA is thus supposed to provide the design codes for organisms and additionally the heritable subset of DNA - the elements that gets passed along in conceiving new life - should provide the basis for the dynamics of evolution. Consistent with this role, DNA should implicitly define the innate differences between organisms, both in a gross interspecies sense as well as a more intimate intra-species sense.

A reminder here is that genes consist of the subset of DNA which provide blueprints for the construction of the body's protein molecules. DNA (or the genome) also has significant content beyond the 1.5 percent constituting genes, nevertheless "genes" (and thus "genetics") tends to be overused and can lead outsiders to think that that is all there is to DNA or at least its functional role. Quite often this book's essays will go with the flow and stick with that "genetics" tendency.

Continuing, a key point for discussions here is that in specifying the details of individuals, the genome should thus specify the innate differences between them - including amongst inborn behavioral tendencies. This again is supposed to be true within a species - and thus the field of behavioral genetics - but it is also believed to be critical in a larger way [Mayr; Croston et al; Hopkins et al]. In this latter sense DNA should specify for

the differences in the instinctive behaviors displayed by different species. Ernst Mayr wrote that:

> There are reasons to believe that behavioral shifts have been involved in most evolutionary innovations, hence the saying "behavior is the pacemaker of evolution." Any behavior that turns out to be of evolutionary significance is likely to be reinforced by the selection of genetic determinants for such behavior (known as the *Baldwin effect*).[Mayr, p.137].

Thus, the behavioral implications associated with a segment of DNA code should be significant to natural selections' treatment of that segment. Therefore a gene that furthers helpful behavioral inclinations in a species would tend to spread over time, whilst those furthering unhelpful behaviors would tend to become less prevalent over time. "Helpful" here implying positive contributions to reproductive success. As an artificial contemporary example, if there were a gene (or a collection of them) in the human gene pool (our collective DNA codes), that strongly influenced an individual to *not* look both ways before crossing a street, then that gene should tend to decline in frequency since bearers thereof would tend to have reduced progeny (and longevities).

DNA is expected to provide a substantial basis for the big spectrum of behavioral tendencies found among people. This should include providing gross explanations for personality differences, including those found between non-monozygotic twin siblings. As an example, if a child stood out in a family in terms of their aggressive inclinations, then the logic of genetics suggests that they are likely to have more aggression-boosting genetic codes than other family members. It is in this way that modern genetics is confidently committed to identifying such codes, including of course a number of very significant ones. In addition to some previously identified singular DNA code segments - like the Y chromosome and codes responsible for the increased likelihood of some disease conditions - the ongoing comprehensive genetic searches should be greatly filling in our comprehension of genetic contributions, and with those contributions, ourselves. Thus the genomic researcher J. Craig Venter's has a book titled *A Life Decoded: My Genome: My Life.*

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Some basic aspects of DNA's heritability role can be inferred from human studies. This connection was nicely captured by the psychologist Steven Pinker who wrote that:

> schizophrenia is highly concordant within pairs of identical twins [about 50% of the time when one is affected so is the other twin], who share all of their DNA and most of their environment, but far less concordant within pairs of fraternal twins, who share only half of their [variable] DNA ... and most of their environment. The trick question could be asked - and would have the same answer - for virtually every cognitive and emotional disorder or difference ever observed. Autism, dyslexia, language delay, language impairment, learning disability, left-handedness, major depressions, bipolar illness, obsessive-compulsive disorder, sexual orientation, and many other conditions run in families, are more concordant in identical than in fraternal twins, are better predicted by people's biological relatives than by their adoptive relatives, and are poorly predicted by any measurable feature of the environment [Pinker 2002, p.46].

So that many variations in behavioral inclinations that we can observe appear to follow (biological) parent-connected patterns. While variations in innateness are often obvious, the inheritance-packaging of innateness is not so obvious (although physically it certainly can be), but this packaging has become clearer through formal studies. Pinker's statement does, though, appear to shortchange the environmental contributions to schizophrenia [Balter].

