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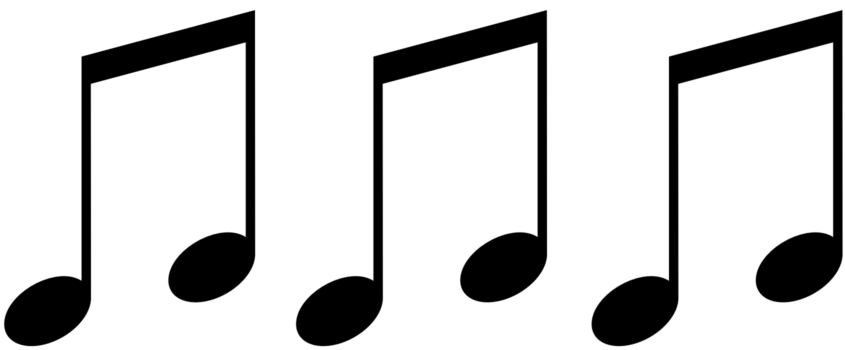

Alan Griswold

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There are a thousand hacking at the branches of evil to one who is striking at the root.

Henry David Thoreau

Contents

Human Intelligence Redescribed

Introduction

There exists a standard description of human intelligence, a description that intelligence researchers know and understand well. It is almost exclusively a *biological* description of human intelligence. This description ties intelligence directly to the human brain, an organ that is characterized as physically hosting and producing intelligence, with the brain's workings and abilities determined primarily by its genetic underpinnings (Basten et al., 2015; Plomin & von Stumm, 2018). External influences are given *some* consideration within this standard description, but these external influences are never depicted as being direct or primary (Tooley et al., 2021). The physical environment, for instance, is studied for its potential impact upon the neurons in the brain and for its effect upon genetic expression, influences that can be both deleterious to neurons and to gene expression (for instance, pollution) and that can be beneficial for neurons and for gene expression (for instance, good nutrition). Ultimately, however, in the standard description, intelligence always comes back to the human brain and remains a direct function of the brain itself (Colom et al., 2010). When today's intelligence researchers wish to observe intelligence directly, they gather DNA samples and take neuroimaging pictures, they do not probe and photograph the brain's surroundings.

Let me be clear about something from the outset. The purpose of this essay is to argue strongly against the standard description of human intelligence and to provide an alternative view that I believe brings greater overall clarification to the subject of human intelligence. But that being said, it also needs to be understood that I accept unreservedly nearly every piece of data and nearly every scientific finding that has backed the standard description of human intelligence. IQ tests, the *g*-factor, neural activity, genetic correlations, the importance of intelligence in everyday life—all these topics will be discussed within this essay and all these topics will be incorporated, mostly as is, into the alternative view I provide. In my way of seeing things, the standard description of intelligence is not so much wrong as it is incomplete. The standard description's fatal flaw is that it purports to tell the entire story of human intelligence, when in fact it has embraced only *half* of that story. Intelligence researchers do not realize this, but their standard description is missing an entire aspect of human intelligence that is essential for explaining the observed patterns in IQ exam results, not to mention essential for explaining the course of human history and the development of human behavioral modernity. The purpose of this essay is to introduce and to outline that other half of the human intelligence story.

For those who are unfamiliar with the details of the standard description, I would recommend a reading of the second edition of *The Science of Human Intelligence*, by Richard J. Haier, Roberto Colom, and Earl Hunt (Haier et al., 2023). This book is recent and thorough, and its authors, being themselves ardent proponents of the standard description, lay out the evidence for its case with both rigor and enthusiasm. Here you will find a treasure trove of accurate information regarding the history of intelligence tests; the psychometric analyses that underlie those tests; twin, adoptive and other family studies that undergird the genetic basis for intelligence; the latest in neuroscience techniques and their multitude of findings; the statistical associations of intelligence exam performance to academic achievement, to job success, and to various other important life circumstances; and finally a fair-minded and fact-based discussion regarding sex, age, individual and group intelligence differences. Some briefer, albeit less complete, alternatives to *The Science of Human Intelligence* can be found in *The Neuroscience of Intelligence*, by Richard J. Haier (Haier, 2016), and in the second edition of *Intelligence: A Very Short Introduction*, by Ian J. Deary (Deary, 2020). As I have suggested above, notwithstanding the hypotheses and conclusions that are often stated within these books, I have no qualm or argument with the many evidentiary details that these books provide. These evidentiary details form the backbone of any reasonable study of human intelligence.

To come straight to the heart of the matter, the missing component in the standard description—the aspect that I believe is essential for arriving at a more complete understanding of the workings of human intelligence—is the artificial, structural and assembled nature of the modern human environment. One of the ironies of this component is that it has become so ubiquitous within the modern world it has become nearly impossible to characterize adequately. We humans now live in an ocean of artificiality, with the structural aspects of that artificial environment influencing almost every one of our perceptions and behaviors. This is in the sharpest contrast to how humans must have lived only a couple hundred thousand years ago, when the species was still purely animal, with not a single artificial feature to be found anywhere within the human surroundings (Klein, 2009). No clothes, no cars, no skyscrapers, no abstract language—just nature and the bestial quest for survival and procreation. I will make the claim that the humans of that earlier era demonstrated no measurable intelligence whatsoever, just as the wild animals of today also demonstrate no measurable intelligence whatsoever, with the absence of this measurable intelligence directly attributable to the dearth of artificial construction to be found within the lived environment. And I will further make the claim that the direct and palpable source of the measurable intelligence that humans now demonstrate in great abundance is the artificial and structural aspects of the surrounding modern world, and not the neurons in the human brain. Human intelligence is originated from the ocean of artificiality in which humans now live, it is not originated from inside the human skull. And until that ocean of artificiality is fully incorporated into our description of human intelligence, the pattern of increasing IQ exam performance—as observed significantly, consistently and population wide throughout the twentieth century (Trahan et al., 2014)—that pattern will continue to make no sense.

To be clear, the brain still plays an important role in this alternative view of human intelligence, a role outlined mostly by the features of the standard description. The brain (and its underlying genetics) is the primary determining factor in general intelligence ability and in individual intelligence differences. But this neural role is not primary. Instead of hosting, producing and originating intelligence, the brain should be seen as *responding* to the intelligence contained within the surrounding environment, responding to that multitude of artificial construction that now exists all around us. This is entirely consistent with the well understood notion that neural systems have evolved as stimulus-response mechanisms (Meyer et al., 2017). For the brain to *produce* intelligence would be biologically and evolutionarily extraordinary, but for the brain to *respond* to the *stimulus* of intelligence would not. Without the stimulus of artificial construction, the human brain would have only the natural features within the surrounding environment with which to respond, the same condition that humans found themselves in a couple hundred thousand years ago, a time when humans were biologically similar to what they are today, but also a time in which humans were demonstrating no measurable intelligence. For human intelligence to exist—and for human intelligence to be fully understood—both halves of the process must be taken fully into account, both the totality of the artificial structural features contained within the lived environment, as well as the corresponding responsiveness of the human brain.

This being only the introduction, I do not expect the reader to accept such ideas without a reasonable amount of skepticism. At the same time, I do hope the reader will provide me the opportunity to expand upon these concepts in greater detail. The remainder of this essay will outline both the reasoning and the evidence behind this alternative approach to describing human intelligence, an approach that gives full and primary weight to the totality of artificial construction contained within the human environment. To accomplish this task, several topics will be explored upon the way: the scientific definition of intelligence; general intelligence ability versus measurable intelligence; the Flynn effect; the nature and impact of artificial construction; the content of intelligence tests; what the standard description gets right, and what the standard description gets wrong; and finally, a discussion of the true nature of genius. My hope is that by the end of these discussions, it will have become clear to the reader why the standard description of intelligence is fundamentally inadequate, and why a more complete description must be offered in its place.

I cannot overemphasize the importance of this topic. No concept is more critical to a thorough understanding of modern humanity than is the concept of intelligence. It is essential that we get this right.

The Scientific Definition of Intelligence

In common use, *intelligence* is one of those words that has a broad range of both denotations and connotations. Ask ten different people to define what intelligence is and you will get ten different answers, and this despite the fact that given the choice, most people will concur upon which of their colleagues are more intelligent and which of them are less intelligent. We seem to *instinctively* know what intelligence is, but we do not seem to *explicitly* know what intelligence is.

Adding to the difficulty, intelligence has also become a hot-potato topic (Carl & Woodley, 2019). Discussions surrounding human intelligence, especially in any kind of ranked form, lead to unease and argumentation within some portions of the population, causing many to suggest that the subject would be better off left untouched.

Let me be clear about where I stand and what meaning of intelligence will form the basis of the discussion within this essay. I believe intelligence is the most important topic there is for an understanding of the circumstances of modern humanity—we would ignore the subject at our peril. And I am perfectly prepared to provide an explicit definition.

The explicit definition that I will use for intelligence is the *scientific* definition of intelligence. This definition has been around for more than a century now and it has produced a cornucopia of useful information. No other definition of intelligence has come anywhere near it in providing both productive data and effective insight, and within the social sciences, it is one of the rare instances of a definition actually proving to be scientific. I should probably warn you first, however, that this definition does contain an ironic twist, so be prepared:

Intelligence is what gets measured by intelligence tests.

I did not create that aphorism. It comes from the psychologist Edwin Boring writing more than a century ago, responding to the first iterations of intelligence tests and to the novel statistical analyses that were arising from them (Boring, 1923). I am not exactly sure how much irony and how much literalness Boring intended, but as time has gone on, the aphorism has revealed itself as containing a good deal of both. It would seem that Boring's main objective, perfectly valid, was to remind and to warn early twentieth-century researchers of the self-referencing nature of what they were attempting to do. Imagine, if you will, that I were to tell you that the human population possesses a characteristic called *gogobag*, and furthermore I was setting out upon a quest to quantify gogobag within each individual and to use that information for comparative purposes. To achieve this quest, I design a series of questions and challenges designed specifically to probe for gogobag ability—gogobag tests, I call them—and I administer these tests to a representative sample of the human population. Afterwards, I perform a statistical analysis upon these results, and lo and behold, what emerges from this analysis is a common factor of correlated performance across all the gogobag tests, something I attribute to a human characteristic I call general gogobag ability. The existence of this common factor and its attributed characteristic proves that gogobag must be real, quantifiable, and comparable across the human population. I next apply for my Nobel Prize.

If you were to witness me making such an effort, you would insist at some point that I must be crazy, or at the very least, must be a very poor researcher. And yet substitute the word *intelligence* for *gogobag* and you would have a decent description of what intelligence researchers were doing in the early twentieth century (and are still doing today). The thing is, although my gogobag efforts would almost certainly turn out to be both ineffective and unproductive, the early twentieth-century intelligence efforts proved to be quite the opposite. IQ exams and their resulting analyses seemed to confirm what researchers both intuitively expected and needed to show, that levels of performance on intelligence tests tended to translate to similar performance across *all* intelligence tasks (Carroll, 1993), and that levels of performance on intelligence tests were very good predictors of academic performance, job success, and an entire host of other life circumstances (Kuncel et al., 2004). How had the researchers pulled off this mostly self-referencing feat? Was it sheer luck, a coincidental accident? Or a case of cheating perhaps? Or maybe a stroke of pure genius? Intelligence researchers never stopped to care. Armed with an effective and powerful tool, researchers then generated more than a century's worth of meaningful and valid study on the subject of human intelligence, including, quite significantly, a preponderance of evidence that individual intelligence abilities are driven primarily by biological, neural and genetic factors (Deary et al., 2022). The study of human intelligence has been one of the great success stories of the last one hundred years of science, and this constitutes the literal side of Boring's aphorism. For whatever reason, intelligence tests work. Scientifically and productively speaking, intelligence is what gets measured by intelligence tests.

There are two audiences that will routinely dismiss this scientific definition of intelligence. The first audience consists of those whom I would call the lay detractors, those who insist intelligence is too complicated, too abstract or too ethereal to be captured by something as mundane as an administered test. Consider all that intelligence purports to encompass, the lay detractor will say: problem solving, reasoning, learning, creativity, adaptation, communication—how is a couple-hour exam supposed to assess all of that? And what would an IQ exam performance even mean, given that intelligence is both malleable and impacted by so many different things—education, parenting, social circumstances, and whether or not one is having a good day? And what about those other important human qualities—resilience, maturity, confidence, altruism—where do these show up on an intelligence exam? And can humans even be thought of as intelligent at all, given the fact of their wars, their inequities, their harmfulness to the planet—how have these stupidities been included in the final tally? No, whatever intelligence is, the lay detractor will say—if indeed it is anything at all—it has to be something much different than what can be gauged by a silly test.

I could perhaps muster some empathy for these objections if I were able to make any use of them, but alas they are entirely impotent. The best I can offer to the lay detractor is a splitting compromise, one that would allow us to go our separate ways in peace. What I would suggest is that I relinquish use of the word *intelligence*, and employ another word instead—*flugleheim*, for instance. The lay detractor can then define intelligence in any way he or she prefers, while I content myself with claiming that flugleheim is what gets measured by flugleheim tests. Neither party should have an objection to these respective words, because neither party will give a whit about the other's.

But before the lay detractor accepts this compromise, I feel I must issue a warning. If that lay detractor should ever want to understand why some individuals tend to learn quickly and broadly, are more successful in their jobs, have better economic circumstances, engage in more satisfying relationships and stable marriages, experience greater health and lasting longevity, all this and much much more; should that lay detractor ever inquire about why some societies, cultures and organizations advance and thrive, while other societies, cultures and organizations stagnate and flounder; should that lay detractor ever ponder upon the puzzle of how did humanity arise from its animal past and go on to build its modern civilizations; should that lay detractor ever engage in such questions, as well as an entire host of others, he or she will discover that their word *intelligence* serves them no use at all. No data, no perspective, no insights—just a handful of scattered and amorphous concerns. And should that lay detractor also happen to notice that there are others who have made progress in the answering of such questions, he or she might also take notice of the accompanying use of flugleheim.

I will of course not be using the word *flugleheim* within this essay (it has been annoying enough already). But do keep in mind that *my* use of the word *intelligence* derives strictly from those supposedly silly intelligence tests.

The second audience that routinely dismisses the scientific definition of intelligence is, surprisingly enough, intelligence researchers. It is not that these researchers do not recognize that their entire profession has been built upon the foundation of these tests—as indeed it has (deLeyer-Tiarks et al., 2024)—but giddy with all their resulting success, these researchers have had a tendency to downplay the significance of their origins. This manifests in a handful of different ways. For instance, some intelligence researchers are wont to say that the content of an intelligence exam is essentially irrelevant, that as long as its questions remain psychometrically valid, they could be about any topic at all. Therefore, push-ups, fertility levels, the amount of food one can consume in a minute, these are perfectly viable candidates for potential inclusion on an intelligence exam—except of course they are not. Whether willing to admit it or not, intelligence researchers have always used an intuition for what type of challenge is appropriate for an intelligence test (and what type of challenge is not), the same intuition that guided them in the construction of their very first intelligence tests. And if those researchers have never stopped to figure out what characteristic it is that has allowed exam questions to be so successful in the measuring of intelligence, other than the tautological characteristic that they are being used to measure intelligence, that does not mean that such a non-tautological characteristic does not exist. This essay, respectful of the scientific definition of intelligence, will examine the content of intelligence exams with some seriousness, and will identify the non-psychometric characteristic that a question must possess in order for it to be a viable candidate for inclusion on an intelligence exam, providing a meaningful answer to Boring's warning about the study of intelligence being too self-referencing.

Another way that the current generation of intelligence researchers dismisses the scientific definition of intelligence is with its response to the Flynn effect. The Flynn effect is another topic that will be explored in greater detail later on, but by way of preview, the Flynn effect is the phenomenon observed, ever since intelligence tests were invented, that the average raw score on these tests has been significantly increasing with time (Pietschnig & Voracek, 2015). Nothing comes nearer to the scientific definition of intelligence than the raw scores on intelligence tests, and so the Flynn effect has emerged as the most significant intelligence finding that researchers have uncovered to date. But frustrated in their efforts to explain the Flynn effect, intelligence researchers have been treating the phenomenon dismissively: through an endless stream of non-compelling suggested causes, through a promulgation of obscure and complex models, and through a biased hope that the Flynn effect soon will end (Griswold, 2024a). The Flynn effect is an inconvenient truth for intelligence researchers, which certainly explains their desire to downplay it, but to downplay the significance of the Flynn effect is tantamount to downplaying the scientific definition of intelligence.

Finally, there is the easy acceptance of the notion of animal intelligence, a sentiment many researchers share with the lay detractors. I suspect what has happened is that because researchers have been able to establish such a strong connection between human intelligence and human neural activity, researchers have now taken to using neural activity as the primary indicator of the presence of intelligence. And since all sorts of animals have brains, and since all sorts of animals engage in brain-based behaviors, and since some of these behaviors are downright humanlike, it must seem perfectly reasonable to contemplate and to study intelligence within these other species (Bräuer et al., 2020). Leopards, honeybees, crows, octopuses, etc.

Sometimes you even get a whiff of suggestion that in some sense, these other animal species are often more intelligent than humans.

But by the scientific definition of intelligence, all such notions of animal intelligence are pure rubbish. What gives evidence of intelligence is not neural activity, not brain-based behaviors, not *humanlike* behaviors. What gives evidence of intelligence is an intelligence test. And intelligence tests are not conceivable for wild animals—neither in administration nor in construction—and without an intelligence test there can be no measurable intelligence.

Think about it, what would an intelligence exam consist of for a wild animal? Since wild animals engage solely in survival and procreative activities, one can measure only for such qualities as speed, strength, attractiveness, sense acuity, fertility, social dominance, and so on—natural characteristics, nothing artificial or fabricated. But such natural characteristics do not show up on *human* intelligence exams, and I suspect every intelligence researcher would quickly disallow any such type of question (and for very good reason). But then what kind of challenge *can* be set for a wild animal? Vocabulary? Matrix patterns? Digit recall? Even if an intelligence exam could somehow be constructed that was appropriate for a wild animal, how then would one administer such a test? I challenge any intelligence researcher to devise such an exam and then travel to a remote section of Africa and deliver that exam to a pack of wild leopards—I am fairly certain I can predict the results.

The one apparent exception to this discussion about animal intelligence is the case of tamed, caged and domesticated animals, but that exception comes with an extremely large asterisk. Tamed, caged and domesticated animals are distinguished by their established connection to the human species, a connection that cannot be separated from their resulting perceptions and behaviors. Thus, when one supposedly is testing for species intelligence within these creatures, what one is more likely doing is testing the strength of their association to *human* intelligence. If this were not the case, then the wild version of these creatures would be just as capable of navigating the tests as are the tamed, caged and domesticated version, but this never turns out to be the result. Therefore, the intelligence being measured in these animals is not a species-specific intelligence but is instead an associated human intelligence, and if you were to remove entirely the humans and the human influences from the test scenario, you would not only no longer have tamed, caged and domesticated animals, you would also lose all the measurable intelligence.

There exists an extremely important corollary to these statements about wild animals demonstrating no measurable intelligence. Humans, as recently as a couple hundred thousand years ago, also were wild animals, living in an entirely natural setting and engaging in nothing but survival and procreative behaviors. These early humans, before their turn towards behavioral modernity, they were just as incapable of taking an intelligence test as are the wild animals of today. (Nor could such a test have been devised for these early humans—certainly nothing like Stanford-Binet or Wechsler.) It would be a mistake to assume that just because these early humans possessed a level of neural activity—indeed a level of neural activity comparable to what humans experience today—that this also means that these early humans could demonstrate a significant degree of intelligence. If intelligence is what gets measured by intelligence tests, then the human species—and not that long ago—was once demonstrating no measurable intelligence.

I suspect many of these statements are unlikely to be well received, but they are scientifically valid and correct. Scientists cannot have it both ways. Either researchers admit that by the scientific definition of intelligence modern humans have been the only creatures upon this planet to have ever demonstrated any species-specific level of measurable intelligence, or else researchers must give up the entire foundation of their profession. *If intelligence cannot be measured, then there is no evidence that the intelligence exists.* And to date, the only effective tool to have been devised for measuring intelligence is an intelligence test. To repeat, intelligence is what gets measured by intelligence tests.

In summary, the purpose of this section is to demonstrate my loyalty to the scientific definition of intelligence, and to insist upon the need for intelligence to be measurable by intelligence exams. In the sections which follow, I will lay out an alternative view regarding the nature of human intelligence, a view that strives both to augment and to overturn the standard description of intelligence. But it needs to be recognized that this alternative view is not being built upon any unusual, popular or novel foundations—for instance, upon the idea of emotional intelligence

(Bru-Luna et al., 2021), or upon social intelligence (Kihlstrom & Cantor, 2000), or upon umpteen different kinds of multiple intelligences (Gardner, 1987), or upon any American Psychological Association definition of intelligence (American Psychological Association, n.d.), or upon all the other psychobabble descriptions of intelligence that can be found within the literature. No, this alternative view is being built upon the very same foundation that has buttressed the last one hundred years of scientific pursuit in the study of human intelligence, is being built upon the foundation of intelligence tests. The content of IQ exams, the Flynn effect, the history of human intelligence—all these topics have a direct connection to what we currently know about human performance on intelligence exams. There is still a great deal of understanding that can be gleaned from the scientific definition of intelligence.

General Intelligence Ability Versus Measurable Intelligence

There are two phrases that will be frequently employed within this essay (indeed, they have already been used within the previous sections). The first phrase is *general intelligence ability*, and the second phrase is *measurable intelligence*. These two phrases refer to different things, and yet in the standard description of intelligence, there is a strong suggestion that these two phrases are tightly connected, even to the point of being mostly interchangeable. But is this in fact the case?

General intelligence ability (often referred to as *g* in the literature) refers to the concept that each individual possesses a certain level of aptitude that can be applied to the solving of every type of intelligence task (Gottfredson, 1998). Not visuospatial ability. Not verbal ability. Not chess ability. *General* ability (hence, the name). This concept arose out of the statistical analyses of the very first intelligence tests, where it was noted that there was a strong correlation of performance across all kinds of intelligence tasks (Spearman, 1904). This is sometimes referred to as the positive manifold, and it can be colloquially described by saying that an individual who does well on one type of intelligence test will also tend to do well on the other types of intelligence tests. Researchers do recognize that each individual will have some specific intelligence strengths and weaknesses, but statistically speaking, these specific strengths and weaknesses have much less influence on intelligence performance than does one's general intelligence ability.

Furthermore, it is general intelligence ability that correlates so well to outcomes in various life circumstances. There is now a large and established body of evidence indicating that those individuals with a higher level of general intelligence ability tend to have greater academic success, more favorable job performance, better economic circumstances, superior health, and so on (Gottfredson, 2002). If you want to make a prediction about how well an individual is going to do in their everyday life, no information is more valuable than to have that individual's general intelligence ability.

Also, through an assortment of family-based studies, scientists have been able to demonstrate that general intelligence ability is determined primarily by one's genetic background (Deary et al., 2022; Plomin & von Stumm, 2018). There are a variety of ways to perform such studies, but the classic and easiest-to-understand version is to find identical twins (same genetics) who have been separated at birth and then raised in different environmental circumstances. The strong tendency is that by the time these identical twins reach adulthood, they will find themselves experiencing similar circumstances and similar characteristics: similar IQs, similar academic achievement, similar job success, and so on. This means that the foundation of general intelligence ability is primarily biological, much more so than, for instance, environmental influences. This mostly biological underpinning to general intelligence ability is now being pursued with great vigor through an assortment of neuroimaging and biogenetic studies (Anderson & Holmes, 2021). When it comes to general intelligence ability, there is really no escaping one's genetic and neural background.