This kind of inheritance relationship also appears to hold in the arena of disease susceptibilities and thus the medical cliche "it runs in families". In some cases this connection does have an identified DNA-basis (as for example with cystic fibrosis and sickle cell anemia) but much more broadly this relationship is simply assumed. The faith in that assumption is the basis for the big expectations of the field of personal genomics. Stepping back this inheritance assumption makes straightforward materialist sense - our innate features are supposed to come from our DNA blueprints which in turn (except for the relatively small number of mutations that occurred after conception) came from our parents. This is both the logic of science's understanding of evolution and also the associated explanation for the similarities found between offspring and their parents.

But there are serious challenges to this inheritance logic and I will introduce three of them here. First, there are large variations present in identical twins although they share the same DNA specifications. The degree of behavioral agreement between identical twins is often only around 50 percent which translates to a crude similarity in a particular behavioral tendency. In the case of male exclusive homosexuality it turns out to only be 20-30 percent [Collins, pp.204-205]. Note that this sexuality characteristic is believed to be in large part binary (expressed or not), unlike personality characteristics (such as aggressive-versus-passive) which appear to be smoothly distributed. These monozygotic differences are a good counterpoint to keep in mind when you encounter some remarkable claims of genetic determinism, for example those inferred by a specific shared behavior found in monozygotic twins that were raised separately. James Watson in fact dismissed such examples of apparent determinism as more likely being coincidence [Watson 2017, pp.378-379]). Monozygotic twins really are substantially different in a behavioral sense as personal exposure can attest to.

A second challenge is that alternative explanations involving environmental influences appear to have quite limited support. Outside of specific fears and a few familial positions (like political affiliation) growing up in a family appears to contribute little to an individual's inclinations. This really comes across in adoption studies but I would argue that it is also apparent in the relatively fixed nature of our own dispositions or personalities. Together the import of these two challenges to the logic of DNA-based inheritance are succinctly captured in another Pinker quote with regard to behavioral inclinations, "identical twins are 50 percent similar whether they grow up together or apart" [Pinker, 2002; p.381]. Hence a basic mystery.

A third challenge to genetics' logic is an indirect but rather gross one (and also arguably belongs in the next chapter). That is that behavioral genetics is supposed to operate thru the influence of the genome (or DNA) on an individual's brain. Observations of individuals with gross brain deficiencies raise questions about this reasoning, though. In a 1980 *Science* article some observations by a neurologist John Lorber with regards to a group of patients who were missing large portions of their brains were described [Lewin]. Many of these patients suffered from a condition called hydrocephalus which entails an enlargement of the brain's cerebrospinal fluid reservoirs and the consequent losses in the volumes of other brain tissues. The article reported that a number of these patients were left with only about 5 percent of normal brain volume, and yet surprisingly appeared to function normally. Others in this category not surprisingly were severely

disabled (and still others with this condition might have died prematurely). Amongst the normal group Lorber reported that:

> [t]here is a young student at [Sheffield University] who has an IQ of 126, has gained a first-class honors degree in mathematics, and is socially completely normal. And yet the boy has virtually no brain.

Findings like these seem to have be selectively neglected by science and they certainly challenge neural and genetic reasoning, as well as more generally materialism. A note for readers here is that in an effort to achieve brevity I have tended to take small relevant excerpts. In this case, and a number of other examples, the source is not long, is available online, and is well worth a look.

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Moving along, it turns out that homo sapiens have been referred to by geneticists as a "small species" since there is relatively little genetic variation amongst us and such limited variation is typical of a species with a small population [Pinker 2002; pp.142-143]. That lack of genetic variation appears to have followed from our having been a small species not too long ago as we struggled through a difficult period. An insufficient amount of time has since elapsed for the set of DNA variations to expand much (unlike our population). Conveniently, it turns out that any two human beings are about 99.9% identical in terms of their DNA blueprints, which translates to being different in only about 3 million bases or letters [Green; Kingsley; Schafer]. In a crude sense it is akin to having us all be identical twins, except that there are some notable exceptions beginning with the gender determining (or at least influencing) Y-chromosome.