These findings regarding general intelligence ability have formed the backbone of intelligence science for more than one hundred years. These findings are not controversial. They are not dubious. More than a century's worth of scientific study has repeatedly indicated that individuals are born with a certain level of general intelligence ability, due mostly to their genetic background and expressed in their neural makeup, and these individuals will experience life circumstances that are mostly in line with their given level of general intelligence ability. There are exceptions, of course, but the overall correlations remain significant and strong. General intelligence ability is a foundational and enduring component of human intelligence.

Whereas general intelligence ability is a characteristic of the individual taking an intelligence test, *measurable intelligence* is a characteristic of the test itself. In simplest form, measurable intelligence is the amount of intelligence being demonstrated via the raw score on an intelligence exam. For instance, assuming the questions are of similar difficulty, a raw score of 60% would demonstrate a greater amount of measurable intelligence than would a raw score of 40%. This description might be adequate if there were only one type of intelligence exam in existence, but in reality there are of course many different types of exams, of varying construction and varying difficulty. This then raises the question of calibration.

The analogy to think of here is that of thermometers (representing intelligence tests, the tools doing the measuring) and heat (representing measurable intelligence, the characteristic being measured). Thermometers can be constructed so that a reading of 60 indicates the presence of more heat than does a reading of 40. But if you have two different kinds of thermometer, their readings will not be comparable unless the thermometers are somehow calibrated. In the same sense, a raw score of 70% on a particular intelligence exam is not comparable against a raw score of 50% on a second intelligence exam unless the two exams have been calibrated. In rough terms, if the first exam is twice as easy as the second exam, then a score of 70% on the first exam would demonstrate less measurable intelligence than a score of 50% on the second exam.

Although intelligence tests are capable of being calibrated, especially when they are taken by the same group of people, in practice this is not always done. Nonetheless, assuming calibration is achievable, the definition of measurable intelligence can then be made complete. *Measurable intelligence* is the amount of intelligence being demonstrated via the calibrated raw scores on intelligence exams.

Both general intelligence ability and measurable intelligence use only relative values—there are no known absolute scales by which to assess their readings. An individual's general intelligence ability is typically estimated by that individual's IQ score, and IQ scores are themselves relative measures, determined by one's statistical ranking against an appropriate cohort of test-taking peers. If Person A has an IQ of 120, and

Person B has an IQ of 105, one can say only that Person A has a greater (estimated) general intelligence ability than Person B, but one cannot say in any absolute sense by how much these abilities differ. The same is true of measurable intelligence. A raw score of 65% on an intelligence exam indicates a greater amount of measurable intelligence than does a raw score of 45%, but it does not indicate in any absolute sense by how much these amounts differ.

It is important to emphasize once again that general intelligence ability and measurable intelligence are two different concepts, each determined in its own way and each applicable to its own entity. General intelligence ability, typically estimated via an IQ score, is a characteristic of a human individual, and represents that person's overall capacity for demonstrating intelligence, including when taking an intelligence test. Measurable intelligence, determined via raw scores and calibration, is a characteristic of the test itself, and represents the amount of intelligence being directly demonstrated via a performance on that intelligence exam. Nonetheless, despite the fact that these are two differing concepts, the assumptions underlying the standard description of intelligence drive a strong motivation to connect them, to assert, broadly speaking, the equivalency—or at least the near equivalency—of general intelligence ability and measurable intelligence.

To see this, note that in a typical intelligence testing scenario, a low raw score on an exam (low measurable intelligence) would translate to a low IQ score, which would then translate to a low estimated general intelligence ability. A high raw score would produce a high IQ score and lead to a high estimated general intelligence ability. Within the standard description of intelligence, this all makes perfect sense. Within the standard description, where intelligence is regarded exclusively as a brain-based activity, a person's general intelligence ability is depicted as representing that person's neural capacity for producing intelligence, and that person's raw score on an intelligence test is depicted as corresponding to the amount of intelligence the brain has produced in this particular situation. Ability and performance appear to meet directly via the test-taker's brain: capacity delivers performance, performance indicates capacity, and thus it seems that both general intelligence ability and measurable intelligence could serve equally well as an indicator of the brain's effectiveness.

But alas, there are known scenarios where the equivalency between general intelligence ability and measurable intelligence does not appear to hold. Some of these scenarios are well understood by intelligence researchers, have reasonable explanations, and can be adjusted for. For instance, if you give a standard intelligence test to a pool of ten-year-olds and then give that very same test to a pool of adults, the ten-year-olds as a group will demonstrate lower raw scores and thus less measurable intelligence than do the adults. This means that if one were to insist on the equivalency of general intelligence ability and measurable intelligence, then one would also have to say that the ten-year-olds as a group possess less general intelligence ability than do the adults. But this is inconvenient for a number of reasons, not the least of which is that it violates the intuition that general intelligence ability should be a stable and consistent characteristic across an individual's lifetime. This intuition can be restored by limiting comparison of ten-year-olds only to other ten-year-olds, and not mixing them in with the adults. Indeed, intelligence researchers have become quite aware that their findings regarding general intelligence ability are prone to being influenced by both the nature of the tests being employed as well as by the characteristics of the population being tested (Detterman & Daniel, 1989). Therefore, when researchers want to make broad statements about general intelligence ability within the human population, they rely upon test scenarios in which a broad battery of tests is used (such as Stanford-Binet or Wechsler) and in which a broadly representative sample of the population is tested. It is only under such circumstances that one can safely inquire about the equivalency of general intelligence ability and measurable intelligence.

Nonetheless, even under these broadly representative test conditions, there are still scenarios in which the equivalency between general intelligence ability and measurable intelligence does not appear to hold, scenarios that do not have a ready explanation nor an easy adjustment. The most prominent of these scenarios arises from the Flynn effect.

To cleanly demonstrate the Flynn effect and to indicate how it plays havoc with the equivalency between general intelligence ability and measurable intelligence, I will employ a hypothetical scenario, and then afterwards discuss how realistic this scenario is. The scenario begins in the year 1925, at which time a broad battery of intelligence tests (similar to the current form of Stanford-Binet or Wechsler) is administered to ten thousand people drawn as a random sample from the adult human population. This population's average raw score on the battery of tests is 30%, with a standard deviation of 10%. These raw results are then normed and set out against the standard IQ scale, from which estimates are made of each individual's general intelligence ability. Studies are then conducted which result in the showing of a strong correlation between these estimated general intelligence abilities and academic performance, job success, and other life circumstances, and also, family-based studies are conducted which indicate that there is a strong genetic/neural component underlying these estimated general intelligence abilities. These are the same kinds of outcomes that have been repeated many times by real-world intelligence researchers ever since intelligence tests were invented—this is all standard fare.

Next, one hundred years later, in the year 2025, the very same test is administered to ten thousand people drawn as a random sample from the extant adult human population. This time, in exact one-to-one correspondence to the 1925 population, everyone doubles their raw score. This means that the average raw score is now 60%, with a standard deviation of 20%. Nonetheless, when these results are normed and applied against the standard IQ scale, and then used to estimate general intelligence abilities, everything turns out to be the same, because the relative and correlative comparisons are still equivalent. (The same is true for the *g*-loadings on the tests, and for every other intelligence statistic determined by relative values.) Also, when the life circumstance and family-based studies are performed for the 2025 population, the results turn out to be essentially identical to those for the 1925 population—general intelligence ability still predicts life success, general intelligence ability still shows a strong genetic and neurological underpinning, and so on. When it comes to general intelligence ability, these researchers are not going to be able to detect any appreciable difference between the 1925 and 2025 populations, an outcome very much in line with what they might have predicted. Evolutionarily and biologically speaking, one hundred years is a short period of time, too short to foster widespread genetic and neural changes. The genetic/neural characteristics of the 2025 population should be nearly identical to those of the 1925 population, and since general intelligence ability is determined primarily by these genetic/neural characteristics, scientists would have every reason to expect that general intelligence ability across these two populations has not changed appreciably over time, exactly as the results appear to confirm.

But the measurable intelligence for these two populations has very much changed over time. An average raw score increase from 30% to 60% demonstrates a significant increase in measurable intelligence (and this is not a problem with calibration, since the test is exactly the same). Intelligence researchers now face a dilemma. If they wish to maintain the connection of general intelligence ability to measurable intelligence, then this increase in measurable intelligence should translate to a corresponding increase in general intelligence ability, something that neither their studies nor their expectations would indicate. But if they *disconnect* measurable intelligence from general intelligence ability, this then creates a contradiction for any brain-based explanation of human intelligence. The fact that general intelligence ability has remained stable from 1925 to 2025 would indicate that brain effectiveness has also remained stable within the human population over that time. And the fact that measurable intelligence has significantly increased from 1925 to 2025 would indicate that brain effectiveness has correspondingly increased within the human population over that time. But it is not possible for both of these statements to be true. You could ask the question directly—has brain effectiveness increased for humans over these one hundred years, or has it not? Either answer is going to cause a problem.

Just how realistic is this hypothetical scenario? As it turns out, it is extremely realistic. The first modern intelligence exams were developed in the early twentieth century, and as that century progressed, these exams were regularly updated and expanded. For calibration and comparison purposes, when a new version of an exam was developed, researchers usually administered both the old and the new version to a representative sample from the testing population. This process created a connected time series of comparable results, and it began to be noticed that later generations of test-takers were always demonstrating significantly better raw performance on these exams than had the earlier generations. Several researchers noted this phenomenon, but it was James Flynn in the 1980s who published two influential papers (Flynn, 1984, 1987) which demonstrated that the phenomenon was extremely widespread, thereby drawing greater attention to it, and in the decades which followed, many studies were published verifying the nearly ubiquitous pattern of increasing raw intelligence scores (Wongupparaj et al., 2023). It was during this time that the phenomenon began to be called the Flynn effect.

The real-world Flynn effect data is of course not quite as neat and clean as the perfect doubling of raw scores in the hypothetical scenario. Nonetheless, the overall difference in raw intelligence scores from the early twentieth century to the early twenty-first century is significantly large, far too large to ignore and far too large to support a simple equivalency between general intelligence ability and measurable intelligence. Researchers were puzzled when they first realized the magnitude of the Flynn effect, and they are still puzzled today (Rodgers, 2023).

There is another important scenario that casts significant doubt on any equivalent connection between general intelligence ability and measurable intelligence. This scenario arises from what has been stated previously about wild animals and early humans (pre behavioral modernity) demonstrating no measurable intelligence. The question presents itself, do these creatures also have no general intelligence ability? What we will come to realize is that there is a great deal of reason and evidence to suggest just the opposite, to suggest that these wild animals and early humans should be recognized as possessing a positive level of general intelligence ability. But if this is indeed true, then what must it say about the concept of intelligence overall, knowing that a species can both possess general intelligence ability and at the same time demonstrate no measurable intelligence?

In the previous section it was asserted that early humans once displayed no measurable intelligence. What this means is that there would have been no intelligence exam simple enough to register a score for these early humans (or even simple enough to administer). One might imagine trying to create such a test, for instance by starting with Stanford-Binet or Wechsler and then simplifying it, even making use of calibration to track how much simplicity was being introduced. But just how easy would one have to make such an exam? It could not be written, it could not contain arithmetic, or abstract vocabulary, or geometric patterns, or digit recall, or just about anything that shows up on a modern exam. By the time one had gone through several rounds of such simplification, would there be anything left at all, and would the calibrating test-takers find themselves challenged to any degree? At some point, it would just be easier to say that this population of early humans must be demonstrating a zero level of measurable intelligence, the same that could be said of *any* of the wild animals.

But does zero measurable intelligence also imply zero general intelligence ability? True, one cannot *calculate* general intelligence ability without measurable intelligence, but that is not quite the same thing as saying that general intelligence ability does not exist.

One of the most established findings of intelligence science is that general intelligence ability is determined primarily by one's genetic and neural makeup, and furthermore it is not just a small number of genes and a small number of neurons that make this determination—there appear to be many genes and many different sections of the brain involved in general intelligence ability (Toga & Thompson, 2005). For large and representative samples from the human population, the principles of biology and evolution would preclude massive changes to these genetic and neural structures over anything but an extremely long period of time. We have already noted that in going from the year 2025 to the year 1925, one would not expect significant changes to the population's overall genetic and neural makeup, but is it really any different if one goes back a couple hundred thousand years? The *Homo sapiens* population from that earlier era should have had a similar genetic/neural makeup to the humans of today, including nearly all the genetic and neural structures now being indicated as influential in general intelligence ability. And if those genetic and neural structures can produce general intelligence ability in modern humans, why would they not have been capable of producing general intelligence ability in the humans of an earlier era? Biologically speaking, scientists have every reason to expect that early humans possessed a significant level of general intelligence ability, even during that time period in which they were displaying no measurable intelligence.

Further bolstering this notion that early humans must have possessed a significant level of general intelligence ability is the consideration of what would have taken place shortly after human behavioral modernity began. The early stages of human behavioral modernity would have been marked by some telling changes in human circumstances—for instance, control of fire, introduction of clothing, structured tools and weapons, ornamental jewelry, cave paintings, abstract vocabulary to refer to these new features, and so on (Klein, 2002). These new circumstances would have had the effect of making an intelligence exam conceivable for this population, because now there would have been features to test against other than just survival-and-procreative demand. True, such an exam would have been extraordinarily simple by modern standards, but nonetheless, it could have served a familiar purpose. If such an exam had been available for that early population, some of its members could have been expected to perform well, some could have been expected to do poorly, with the overall population evincing something like a normal distribution of performance. And if those ranked performances could have been matched against early-era life circumstances, a strong correlation might have been anticipated. That is to say, this early population would have been capable of demonstrating the usual evidence of a positive general intelligence ability. And if the human population possessed general intelligence ability right *after* the turn towards behavioral modernity, then why would it not have possessed general intelligence ability right *before* the turn towards behavioral modernity?

Finally, there is the evidence of the wild animals and their tamed, caged and domesticated brethren. Intelligence researchers have been able to show that under the right circumstances, tamed, caged and domesticated animals can demonstrate a degree of measurable intelligence (Shaw & Schmelz, 2017), and although this measurable intelligence is likely tainted with human influence, its existence nonetheless indicates a positive level of general intelligence ability within these animals. But the wild versions of these animals are genetically the same, and therefore should have the same level of general intelligence ability as do the tamed, caged and domesticated version, even though the wild versions of these animals are not capable of demonstrating any measurable intelligence. Again we have a situation—much like with the Flynn effect and much like with the case of early humans—in which any direct connection between general intelligence ability and measurable intelligence appears to be fundamentally broken.

I hope these scenarios do not come across as technical nitpicking, because this fundamental distinction between general intelligence ability and measurable intelligence is what lies at the heart of a more thorough understanding of human intelligence. Of these two concepts, general intelligence ability is by far the most studied and the best understood, and therefore the most influential—it has been the main pursuit of intelligence science for more than one hundred years, and it has served as the cornerstone of nearly every meaningful intelligence finding to date. When scientists speak of intelligence it is mostly through reliance upon this notion of a general intelligence ability, along with its established connection to genetic signatures and neural structures. Thus, it cannot be all that surprising that scientists think of intelligence as being exclusively a brain-based phenomenon.

In contrast, very little attention has been paid to measurable intelligence. Other than the Flynn effect, the calibrated raw scores on intelligence exams have been mostly ignored. I would claim that this neglect is an unfortunate mistake. In the scientific definition of intelligence (that is, intelligence is what gets measured by intelligence tests), measurable intelligence is the direct reference, not general intelligence ability. General intelligence ability is a *derived* concept, measurable intelligence is the *thing itself*. And what this section has both demonstrated and emphasized is that general intelligence ability and measurable intelligence are two very different things—not just conceptually different, but also different quantitatively. We have at least the following three scenarios to describe the uneven relationship between general intelligence ability and measurable intelligence:

- Sometimes, when measurable intelligence increases [decreases], so does general intelligence ability, and vice versa (typical testing scenario).
- Sometimes, when general intelligence ability remains constant, measurable intelligence increases (the Flynn effect).
- Sometimes, when general intelligence ability is positive, measurable intelligence can be zero (early humans and wild animals).

Whatever measurable intelligence is, it is fundamentally not the same thing as general intelligence ability, meaning among other things that measurable intelligence is not necessarily a brain-specific phenomenon. Something else is going on here, something that has been overlooked by intelligence researchers to date, and thus we need to arrive at a more thorough understanding of what exactly is being indicated by the readings of measurable intelligence.

The Flynn Effect

The Flynn effect can be described in very few words: *measurable intelligence, indicated by the calibrated raw scores on intelligence tests, increases over time.* This description links directly to the scientific definition of intelligence, so one might expect that the Flynn effect must be a very big deal within the realm of intelligence science. And yet this is not exactly the case. For instance, in the book *The Science of Human Intelligence* (Haier et al., 2023)—possibly the most thorough presentation of the current state of intelligence research—the Flynn effect barely gets a mention. It is almost as if it is being swept under the rug. Intelligence researchers are *aware* of the Flynn effect, but they do not know what to make of it.

The widespread perplexity surrounding the Flynn effect is evidenced most obviously by the large number of causes that have been suggested for its existence, none of which have proven to be compelling: greater hybrid vigor, better nutrition, expanded education, increased exposure to IQ exams, increased exposure to video games and graphical puzzles, the rise of science, a decrease in infectious diseases, etc.—along with various combinations of all of the above. Everyone has a favorite explanation, and yet nowhere is there anything like a consensus. In addition, several complex models have been developed to plot and to predict the Flynn effect patterns, models geared mostly towards matching various environmental factors against the long-term influences underlying general intelligence ability. The Dickens-Flynn model (Dickens & Flynn, 2001) and Woodley's theory of fast and slow life (Woodley, 2012) are two of the more well known of these complex models—each has its proponents but neither has been convincing.

Researcher Linda Gottfredson, in responding to James Flynn's book *What Is Intelligence?*, once offered the following statement:

> The chief riddle posed by the Flynn Effect is this: How can something so heritable as IQ change so quickly from

> one generation to the next? To my mind, this paradox signals that we have yet to learn something fundamental about intelligence or current measures of it (Gottfredson, 2007).

That is by far the most insightful statement I have ever seen from an intelligence researcher regarding the Flynn effect—it points the way. If I might be allowed to rephrase it somewhat, what it is suggesting is the following: to successfully explain the Flynn effect, it is going to be necessary to reconceptualize human intelligence. Unfortunately, no researcher—including Gottfredson herself—seems to have taken her up on the offer. Every suggested cause and every complex model employed to explain the Flynn effect to date has its roots in the standard description of human intelligence. And for this reason, every suggested cause and every complex model is wrong.

There are two telltale signs that indicate that all the thinking surrounding the Flynn effect has been heavily influenced by the standard description of human intelligence. The first such sign is the widespread belief and insistence that the Flynn effect must be temporary. Intelligence tests did not appear until the early twentieth century, and so there is no actual hard data to indicate whether or not the Flynn effect would have been operative before the year 1900. And yet despite the fact that it would seem the default choice would be to assume that the twentieth century was a continuation of what had come before, the consensus within the intelligence research community appears to be strongly in favor of the Flynn effect being only a twentieth-century phenomenon—a twentieth-century aberration, if you will. Only a couple researchers, such as James Flynn himself, have suggested that the Flynn effect could trace its origin to somewhat earlier days, for instance to the time of the Industrial and Scientific Revolutions (Flynn, 2007; van der Linden & Borsboom, 2019). But I am unaware of *any* researcher who has suggested that the Flynn effect might have existed any earlier than that.

On the other side of the calendar, the latest trend in intelligence research has been the diligent hunt for evidence that in the early twenty-first century, the Flynn effect is now ending or reversing. Several studies have been published to this effect (Dutton et al., 2016; Pietschnig & Gittler, 2015), claiming that raw intelligence scores have started a downwards trend, and although there have also appeared other studies indicating that the Flynn effect is still continuing (Colom et al., 2023; Liu & Lynn, 2013; Nijenhuis et al., 2012), most of the fanfare has come down on the side of the Flynn effect's imminent demise. Within the intelligence research community, both the belief and the hope seem to be that the Flynn effect cannot go on forever.

It has already been hinted at why the standard description of human intelligence requires that the Flynn effect be temporary. The standard description, based almost entirely upon the concept of general intelligence ability and depicting human intelligence as a brain-specific and brain-produced phenomenon, is thereby bound to the known principles of biology and evolution. As a biological characteristic, especially one with such a broad neural and genetic basis, human intelligence must be anticipated as remaining fairly stable over time. If, for instance, the average human body were to begin doubling in size and weight every century or two, scientists would find themselves utterly dumbfounded, since such a population-wide growth in physical dimensions would violate every known biological and evolutionary principle. But that is exactly what appears to be happening with human intelligence, creating an ongoing conundrum, one that would be challenging enough to explain across the span of a century, and essentially impossible to explain across any time period much longer than that.

Therefore, the solutions usually offered to explain the Flynn effect are presented as short-term boosts to overall human intelligence—twentieth-century boosts. Greater hybrid vigor, better nutrition, expanded education, increased exposure to IQ exams, increased exposure to video games and graphical puzzles, the rise of science, a decrease in infectious diseases, etc.—all these are generally put forth as twentieth-century surges in human experience, not operative during earlier times and soon to run their effective course, covering the known range of the Flynn effect data. Furthermore, the complex models employed to explain the Flynn effect, such as those of Dickens-Flynn and Woodley, these are constructed in such a way as to allow human intelligence to increase, to decrease, and also to remain stable over time, a remarkably flexible feat accomplished mostly through the use of a large number of parameters within the model, all done with the stated intention of allowing intelligence to exhibit an occasional short-term variation while at the same time maintaining its underlying long-term stability. It would seem that whatever explanation is being offered, the one characteristic that the Flynn effect cannot be allowed to have is to be enduring.

But human history gives every reason to expect that the Flynn effect is indeed enduring, and has been a part of the human species ever since the turn towards behavioral modernity. We have already noted that there would have been no intelligence exam simple enough to administer to humans before their behavioral turn, indicating a zero level of measurable intelligence for that population (the same level of measurable intelligence witnessed in wild animals today). And even after the behavioral turn, although intelligence exams would have then become conceivable, they would have had to remain extraordinarily simple for quite some time, certainly much simpler than any of the modern forms of Stanford-Binet and Wechsler. Such early exams could not have been written, they could not have contained arithmetic, nor complex geometrical patterns, nor any of the broad vocabulary that paints the modern world of today, etc. Almost everything that currently shows up on a modern intelligence exam represents a concept or artifact that was introduced into the human species over the course of the last several thousand years, meaning that human intelligence has been increasing steadily and continuously from its initial level of zero a couple hundred thousand years ago to the far more substantial level that is witnessed today. Judging by what we can see of the progress of human history—from the days of being purely hunter-gatherers, to the days of being budding agrarians, to the days of being civilization builders, to the days of being architects of towering skyscrapers—and judging by what would have been available for inclusion on an intelligence exam across all that period of time, one would have to say that measurable intelligence within the human population has been steadily increasing ever since the turn towards behavioral modernity. Therefore, the Flynn effect has been anything but temporary.