Furthermore, of additional note here is that even within the 0.1% variable portion of our genomes, there could be plenty of irrelevant junk given the haphazard workings of evolution [Zimmer]. A gross way to grasp this point is to note that some simpler species have much larger genomes than we do. The broad-footed salamander and the onion, for example, have genomes about fifty and five times longer than our genome (note this would seem to be a serious challenge to the logic of intelligent design). A more subtle way to infer the junk or neutral content is implicitly via the soon to be discussed, inability to connect variable DNA to heritable characteristics. Altogether then, amidst the oft-cited three billion human DNA letters,

there is in fact a much smaller subset that should be home to the origins of our heritable distinctions.

Against this evolutionary backdrop the ongoing genome searches are supposed to identify some specific DNA codes, and hopefully with them, some useful insights into problematic heritable conditions. These searches could also offer some confirmation of DNA's evolutionary roles. On this latter point consider the following found in a 2003 *Scientific American* interview with Nobel laureate James D. Watson [Watson 2003]:

> *Scientific American*: [i]n a century, we went from rediscovering Mendel's laws and identifying chromosomes as agents of heredity to having the human genome largely worked out. Finding the double helix drops neatly in the middle of that span. How much, with respect to DNA, is left for us to do? Are there still great discoveries to be made, or is it just filling in details?

And then after some speculation:

> Watson: [relevant research] seems to moving pretty fast. You don't really want to make a guess, but I'd guess that over the these next 10 years, the field will be pretty played out. A lot of very good people are working on it. We have the tools. At some stage, the basic principles of genetics will be known be in terms of gene functioning, and then we'll be able to apply that more to [more difficult] problems such as how the brain works.

Finally, *Scientific American* asked Watson, "[i]f you were starting out as a researcher now". Watson interjected, "I'd be working on something about connections between genes and behavior. You can find genes for behaviors…". His optimism likely reflected the confidence in the DNA model; the limited extent of our variable DNA; and the quality of the then pending research efforts. Given the difficulties encountered in the subsequent genetic searches, it is likely that those research efforts have expanded beyond Watson's expectations.

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The big problem facing genetics, though, has been the unfolding inability to identify the expected DNA determinants for behavioral as well as disease inclinations. Watson's above-suggested 2013-ish finish line for identifying basic genomic connections was not accurate. In fact in a 2014 review of another 'breakthrough' in the genetics of intelligence (which purported to

account for a possible 1 percent in the variation of innate intelligence), *Scientific American*'s John Horgan pointed out that in a 2012 *Behavioral Genetics* editorial it was stated that:

> [t]he literature on candidate gene associations is full of reports that have not stood up to rigorous replication. This is the case both for straightforward main effects and for candidate gene-by-environment interactions…As a result the psychiatric and behavioral genetics literature has become confusing and it now seems likely that many of the published findings of the last decade are wrong or misleading and have not contributed to real advances in knowledge [Horgan].

This was a very significant story which drew little attention and Horgan was good to point it out.

The first major public acknowledgement came earlier in September 2008, when Duke University's geneticist David Goldstein was quoted regarding the outcome of thorough (or "tour de force") comparisons between the million or so common genetic variations and the inheritance patterns associated with the occurrences of common complex diseases (which also overlap some into the behavioral domain) [Wade]. It had been expected that some of these common variations in our DNA blueprints would of course be correlated with the patterns of susceptibility to common diseases (and also to other heritable distinctions). Goldstein pointed out that:

> [a]fter doing comprehensive studies for common diseases, we can explain only a few percent of the genetic component of most of these traits. For schizophrenia and bipolar disorder, we get almost nothing; for Type 2 diabetes, 20 variants, but they explain only 2 to 3 percent of familial clustering, and so on.

Goldstein then added:

> It's an astounding thing that we have cracked open the human genome and can look at the entire complement of common genetic variants, and what do we find? Almost nothing. That is absolutely beyond belief.

Note that "common" here implies that a given specific variation in the genome is present in at least 5 percent of humans. This initial and stunning result - in particular of the common variants theory in which commonly

occurring differences in our DNA were hypothesized to be (causally) correlated with the common variations in our complex disease experiences - has been followed by a decade of mostly awkward silence amidst the subsequent genetic searches.

A simple example of a common variation in DNA is the Y-chromosome (chromosome denotes a large physically distinct segment of DNA code). About 50% of people have a Y-chromosome in their genome and as a result those people have male anatomy. Similarly, one would expect that some of the other variable code sequences in our DNA would be correlated to other innate differences. Note that such differences do not have to be simple and deterministic (or visible in a mirror), rather they could merely stack the physiological deck in favor of the occurrence of a particular disease or condition. Also, due to the presence of junk or inconsequential DNA sequences, not all of the variations - commonly occurring or otherwise - would be expected to have an impact.

This missing heritability or more tangibly, the missing headline, problem is a huge deal both practically and intellectually, but it is almost never discussed. In the above quote Goldstein was assuming that rare genetic variations (variable codes in the DNA which are much less common in their occurrences) are responsible for the missing heritability. Yet no significant discoveries along those lines, or apparently otherwise, have been reported in the following decade.

The above "beyond belief" quote was reiterated in a subsequent October 2010 *Scientific American* article, "Revolution Postponed" [Hall]. Another frank appraisal also came in 2010 in which Jonathan Latham and Allison Wilson of the Ithaca, New York's Bioscience Resource Project pointed out that with few exceptions (including previously identified genes for cystic fibrosis, sickle cell anemia, and Huntington's disease; and also including genetic contributions for some instances of Alzhemier's and breast cancer):

> according to the best available data, genetic predispositions (i.e. causes) have a negligible role in heart disease, cancer, stroke, autoimmune diseases, obesity, autism, Parkinson's disease, depression, schizophrenia and many other common mental and physical illnesses that are the major killers in Western countries [Latham and Wilson].

They went on to ask (in italics) *"[h]ow likely is it that a quantity of genetic variation that could only be called enormous (i.e. more than 90-95% of that for 80 human diseases) is all hiding in what until now [circa 2010] had been considered genetically unlikely*

places?". Has this point been rebutted by geneticists? Furthermore, Latham and Wilson also suggested that "[b]y all rights then, reports of the GWA [genome wide assessments] results should have filled the front pages of every world newspaper for a week". Needless to say, that missing heritability coverage did not happen.

A recent and thus more significant appraisal showed up in a May 2017 *Scientific American* article, "Schizophrenia's Unyielding Mysteries: Gene Studies Were Supposed to Reveal the Disorder's Roots. That Didn't Happen. Now Scientists Are Broadening the Search" [Balter]. The author, Michael Balter described the big DNA search tool utilized, Genome Wide Assessment Studies (GWAS), as:

> scan[ning] the entire genome for differences between the disease and control groups. [They] employ sophisticated statistical analyses to pick up even small increases in the number of specific genetic variants that might contribute to disease risk.

These searches very carefully check for statistical connections between specific DNA codes and the occurrences of supposedly heritably-influenced conditions like schizophrenia. Thus in genetic jargon hoping to identify genotypes (codes) behind the phenotypes (outcomes). "Genetic" conditions are of course supposed to reflect actual genetic contributions.

These big schizophrenia DNA searches as of 2017 involved a scientific armada numbering over 800 researchers and DNA samples from more than 900,000 subjects. Balter provided a number of superficial positive reports before offering some realistic ones. In one such assessment David Goldstein, currently director of Columbia University's Institute for Genomic Medicine, commented that the C4 finding and the associated possible insight for schizophrenia represents "the first time we have gotten what we wanted out of a GWAS." Additionally, the C4 finding was characterized by one evolutionary genetics researcher, Kenneth Weiss of Pennsylvania State University, in diminutive fashion - "[e]ven if the C4 story is right, it accounts for only a trivial amount of schizophrenia" and that its significance "is debatable".