Furthermore, these considerations alone should be reason enough to doubt any suggestion that the Flynn effect is currently ending or reversing. What an incredible coincidence it would be to find a human phenomenon that has been in existence for tens of thousands of years, and then just now, right at the very moment of its conscious discovery, that phenomenon screeches to an abrupt halt. That would make no logical sense at all. But more than just this, if the twentieth century is to have taught us anything, it is that an increase in human intelligence was more than just an observed phenomenon over those one hundred years, it must have also been a necessity. Consider the long list of new features and new experiences that the twentieth century brought to nearly the entire swath of the human population—the speed of automobile travel, the reach of airplane flights, the ubiquity of electronic communication, the complexity and hustle-bustle of modern cities, the algorithmic turns of digital computers, the widespread connectedness of the Internet—all this and much much more. Would it have been conceivable for humans to have absorbed and to have mastered these new features and new experiences, while at the same time becoming *less* intelligent? That population would surely have been overwhelmed by all these new constructions and all these new life requirements if it had not somehow kept pace cognitively, as indeed it did. But if these statements are true about the twentieth century, why would we expect the twenty-first century to turn out any different? There are a host of challenging new innovations now appearing on the human horizon—virtual reality, machine learning, bioengineering, robotics, not to mention discoveries yet to be made. Is it really feasible to think that humanity will somehow navigate these new artifacts and these new experiences while at the same time moving backwards in intelligence? Does that really make any sense at all?

Listen, I am willing to give science its time to work. If enough solid evidence accumulates that measurable intelligence is indeed plateauing or reversing, I will gladly surrender every claim made within this essay. But you cannot expect me to hold my breath. There is no logical reason and no historical basis to believe that the Flynn effect is temporary. What there actually is, is a desire to maintain the sanctity of the standard description of human intelligence. What I believe is currently taking place within the academic community is something like the following. After forty some years of consistent Flynn effect data, still more reports of an increase in raw performance on intelligence exams is no longer interesting news—both journal editors and the academic press have seen this story many times before. But in their desire for something fresh, and in their desire to defend the standard description of human intelligence, both journal editors and the academic press quickly perk up their ears at any hint that the Flynn effect might be ending or reversing. If twenty studies are offered indicating that the Flynn effect is continuing, and just one study is offered suggesting that the Flynn effect has ended, guess which one is going to get published, and guess which one is going to make the news. I believe we are in the middle of a scholarly fad, the fad of the Flynn effect's imminent demise, but since there is no logical reason and no historical basis to believe that the Flynn effect is temporary, I am convinced this fad will soon run its unfortunate course. I have no difficulty making the following claim: the Flynn effect is a fundamental and enduring component of human intelligence, has been with humanity ever since the turn towards behavioral modernity, and barring unusual circumstances (such as civilization collapse), the Flynn effect will continue to be with humanity into the foreseeable future. The Flynn effect is not temporary.

If I might be allowed to pause the discussion for a moment, I would like to make the suggestion that the confusion surrounding the Flynn effect's permanence or transience is actually a result of the confusion surrounding general intelligence ability and measurable intelligence. As has been suggested already within this essay, and as will be discussed in some detail later on, there is very good reason to make the assumption that general intelligence ability is a stable component of human intelligence, and that it exists at nearly the same levels today as it did during the time of the human behavioral turn. Therefore, when researchers speak of intelligence being stable over time, it is likely of general intelligence ability that they are thinking, along with its established connection to genetics and to the human brain. I have no actual argument with this point of view, as long as it remains specific, as long as it remains restricted to the domain of general intelligence ability. But general intelligence ability is not the same thing as measurable intelligence, and the Flynn effect is not an outcome of general intelligence ability, it is an outcome of measurable intelligence. The mismatch between these two concepts, between general intelligence ability and measurable intelligence, this is what is producing the "paradox" of Gottfredson's statement, this is the "something fundamental" that researchers have yet to learn about intelligence and current measures of it.

The second telltale sign that the thinking surrounding the Flynn effect is being heavily influenced by the standard description of human intelligence is that every suggested explanation is offered as a solution that impacts the human brain. In the standard description, brain effectiveness is everything—any increase in an intelligence measure is assumed *ipso facto* to translate to a corresponding increase in brain efficiency and brain effectiveness (Langer et al., 2012). For some of the suggested Flynn effect solutions, this connection is obvious—greater hybrid vigor and better nutrition, for instance, these are chosen for their presumed organic consequence upon neurons, synapses and biochemical activity. In other instances, the impact might be described as being a little more indirect—expanded education and increased exposure to video games and graphical puzzles, for instance, here one might point to an augmentation in the brain's stored knowledge or to a vigorous exercising of the brain's working memory or something of the like. But direct or indirect, if you dig deeply enough into any of the offered Flynn effect explanations, what you will ultimately find is an insistence that the explanation results in an increase to the brain's effectiveness, the only way within the standard description that intelligence can be enhanced (Marsman et al., 2017).

But this approach creates a logical conflict—a conflict with general intelligence ability. General intelligence ability, believed to be the product of many different genes and understood as being hosted across a multitude of neural regions, already addresses the notion of general brain effectiveness (Colom et al., 2006; Haier et al., 2004). So when an *additional* boost to brain effectiveness is proposed, the question naturally arises, does this additional boost to brain effectiveness also impact general intelligence ability? The prevailing evidence would appear to say that the answer to this question is no, that the Flynn effect does not represent an increase to general intelligence ability (te Nijenhuis & van der Flier, 2013). But then biologically speaking, how does the proposed additional boost accomplish such a selective feat, increasing the brain's effectiveness overall but not impacting those many brain structures involved with general intelligence ability? Take better nutrition, as an example. How does better nutrition impact the neurons, synapses and biochemical activity that lead to the increase in intelligence corresponding to the Flynn effect, while at the same time somehow managing to avoid all those brain features implicated in general intelligence ability? It sounds too organically magical. The alternative of course is to assume that the Flynn effect does represent an increase in general intelligence ability, but for this there is no actual evidence and there is no other reason to support the conclusion. No matter which way one turns, any suggested additional increase to brain effectiveness inevitably creates a double-edged sword with general intelligence ability.

To help untangle this confusion, let us recall the three scenarios that describe the uneven relationship between general intelligence ability and measurable intelligence:

- Sometimes, when measurable intelligence increases [decreases], so does general intelligence ability, and vice versa (typical testing scenario).
- Sometimes, when general intelligence ability remains constant, measurable intelligence increases (the Flynn effect).
- Sometimes, when general intelligence ability is positive, measurable intelligence can be zero (early humans and wild animals).

If we wish to describe mathematically the relationship between general intelligence ability and measurable intelligence, the three scenarios above will rule out certain combinations. For instance, the following expression of equivalency cannot possibly be true:

measurable intelligence = general intelligence ability

This equation would work well for the first scenario, since within it general intelligence ability and measurable intelligence move up and down in tandem. But the equation cannot be made to fit either the second or the third scenario, including of course the scenario of the Flynn effect.

But with a slight adjustment, we can arrive at something that is a little more promising. Consider, for example, the following equation:

measurable intelligence = general intelligence ability x ___________

The blank represents a yet-to-be-named factor, one that can mediate the relationship between general intelligence ability and measurable intelligence. And if that unnamed factor is assumed to be independent of (orthogonal to) general intelligence ability, then all three scenarios can be easily accommodated:

- When the unnamed factor is constant, general intelligence ability and measurable intelligence will move up and down in tandem, covering the first scenario.
- When general intelligence ability is constant, measurable intelligence will move in tandem with the unnamed factor, and in particular, if the unnamed factor increases over time, measurable intelligence will also increase over time, the scenario of the Flynn effect.
- When the unnamed factor is zero, measurable intelligence will be zero as well, including those instances when general intelligence ability is positive, the presumed scenario of early humans and wild animals.

The requirement of independence between general intelligence ability and the as-yet-to-be-named factor is important. Without independence, the interaction between general intelligence ability and the unnamed factor would create a strong second-order effect, destroying all the mathematical simplicity that the equation contains and conflicting with both the reasoning and the evidence that suggests general intelligence ability remains stable over time. But this requirement of independence also rules out every suggested solution that has ever been made for explaining the Flynn effect. Greater hybrid vigor, better nutrition, expanded education, etc.—all these choices can be ruled out as candidates for the unnamed factor, because all these choices have been put forth as boosts to brain effectiveness, and you cannot boost brain effectiveness and at the same time remain independent of general intelligence ability. The standard description of human intelligence is actually getting in the way, forcing researchers into solutions that necessarily encompass the human brain, when what is actually needed is a solution that does not touch the brain at all. The unnamed factor, whatever it happens to be, should have no influence on neural operations, allowing general intelligence ability to continue all its functioning undisturbed.

Therefore, what we are seeking, using the Flynn effect as our primary guide, is an influence on human intelligence that increases over time, is not temporary, and does not impact the operations of the human brain. What we are seeking will turn out to be the key ingredient to a reconceptualization of human intelligence.

Artificial Construction and the Content of Intelligence Tests

There are two main indicators of the identity of the factor connecting general intelligence ability to measurable intelligence. The first indicator is the material description of human history, beginning with the circumstances of the crossover to human behavioral modernity, and continuing across the entire range of tangible alteration that has brought humanity to the circumstances of the modern world today. The second indicator is the content of intelligence tests.

Prior to their turn towards behavioral modernity, humans were living the lives of pure animals, which is to say they were living in an entirely natural setting and were experiencing only those perceptions and behaviors critical to survival and procreation (Klein, 2009). There was essentially nothing artificial or constructed within these ancient human surroundings, the same as can be witnessed in the lived environment of wild animals today. And as has been noted, there would have been no intelligence exam simple enough to be constructed for or administered to these early humans, indicating a zero level of measurable intelligence for that entire population. Indeed, if one were trying to predict the success or failure in life circumstances of these early humans, an intelligence exam would have been of no help at all. All that mattered to these early humans was their survival-and-procreative ability, and thus, to predict their life outcomes one would have needed to have measured for their strength, speed, fertility, sense acuity, attractiveness, and so on, qualities that of course do not make an appearance on modern intelligence exams. For these early humans, intelligence meant nothing at all—everything hinged entirely upon the immediate and natural needs of survival and procreation, the same as has been true of wild animals throughout the many years, and the same as is true of wild animals today.

The crossover from those ancient circumstances to the beginnings of human behavioral modernity was a pivotal event (Christian, 2018), one that had not been experienced by any other species upon this planet, and one that would mark the start of human intelligence. Many scientists are wont to explain this event with biological causes, such as the presumed emergence of a language gene, or perhaps through an impactful alteration in neural structure (Bradshaw, 2002; Graham & Fisher, 2013). Unfortunately, such explanations remain almost entirely unspecified—no language gene has ever been successfully identified, and no concrete alteration in neural structure has ever been explicitly depicted. Furthermore, no plausible description has ever been offered as to how these proposed biological changes could have managed to spread so quickly to essentially one hundred percent of the human population. Once again, these biological explanations begin to sound too organically magical. What I prefer is an explanation that is not biological at all, and I prefer it because it possesses a multitude of specific evidence, evidence existing right there before our very eyes.

What has never been in dispute about that initial crossover to human behavioral modernity is that it was accompanied by a dramatic and tangible change to the circumstances of the human surroundings (Henshilwood & Marean, 2003; Klein, 2002; Sterelny, 2011). Within a lived environment that had been previously entirely natural, there now began to appear many features of a much different kind: fire pits, animal skin clothing, structured tools and weapons, ornamental jewelry, cave paintings, etc. None of these new features were natural, and none of these new features had anything in common with the circumstances of the other creatures of the animal kingdom. These were the first examples of something *artificial* appearing within the human surroundings, and these were the first instances of the human environment becoming *constructed*. It is not possible to overstate the importance of this occasion, this event was truly momentous. Artificial construction—the palpable evidence of the turn towards behavioral modernity, and also the key ingredient to a reconceptualization of human intelligence—it had now arrived upon the human scene. And this was only its beginning.