Another fitting assessment in Balter's article came from the behavioral geneticist, Eric Turkheimer, who said that "GWAS shows that schizophrenia is so highly, radically polygenic [i.e., with many DNA contributors] that there may well be nothing to find, just a general unspecifiable genetic background". I suggest here that this is effectively, 'we know that the DNA

roots are there (but we just can't find them)'. This conclusion is the opposite of the confidence communicated in the *The Gene* or any genetic literature that I am aware of. Finally, David Goldstein provided an appropriately critical comment on the nature of the genetic search business in saying that "[p]eople working in the schizophrenia genetics field have greatly over-interpreted their results" and further that they should utilize "a whole lot more humility". How many subfields of the genomic search business are there where this comment does not apply? Are there any scientists or academics willing to publicly expound on this DNA deficit?

Furthermore, the aforementioned James Watson broke from his earlier optimism and similarly acknowledged the lack of genetic insight into the occurrences of mental illnesses in his 2017 book, *DNA: The Story of the Genetic Revolution.* Watson pointed out that "[t]he history of this research is full of high hopes brought low" [Watson 2017, p.391]. He also provided a fitting quote on the situation from the geneticists Neil Rich and David Botstein:

> [t]he recent history of genetic linkage studies for [manic depression] is rivaled only by the course of the illness itself. The euphoria of linkage findings being replaced by the dysphoria of non-replication [in other populations] has become a regular pattern, creating a roller coaster-type existence for many psychiatric genetics practitioners as well as interested observers [p.392].

Watson, though, not surprisingly still upholds the faith as reflected in his subsequent statement pointing that "[t]hat said, I am extremely hopeful that we are entering an era of genetic analysis that will soon take us beyond this irritating game of 'now we have it, now we don't" [Watson 2017, p.392].

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For some possible additional insight here on the heritability process I consider a simple binary model. For simplicity here let's consider conception ultimately resulting in very similar male and female human beings within an isolated population. The only innate distinctions within the two groups are found in a small subset of behavioral characteristics. The two groups then constitute almost truly identical replicas or twins. It is a limited and boring scenario but it allows for the consideration of the basics of conception/heritability, behavioral genetics, and even a bit of evolution.

This simplistic hereditary model dismisses the very long list of DNA's supposed contributions to our behavioral inclinations. That very long list

fell out of the many inferences based on behavioral genetic analyses. Those inferred DNA contributions were largely derived from twin studies in which behavioral tendencies appearing to be more similar between monozygotic twins than between fraternal twins produced genetic inferences. Of note here is that among the variable portion of DNA, monozygotic twins almost completely share their specifications (some post-conception mutations could provide for a few differences), whilst fraternal twins share on average only half of their variable specifications, just like regular siblings. The simplified alternative considered here keeps the list of variable characteristics really short: introverted versus extroverted; aggressive versus passive; tending to put on weight versus staying thin; tending towards liberalism versus conservatism; and tending towards worrying versus gravitating towards laid-back. This is obviously a very small range of variation, not too mention variation that is only binary (i.e., a model person here would for example be classified either as aggressive or passive), but it allows for a basic discussion of the dynamics of heredity.

In this hypothetical population of super-similar females and males, a particular person would only be distinguished from their same-gender peers by their specifics on these 5 variable genetic elements (and of course their freckles might differ in location too). One such specification might be tending to be introverted, passive, struggling with weight, liberal, and laid-back. If we had used a much longer and more realistic list of innate attributes, then a particular specification could conceivably describe just one person. As is, though, there may be many virtual females or males in the hypothesized population sharing the same 5 variable behavioral element specification. To add some realism here you can remember that our behavioral specifics can also respond some to environmental (or experiential) factors and thus these virtual people could be distinguishable even if they received the same genetic specifications.