The tale of modern human history is first and foremost a tale of accumulating and increasingly sophisticated artificial construction

(Christian, 2014). From the days of the Upper Paleolithic, with its introduction of bone tools, crafted weapons and carved intricacies, opening pathways to humanity's ever more widening range; to the days of an agrarian awakening, and its explosion of new artifacts into the human environment—huts, pottery wheels, irrigation trenches, chisels, burial tombs; to the days of the great civilizations, and their remarkable recasting of entire landscapes—aqueducts, monuments, roads, carts, ships and more; to the days of the Scientific and Industrial Revolutions, and their dense cluttering of the now crowded human scene—cathedrals, factories, laboratories, tractors, houses arranged upon row after row after row; to the days of the early twenty-first century, in which nature has been almost entirely eclipsed from human view, eclipsed everywhere by automobiles, highways, towering skyscrapers, books, computers, televisions—the list goes on and on. From surroundings that were once entirely natural, humans now live in an ocean of constructed artificiality, its evidence exists literally every direction one looks. And if one were seeking for a human characteristic that could be relied upon to increase significantly, indeed exponentially, over a long period of time, one could do no better than to turn to the unrelenting and ubiquitous growth of artificial construction.

Plus it has been more than just the features themselves that have marked the human transformation, because artificial construction has also thoroughly altered almost every human perception and behavior (Rączaszek-Leonardi et al., 2019). Each new artifact changes something about what humans apprehend and do: clothing alters where humans live, controlled fire alters what humans eat, structured weapons alter what humans hunt, structured tools alter what humans build, and so on. The entirety of the human transformation rests upon this foundation of artificial construction, and if you do not believe me, then ask yourself what would happen if we were to remove every artificial feature that now exists within the human environment, and if we were to suppress every human behavior that owes its origin to those removed artifacts. Ask yourself, what would then remain? All that would then remain would be the purely natural environment in which humans once used to live, and all that would then remain would be the purely survival-and-procreative behaviors that humans once used to display. All that would then remain would be the pure animals that humans once used to be. Modern humanity is, above all else, a product of its artificial construction.

In the present world, the impact of artificial construction upon human lives has become so pervasive as to be almost overlooked. There are now very few instances of humans engaging in purely survival-and-procreative behaviors, but there are now countless instances of humans engaging in the unnatural behaviors that have been induced by a multitude of unnatural features: we drive because there are cars on the street, we read because there are books on the shelf, we shave because there are razors in the cabinet, etc. For humans, successfully navigating the modern world means successfully navigating an entire surrounding ocean of artificial construction, and those who master that ubiquitous world of artificial construction, they are the ones who do well, and those who do not master that ubiquitous world of artificial construction, they are the ones who do poorly. And what characteristic is it that determines how successful an individual can be in navigating and mastering all this artificial construction? We may not be accustomed to employing the word in just quite this fashion, but the successful navigation and mastery of the surrounding multitude of artificial construction is simply an alternative definition of the word *intelligence*.

In the previous section, it was suggested that the uneven relationship between general intelligence ability and measurable intelligence could be captured by the following equation:

measurable intelligence = general intelligence ability x ___________

To make this equation conform to the circumstances of human history, and to allow this equation to work with the known data regarding human performance on intelligence exams, including especially the Flynn effect, the blank needs to be filled in by the totality of artificial construction to be found within the human environment. Artificial construction is the feature that connects an individual's general intelligence ability to that individual's specific raw performance on an intelligence exam.

measurable intelligence = general intelligence ability x artificial construction

At any given moment in time and for a particular testing population, the amount of artificial construction to which that population has been exposed is going to be roughly the same (this is particularly true in today's world, where widespread travel and electronic communication exposes nearly every aspect of the artificial environment to nearly every member of the human population). If the amount of artificial construction is roughly the same for all the test-takers, then it can be seen by the equation above that their relative raw performance on intelligence exams is going to be determined solely by their relative levels of general intelligence ability—those with more general intelligence ability will absorb a greater amount of the artificial construction around them and will display more measurable intelligence, and those with less general intelligence ability will absorb a lesser amount of the artificial construction around them and will display less measurable intelligence, the typical testing scenario. But this only works at a given moment in time, because as time progresses the amount of artificial construction continues to grow, increasing its factored contribution to measurable intelligence. This is why earlier test-takers, such as those from the early twentieth century, end up displaying considerably less measurable intelligence than do later test-takers, such as those from the late twentieth century, even though each population possesses roughly the same average level of general intelligence ability. It is the changing amount of artificial construction to which these populations are exposed that accounts for their overall difference in measurable intelligence.

Before the turn towards behavioral modernity, there would have been no artificial construction to be found within the human environment, and although it could be surmised that humans possessed a positive level of general intelligence ability during that time, since there was no artificial construction against which to apply (to multiply, via the equation) this ability, the result would have been a zero level of measurable intelligence. After the turn towards behavioral modernity, with its budding appearance of artificial construction, humans would have then had features to apply (to multiply) their general intelligence ability against, resulting in a beginning level of measurable intelligence. And as human history has progressed, from the days of the hunters-gatherers through the days of the early twenty-first century, the amount of artificial construction contained within the human environment has continued to increase in both size and complexity over all that period of time. And assuming that general intelligence ability has remained fairly stable within the population, this continuous increase in artificial construction will have produced a corresponding increase in measurable intelligence, the precise description of the Flynn effect. Note that this process would have been entirely observable throughout the twentieth century, a century in which artificial construction was increasing by leaps and bounds—automobiles, airplanes, electronic communication, sprawling cities, computers, etc.—and a century in which the raw scores on intelligence tests were also increasing by leaps and bounds. Even though general intelligence ability remains stable within the human population, the increase in artificial construction drives a corresponding increase in measurable intelligence, meaning that the changing amount of artificial construction contained within the human environment is the sole driver and the sole explanation of the Flynn effect.

This analysis also buttresses the claim that there is no reason to expect that the Flynn effect is ending or reversing. In the twenty-first century, the amount and complexity of artificial construction contained within the human environment continues to grow at a significant pace, just as it has during all the previous centuries (Nijs, 2015). Future generations, if they are going to be successful in their everyday lives, will be obliged to navigate and to master all this newly created artificial construction (as well as continue to navigate and to master all the previously created artificial construction). Through this accumulative process, future generations will display knowledge and skills that translate into higher levels of measurable intelligence, significantly surpassing the raw intelligence scores of all the previous generations. As long as the amount and complexity of artificial construction continues to grow within the human environment, the Flynn effect will not end.

The second indicator that artificial construction serves as the factor connecting general intelligence ability to measurable intelligence is the distinctive content of intelligence exams. There is a certain irony to the fact that a wide range of questions and challenges can serve as appropriate content for an IQ test—vocabulary queries, game puzzles, arithmetic, traffic sign recognition, sports trivia, etc.—all these items, and many more, can adequately serve the purpose of differentiating individual intelligence abilities. All these items conform to the positive manifold of human intelligence (Kovacs & Conway, 2016). This great variety of productive content for intelligence tests might lead one to think that just about *any* type of challenge could serve as a possible candidate for inclusion on an IQ exam, and indeed some intelligence researchers have made the leap to claiming that the content of intelligence tests does not matter much at all, that just about any collection of questions will do. But this is absolutely not the case.

There are entire categories of queries and challenges that have never made an appearance on an intelligence exam, and never will. One's capacity to beget children, for instance. One's digestive rate. One's forestalling of bacterial disease. One's running speed, lifting strength, throwing accuracy, etc. These are all important human attributes, they could make a difference in the quality and success of a person's life, and yet they remain entirely out-of-bounds for an intelligence exam. But why is this the case? One could point to the likelihood that performance on such challenges will not correlate to performance on items that traditionally appear on intelligence tests, but this is simply confirming a conclusion we already knew. The developers of the very first intelligence tests *understood* which types of challenges needed to be included, and which types of challenges needed to be excluded, and this was before they had done any psychometric analysis at all. We intuitively recognize that there is something about these alternative queries and challenges that is fundamentally incompatible with the types of queries and challenges that do show up on intelligence tests. We have just never bothered to make the distinction clear.

What should come to mind of course is that these alternative queries and challenges—such as digestive rate, running speed, etc.—these are derived exclusively from the *natural* characteristics of human beings, their origins are owed to the evolutionary and organic underpinnings of the species. As such, these qualities could have been tested and measured even *before* the turn towards human behavioral modernity; these characteristics are intimately connected to the species' long biological quest for survival and procreation. Anything which is natural, physical, biological, organic, it does not belong on an intelligence exam. And indeed, if you inspect every single question on every existing intelligence test, you will not find the slightest hint of anything natural, physical, biological, organic.

So what then remains? What type of query or challenge *is* acceptable for inclusion on an intelligence exam? If everything natural, physical, biological, organic needs to be excluded from an intelligence test, then all that then remains is that which is artificial and constructed. The content of every single intelligence test is content that is exclusively derived from artificial construction. Words, digits, matrices, arithmetic, grammar, logic, geometric patterns, analogies, codes, connections, pictures, blocks, symbols, etc. Inspect every single question on every existing intelligence test, and all you will ever find are examples of artificial construction. All you will ever see are features that were synthetically introduced into the human species sometime *after* the turn towards behavioral modernity.

What this implies is that an intelligence test serves as a proxy. It serves as a proxy for the artificial construction that humans must navigate and master in their everyday lives. The same structure that underlies the multitude of artificial features that can be found in the modern world—structure identified by such concepts as grammar, logic, mathematics, etc.—that very same structure is recast into the form of artificial challenges and questions, providing the means for making a measurable and comparable assessment. Those individuals who can successfully navigate and master the artificial construction contained on an intelligence test are the same individuals who can successfully navigate and master the artificial construction ubiquitously contained in the human environment, making the correlation of IQ exam performance to general life circumstances little more than a tautology. The key is artificial construction—it serves as the linchpin between intelligence tests and the experienced world.

A major consequence of this realization that intelligence tests serve as a proxy for the artificial construction contained within the surrounding human environment is that intelligence tests cannot remain static over time. The amount and complexity of artificial construction contained within the surrounding environment is continuously increasing, and so to remain effective and valid as proxies, intelligence tests must be constantly reconstructed to contain greater variety and greater intricacy as time goes on. This is not news to the IQ test developers of the past century (Berger, 1986), and it will not be news to the IQ test developers of the coming century—intelligence tests have been, and will be, frequently modified, with the trend always being towards greater variety of content and greater difficulty. Think of all the additional artificial complexity that humans must now confront in their present world—greater demands to multitask, constant requirements to program "smart" machines, novel needs to decipher emojis and other addendums that have come with the widespread use of electronic communication, etc. If corresponding challenges are not added to the IQ tests, then the tests will eventually stop behaving as adequate proxies for the surrounding environment, and they will begin to fail in their purpose of differentiating individual intelligence abilities. This necessary fluidity to intelligence exam content is also made clear from the course of human history: a test such as Stanford-Binet or Wechsler would have completely overwhelmed, for instance, an ancient agrarian population, but a test appropriate for that ancient agrarian population would turn out to be too simplistic for the average twenty-first century human. The content of intelligence tests must *correspond* to the type of artificial construction contained within a testing population's lived environment, and because the amount and complexity of this artificial construction continues to increase over time, the sophistication of intelligence tests must be continuously boosted as well, just one more piece of evidence cementing artificial construction's role in the driving of the Flynn effect.

Finally, it should be noted that this emphasis on artificial construction provides an effective answer to Edwin Boring's warning about intelligence being too self-referencing. The developers of the very first intelligence tests were relying upon their intuition (Terman, 1916), looking to such terms as *mental*, *reasoning*, *cognition*, etc. to help guide them in their choice of questions and challenges, not quite recognizing that all these terms (just like the term *intelligence*) are intricately linked to the concept of artificial construction. But once those first tests had been developed, and once the positive manifold of human intelligence had been recognized, the future course was then set for all further test questions, via the correlation of their underlying connection to artificial construction. Without recognizing this role that artificial construction is playing in the process, intelligence exam development and psychometric analysis will indeed seem to be too self-referencing, but in truth the process is actually well grounded. It is grounded in the everyday lives and in the everyday endeavors of modern humans, grounded in their continuous interaction with an entire surrounding ocean of artificiality. When intelligence gets recognized and defined as the ability to navigate and to master artificial construction, intelligence stops being self-referencing.

Augmenting and Overturning the Standard Description of Human Intelligence

The standard description of human intelligence is not entirely wrong. Its popularity derives from its extremely successful depiction of general intelligence ability, a depiction that has been built upon more than one hundred years of detailed study regarding relative performance on human intelligence exams. In the equation **measurable intelligence = general intelligence ability x artificial construction**, general intelligence ability is one of the two critical components in the determination of measurable intelligence, and of these two components, it is the one that has been the most analyzed and the best understood. General intelligence ability explains individual intelligence differences; general intelligence ability predicts academic success, job performance, and an assortment of important life circumstances; general intelligence ability is expressed via neural characteristics; and general intelligence ability is determined primarily by genetic background. There is no doubting the validity and the importance of these many informative findings, and therefore, there is also no doubting the essential role that general intelligence ability plays in a thorough understanding of human intelligence behavior (Gottfredson, 1998).

The problem with the standard description, its fatal flaw, is that it places the *entire* burden of explaining intelligence on general intelligence ability alone, alongside its corresponding neural and genetic foundations. As alluring as this has been, it cannot be made to work. As we have already observed, the standard description's most glaring deficiency is its complete inability to account for the Flynn effect, an inability that becomes painfully obvious once it is recognized that the Flynn effect is not a product of general intelligence ability at all. This then has led to the bizarre hope within the intelligence research community, still desirous of maintaining the sanctity of its standard description, that the Flynn effect will prove to be little more than a temporary and unimportant phenomenon, a hope that has no logical, scientific or historical basis.

But more than just its inability to explain the Flynn effect, the standard description suffers from an obvious difficulty that arises from its emphasis on intelligence being strictly a biological and brain-produced phenomenon. What this emphasis does is it forces an attribution of functionality onto the human brain that does not align with the primary task of neural systems. Neural systems within animal species have been well studied and are generally well understood, being most commonly and most accurately portrayed as stimulus-response mechanisms (Simmons & Young, 2010). These mechanisms have been in place for hundreds of millions of years and they have been evolutionarily honed to support basic survival-and-procreative demands. The human neural system is of course no different. Although very few humans today are raised and trained to live a predominantly survival-and-procreative existence, that biological capacity still remains. And therefore, if one wishes to discuss human neurons supporting stimulus-response behavior, then one would find oneself on very solid biological and evolutionary ground. But if on the other hand, one wishes to discuss human neurons producing and hosting intelligence, then one has now stepped into the realm of the biologically and evolutionarily extraordinary.

As the standard description of intelligence would appear to have it, around a couple hundred thousand years ago, the human brain, until then simply a component of a typical stimulus-response mechanism, began to take on the *additional* role of producing and hosting intelligence. Abstract language, calculation, pattern recognition, logic, etc.—all these characteristics that are commonly associated to intelligence, characteristics that had not been seen before within the entire animal kingdom, they somehow began to emerge as tangible and special features somewhere inside the hominin brain. It is these very same cerebral features that are the target of today's sophisticated neuroimaging studies, and it is these very same cerebral features that are depicted as being the palpable source of human intelligence (Jung & Haier, 2007).

But there are a myriad of troubling questions that arise from this widely held view. To begin with, how is it that these extraordinary cerebral features became so quickly and so thoroughly suffused throughout the entire human population? This question is made all the more challenging by the fact that intelligence is not associated to just a single neural characteristic, nor is it the consequence of a specific genetic cause—many neural regions and many genetic markers have been implicated in the expression of human intelligence ability (Basten et al., 2015; Plomin &

von Stumm, 2018). So did all these regions and all these markers emerge within the population suddenly and together? Or perhaps instead, were most of them already fortuitously in place, just waiting for some final piece of the evolutionary puzzle to happen along? Either way, it begins to sound a bit convenient. Another troubling question is how does one account for the progression of intelligence? If during the days of the hunter-gatherers and the early agrarians, the human brain already contained the neural features necessary for the production of intelligence, then why was there no appearance during that time of algebra, calculus, formal logic, scientific method, polyphonic music, literature, and so on? If the brain was physically capable of such feats, and if the brain is supposedly the *source* of such feats, then why would there need to be any delay? For that matter, if there are going to be *future* intelligence advances—say, an important scientific understanding or an innovative computational technique—then why does the current brain not pop out that information right now, what could it possibly be waiting for? Perhaps you will say that the brain's journey towards intelligence is not altogether complete, that the brain is always in the process of becoming more effective generation after generation, that its capacity has been, and still is, organically advancing over time. But this then would require a biological explanation, would it not, a plausible mechanism to describe how such a generational and population-wide improvement is supposed to work, or are we again going to resort to some organic magic?

All of these concerns can be quickly dispelled by removing the insistence that human intelligence be regarded as strictly a biological, brain-produced phenomenon, and by giving instead equal weight to the influence that the totality of artificial construction has had upon the development and support of human intelligence. That is what is being conveyed by the equation **measurable intelligence = general intelligence ability x artificial construction**. Intelligence is not strictly a biological concept, nor is it strictly a non-biological concept. Measurable human intelligence is most accurately and most thoroughly portrayed as the orthogonal interaction of both biology and artifact, as the orthogonal interplay of general intelligence ability and the totality of artificial construction.

The key to understanding the workings behind this alternative description of human intelligence is to recognize that intelligence is not being housed somewhere inside the human skull. Instead, logic, reasoning, number, composition, calculation, rationality, grammar, etc., all these concepts commonly associated to human intelligence, they have a far more plausible and far more observable home right there in the structural features of the surrounding artificial environment, and there is no need to duplicate these features somewhere inside the human head. The tangible form of human intelligence exists literally all around us, and no neural depiction of intelligence can possibly be as elucidative as what we witness with our very own eyes. What neural instance of abstract language is going to be more informative than an actual conversation or the pages of a written book? What cerebral example of calculation is going to be more instructive than a performed integration? What cognitive bit of geometry is going to be more enlightening than a towering skyscraper? And what synaptic path of logic is going to be more compelling than a highway system, a legal brief, or a proof sketched out upon the chalkboard? Human intelligence first appeared in the form of the species' very first artifact, and human intelligence has continued to progress with the accruing size and connected complexity of the world's synthetic structure. Everything that needs to be understood about the material nature of human intelligence can be observed directly within the artificial environment, and to go seeking for that information somewhere inside neurons, synapses and biochemical activity would be to engage in nothing more than a redundant folly. Corporeally speaking, artificial construction *is* human intelligence.

The role of the human brain in this alternative description of human intelligence is to *respond* to the *stimulus* of artificial construction, and in that sense, the human brain continues in its age-old purpose, as a stimulus-response mechanism. The stimulus has of course changed greatly from former hominin times, and therefore so has the response, but the neural mechanism remains essentially the same. Instead of perceiving predators, prey and sexual targets, today's human brain spends far more time discerning traffic, restaurants and the latest fashion. Instead of responding vigorously to rivals, terrain and impending droughts, today's human brain reacts more robustly to computers, a building's layout and the evening news. Natural stimuli and organic responses produce what we call survival-and-procreative or biological behaviors, and artificial stimuli and constructed responses produce what we commonly call intelligence behaviors, but despite the differing labels, the supporting apparatus remains much the same. It could be surmised that if today's neuroscientists could be sent back in time a couple hundred thousand years, and could hook up their neuroimaging equipment to the human brains then engaged in purely survival-and-procreative activities, the neural patterns observed would be quite similar to what is witnessed in test subjects today, test subjects engaged in intelligence activities.

Therefore, it is dubious to speak of such things as cognitive modules within the human brain (Coltheart, 1999; Hilger et al., 2017). Instead of a language module, what there actually is is a language artifact within the artificial environment—a gesture, an uttered sound, a mark upon the page—and when the human brain perceives that artifact and responds meaningfully and productively to it, it produces what we call intelligent language behavior. Instead of a calculation module, what there actually is is a numerical or geometric artifact within the artificial environment—a grouping, a triangle, an algorithmic recipe—and when the human brain encounters that artifact and responds meaningfully and productively to it, it produces what we call intelligent mathematical behavior. Instead of a logic module, what there actually is is a formal artifact within the artificial environment—a key, a rule, an outlined argument—and when the human brain engages with that artifact and responds meaningfully and productively to it, it produces what we call reasoned intelligence behavior. Some human brains are more effective at *perceiving* the stimulus of artificial construction, some human brains are more effective at *responding* to that artificial construction, and some human brains are more effective at both, giving rise to individual intelligence differences and the concept of general intelligence ability. But no human brain has undergone a biologically radical or evolutionarily extraordinary alteration from its structure and operations of former hominin times. The dynamics of human intelligence are being driven almost entirely by the changing features of the surrounding artificial environment, and it is only because of this accumulating artificial stimulus that the human brain can now so frequently produce an entirely different kind of response—produce what we call an intelligence response.

The most prominent consequence that arises from this alternative description of human intelligence is that it provides for an elegant and extremely straightforward explanation of the Flynn effect. The overall increase in raw performance on human intelligence exams—observed directly ever since intelligence tests were invented, and demonstrated indirectly from the progressive course of human history—this increase can be characterized as being driven by the accruing amount and growing complexity of artificial construction contained within the human environment, with no need to posit any biological alteration at all. This allows general intelligence ability to continue all its functioning undisturbed and to continue to be regarded as a stable component of human intelligence, likely to be found at similar levels today within the human population as it would have been during the time of the turn towards behavioral modernity, exactly as might be anticipated for a characteristic determined primarily by neural and genetic factors. And yet despite this biological stability, measurable human intelligence can still grow indefinitely and without restriction, because measurable human intelligence is determined by more than just its neural influence. Due to the orthogonal impact of artificial construction, measurable human intelligence can grow as swiftly as the structural features of the surrounding environment allow, structural features not hindered by any biological limitations.

Genius

One manifestation of the misunderstandings that can arise from the standard description of human intelligence is the popular misconception surrounding the topic known as *genius*. In common parlance, genius is typically equated to the highest levels of IQ. For instance, famous historical figures such as Mozart, Newton and Einstein are frequently proclaimed to have possessed IQs surpassing the 150 level, even reaching well into the 200s. These assertions are of course specious—intelligence tests had not yet been invented during the days of Newton and Mozart, and there is no evidence Einstein ever took an intelligence test. The actual IQ of almost every known historical genius remains entirely unknown. And yet the reason these claims can be so widely promulgated and at the same time so broadly accepted is that there would appear to be no grounds for assuming otherwise. After all, genius *means* the highest levels of intelligence, does it not, and so once genius has been recognized, it would seem the prodigious IQ must of necessity follow. In the standard description of human intelligence, intelligence *is* IQ, intelligence *is* general intelligence ability, intelligence *is* brain effectiveness, and so genius has no other role than to occupy the far end of this one-factor scale.

And it is not just in common parlance that these notions regarding genius have taken such a firm hold, they can be frequently seen also within the intelligence research literature. Here is one telling quote from *The Science of Human Intelligence*:

> In the longer term, if we learn how to tinker with brain mechanisms to increase reasoning ability, we might enter a new phase of personal achievement and societal well-being. Such knowledge might even create more geniuses on the level of Einstein, Newton, Cervantes, or Da Vinci (Haier et al., 2023).

Another example of how higher levels of intelligence are equated to the concept of genius comes from the domain of artificial intelligence research, where one prominent figure from the field has recently boasted that advances in artificial intelligence will soon create a "country of geniuses in a datacenter" (Amodei, 2024). It seems that every direction one turns, the concept of genius has been decisively determined: genius is achieved solely and necessarily by possessing the highest levels of intelligence.