Now this model can be used to introduce the nature of the inheritance process. You can forget DNA for now and simply consider that each of these 5 characteristics as being determined by a coin flip. For example then a Heads might specify a worrier versus a Tails specifying a laid-back-er. This same analogy has been used to suggest that each of us actual humans 'is so lucky to be alive' since we were conceptually specified via a sequence of coin flips (and the DNA code really can be viewed as binary) that arrived at our particular variable DNA specification. Since an actual DNA specification involves a lot more than 5 variable elements you can get a sense as to why we are supposed to be feel so lucky.

The above coin flipping scenario represents conception (a sperm and an egg merging) and given the unpredictable nature of the production of a given sperm and egg cell (via the intra-chromosome shuffling of meiosis), siblings in this model scenario would likely have different 5 element specifications. Additionally, it is worth noting that if both the mother and the father are serious worriers then their offspring would also likely have a biased coin flip with regards to their status as worriers versus laid-back-ers. In fact, in that case a better analogy might even be a one-sided coin whereby the resulting conceived of female or male would be a guaranteed worrier (for simplicity here I am ignoring a number of details like recessive versus dominant genetic contributions). In this way the behavioral status of the mother and father can really skew the coin flipping business representing conception. That skewing can in turn be seen as establishing the inheritance patterns that we can observe around us (again rather blatantly with regard to appearance). An aggressive mother and father are more likely to have aggressive offspring.

Moving onto some consideration of evolution you can think about a scenario in which the super-similar human population encounters a very long stretch of easy living (think a century or two here). Perhaps under such idyllic conditions laid-back-ers would be better suited to the survival and reproduction business and they then might produce more offspring. Note, we are not going to worry about possibly excessive population growth in this scenario. Continuing, the worrier crew might be compromised by their worrying tendency and perhaps then in someway could be akin to workaholics struggling on a long pleasant vacation. For them easy is problematic and as a result they might have fewer offspring in part, perhaps, because they would be less attractive as mates in this scenario. This would be an example of a small evolutionary dynamic, here in which a populations' gene pool gets skewed in favor of a laid-back genetic behavioral specification (officially such a dynamic is termed microevolution).

Before tackling the missing heritability aspect here I pause to reflect on some related matters. For some people it might seem that I am undervaluing the nurture aspect here. Perhaps then nurture is the big reason that "[a]n aggressive mother and father are more likely to have aggressive offspring" or more relevantly a hypothesized worrier person mostly reflects the worry-prone environment they were raised in. One can see the official scientific response to such thinking - including the limited impact of adoption on adoptees' inclinations - but I see this quite a bit in terms of my own experiences. When I look around and note the basic behavioral attributes

of people that I have known, what tends to standout is the relatively fixed nature of those attributes. I can imagine either of my brothers significantly changing their appearances (hopefully not involving weight gain), but actually changing their personalities is much harder. In my experience those aspects are quite fixed.

Continuing with the innateness or nature argument, my first introduction to the nature-versus-nurture terrain was in the physical realm of athletic ability. Growing up I enjoyed a pretty physically active agenda and in so doing became aware that I was of middling athletic ability. On the other hand I encountered a few individuals, including my best school friend in first through third grades, for whom excelling at athletics came easily. Furthermore, these kinds of aptitudes tended to stick (I never exceeded middling athletic achievement).

Now back to the missing heritability problem. So what constitutes that problem in this simplistic scenario? It is the ongoing inability to find the coins which are presumed to provide a physical basis for heredity. In order to confirm the modern understanding of life, science needs to find the DNA-coins or be faced with a very large mystery. Additionally, a conceptual difficulty associated with the existing DNA model is that it is supposed to be haphazard in nature. As such, that model might seem to allow for big singular contributions like the long ago mutation believed to have occurred in the primate lineage which improved color vision. The subsequent evolutionary success of that mutation appears to have given almost all of us relatively good color vision. Yet on the other hand, complex behavioral characteristics - including elaborate instinctive behaviors and also characteristics like intelligence - seem to require something more than the haphazard hand of natural selection. That such behaviors could have shown up in DNA via evolution is surprising. That such a dynamic would not have left some significant (i.e., non-tiny) DNA contributors - which should have already been found - is extremely surprising.