But if you find yourself actually believing such notions regarding the concept of genius, I would ask you to take a careful look at the twentieth century. The twentieth century was notable for having produced a substantial list of recognized geniuses: Einstein, de Broglie, Heisenberg, Stravinsky, Picasso, Joyce, Wittgenstein, Turing—a list likely not altogether complete. The twentieth century was also notable for having produced a substantial and observed Flynn effect, with the overall level of human intelligence increasing sizably from the beginning of that century through its end. Therefore, we have a century in which genius was initially flourishing, and we also have a century in which the population-wide level of intelligence was increasing significantly, and so if you believe in the equivalency between genius and the highest levels of human intelligence, then the only logical conclusion would be to say that by the year 2000, there must have been a genius standing on just about every street corner, you could not have walked more than fifty feet without bumping into another one. But the reality of course turned out to be just the opposite. Nearly all the genius of the twentieth century was *front loaded*, it occurred almost exclusively within the century's early decades, at a time when intelligence was at its relative ebb. Since then, there has been almost nothing—I personally cannot think of a single individual from the last fifty to seventy-five years whom I would deem worthy of inclusion alongside that list of names from above. As the twentieth century progressed, and as the overall level of human intelligence advanced to ever more impressive heights, genius went from being relatively abundant to being essentially disappeared. Do we really want to stick with the notion that genius is the same thing as the highest levels of intelligence?

Or try this experiment on for size (this is an experiment that can actually be performed, by the way, so I would encourage all the academicians to apply for a grant): give a standard intelligence test to a very large portion of the human population, then gather up the top one hundred scores. Put those extremely high IQ people into a room for a week and then encourage them, singularly or together, to develop as many ingenious ideas and constructs as they can. At the week's end, just open the door and allow all that ingenuity to flow out into the hallway, being careful not to let any of the more brilliant insights escape.

Does anyone actually think that such an experiment would prove to be productive in any way? I know what I would predict—I would predict that those efforts would amount to absolutely nothing in the way of genius, that the only insight emanating from that room of extremely high IQ people would be the deafening sound of silence. Genius is not the same thing as high IQ, not even close. The entire thought is conceptually wrong. What genius actually is is the solution to how human intelligence grows. And since human intelligence is composed fundamentally of the artificial construction contained within the human environment, genius can also be described as the characteristic that ignites the accumulation and advancement of the world's synthetic structure. Genius is the spark that fires the Flynn effect, and it does not require an extraordinary amount of intelligence to do its work. What it does require is an extraordinary amount of atypicality.

As humans swim in their current ocean of artificial construction, a question that might enter their thoughts is how have all these artifacts come to be? The biological world passed hundreds of millions of years without producing one constructed invention, and hominins themselves went for many millions of years without manufacturing a single thing (Klein, 2009). What prompted the first fire pit? How and why were structured tools and weapons originally crafted? What could have possibly driven an individual to draw a representational picture upon a cave wall? What launches the assembled abundance of a modern city? As it happens, growth in artificial construction can be accomplished in a variety of ways, some of which are quite common and rather mundane, not resembling very much at all the characteristics of genius. For instance, there is copying and adjusting. Whereas the very first automobile was quite the revolutionary achievement—adding a significant amount of novel and influential structure into its surrounding environment—every other automobile that then followed would have been essentially a replication of, or a variation upon, that very first template. The majority of the artificial construction that enters the human world does so through these means of replication and improvement—these are the time-honored and widely practiced techniques that allow the content of human intelligence to spread universally, they are the techniques that permit the Flynn effect to become impactful population wide.

But activities such as copying and adjusting can only go so far. For instance, these activities cannot produce the original construct, and eventually they will reach a point of saturation, where further copying and adjusting produces only diminishing returns. To *initiate* artificial construction and to continue to expand its variety and depth, novel instances of structure must be periodically inserted into the surrounding environment—richer patterns, more fruitful forms, additional scintillating symmetries. What is required for this innovative advancement of artificial construction, and for the subsequent expansion of human intelligence, is not a perception and reproduction of the world's synthetic structure *as it currently is*, but instead a perception and introduction of the world's synthetic structure *as it soon will be*. Not a *typical* understanding of the current human surroundings, but instead an *atypical* vision of the ambient state of affairs—a coming revolution, an impending paradigm shift, an iconoclastic act of genius.

The quintessential example of these operations would be Isaac Newton's introduction of the laws of motion and gravity, followed by the resulting explosion of artificial construction produced during the era of the Industrial Revolution (Jacob & Stewart, 2004). Newton's distinctive act was to insert into his surrounding environment (insert quite *literally*, for instance via the original pages of the *Principia*) the novel structure contained inside his formulaic laws. But beyond this igniting act, Newton himself did little to add to the artificial construction of the surrounding world: Newton built no steam engines, no airplanes, no rocket ships, he did not expand the mathematics of his calculus nor oversee a multitude of physics labs. These furthering and constructive activities, various forms of copying, adjusting and improving, all traceable back to Newton's original conceptions, were carried out by countless other individuals, indeed by nearly the entire human population. The twofold advantage to this mass reproduction of Newton's original structure was that it tangibly spread that structure all around the planet, and it also encouraged a multitude of individuals to engage with that structure personally and directly. Very few people learn to master Newton's laws by reading the pages of the *Principia*. Most people learn to master Newton's laws by interacting with the artifacts of the modern world. Acceleration, momentum, force, energy, differentiation, etc., these concepts are *embodied* in the many constructions of the modern human environment, and by engaging with and navigating these constructions, the human population achieves a degree of mastery comparable to that of Newton at the moment of his conception.

Copying, adjusting, improving, navigating, mastering—these are the *typical* activities of engagement with the structural features of the surrounding world, they are the artifact-inspired behaviors that remain open to nearly all, and we measure the strength of an individual's ability to engage in these typical activities by formulating intelligence tests out of those very same structural features. But these *typical* activities, important as they are, would be entirely inconceivable without a preceding *atypical* event. Without the initial introduction of an unforeseen instance of novel environmental structure, every resulting structural consequence would have no opportunity to be—no copying, no adjusting, no improving, no navigating, no mastering, no anything. That initiating event, that seemingly out-of-nothing insertion of a new and momentous artificial feature into the human environment, this is an activity that is not open to all, it is in fact a behavior that is exceedingly rare. So extraordinarily exceptional, and at the same time so consequentially productive, have been these atypical events throughout the course of human history that humans have felt compelled to celebrate that original moment (celebrate it often very much in retrospect), celebrate it for what it has proven to be—revolutionary, atypical, ingenious.

Ironically, the requirement of atypicality means that an extremely intelligent individual would actually be a very poor candidate for producing genius. An extremely intelligent individual, one who possesses the highest of IQs, is demonstrating an extraordinary ability to navigate and to master the artificial structure contained within the surrounding environment *as it currently exists*. This would be reflected through the contents of the intelligence exam itself, which can only be composed out of questions containing structural features that are already widely recognized and well known, because no test developer would ever be able to formulate a question out of structural features that have yet to be invented. But this superior ability to navigate and to master the world's artificial structure as it currently exists would serve as a hindrance to seeing that world in a much different light. A high IQ individual has already mastered the world's surrounding structure, and would have little motivation to consider radically changing it.

Therefore, I suspect there are very few, and perhaps no, historical geniuses who have possessed an extremely high IQ. Yes, these individuals would have possessed a decent amount of general intelligence ability—enough to understand the details of their relevant problem domain—but beyond that, more intelligence would have only had the tendency to get in the way. If Beethoven had been *more* intelligent, then perhaps he could have done a more reliable job of mimicking Haydn and Mozart. If Einstein had been *more* intelligent, then perhaps he could have been more effective at confirming Newton and Maxwell. Geniuses are not known for their ability to navigate and to master conventional wisdom and established paradigms—Newton and Einstein, for instance, were rather mediocre students. What geniuses are known for are their atypical characteristics—taciturn, irascible, isolated, iconoclastic—characteristics that give evidence of the genius's unusual mode of perception (Snyder, 2004). Geniuses have not *mastered* their surrounding environment so much as they have *chafed* against it, and it is out of their resulting irritation that the most consequential instances of innovative structure have been introduced into the human world.

Although not entirely essential to the discussion here, I have suggested elsewhere that autism is the the key to a deeper understanding of the atypical characteristics associated with genius (Griswold, 2024b). Autism has been traditionally researched and described as a medical condition, but fifty plus years of failed efforts along those lines have put that conjecture into doubt (Myers et al., 2020; Parellada et al., 2023; Whitehouse et al., 2021). A more effective approach to describing autism would be to focus on the concept of conspecific perception, the inherent biological tendency for an organism to perceive first and foremost the other members of its own species, a characteristic essential for holding a species together and for providing its newborn members with a sensory grounding. Autistic individuals can be characterized as experiencing a significant lack of conspecific perception, causing them to be less attached to the other members of their own species, and also causing them to be less able to achieve a sensory grounding by the usual species-focused means. Needing a sensory grounding to overcome their potential sensory chaos, most autistic individuals begin to perceptually focus on those environmental features that contain inherent form—patterns, repetitions, symmetries, etc. These structure-focused perceptions are evidenced in autistic individuals' unusual interests and behaviors—fascination with geometric objects, insistence on repetitive routines, migration towards technical disciplines, etc.—interests and behaviors targeted almost always towards ambient structure. This inherent fascination with environmental form is what ties autism to the concept of artificial construction, and it is my contention that the natural autistic proclivity towards surrounding structure, and also the natural autistic proclivity towards atypicality, is what drives the idiosyncratic perceptions that underlie the innovative and synthetic constructions of genius.

But whether or not one chooses to entertain this connection between autism and genius, the one lesson from this section that cannot be held in dispute is that the brain-specific standard description of human intelligence is inadequate for describing and explaining genius. All that the standard description can offer is the default conviction that genius must be the consequence of the highest levels of intelligence, a conjecture that is demonstrably and observably false. Just as was the case with the Flynn effect, a deeper understanding of human intelligence is necessary for describing and explaining genius—brain effectiveness by itself is not sufficient. By incorporating the impact of artificial construction into a more complete understanding of human intelligence, and by recognizing that novel growth in artificial construction is the ultimate source of the Flynn effect, one sheds meaningful light on the role that genius plays. Not a high IQ, but instead an atypical perception for the surrounding environment, that is what prompts genius to add innovative structural features into the human environment, thereby opening a pathway for those features to be copied and spread, raising the amount and complexity of artificial construction everywhere, and raising the level of measurable intelligence for the entire population.

Conclusion

What makes the study of human intelligence a *scientific* pursuit is that human intelligence can be measured. The instrument for making these measurements is an intelligence test, of which many examples exist, Stanford-Binet and Wechsler being two of the more commonly known and widely used. But there is an irony and a bit of a mystery currently accompanying these tests. Although researchers have been successfully employing intelligence tests for more than a century now, they still do not understand the nature of the entity that is being measured. That is, they do not yet know what is being indicated by the calibrated raw scores on intelligence exams. This unusual situation would be the equivalent of physicists using thermometers in their everyday work while having almost no conception of the nature of heat.

The primary reason for this state of affairs is that intelligence researchers have been able to make a surprisingly productive use of a *derived* measure of human intelligence—the IQ score. Analysis of IQ scores from contemporaneous cohorts has led to the discovery of general intelligence ability, an extremely important concept for explaining individual intelligence differences, for predicting general life circumstances, and for uncovering the cognitive influence of neural and genetic characteristics. Intelligence researchers are certainly to be applauded for these many insightful efforts, efforts that have become crystallized in the standard description of human intelligence, but researchers also need to be reminded that these derived results have been distracting them from what could have been their original task, namely figuring out what it was that was being measured via the raw scores on intelligence exams. The continuing impact of this distraction is made evident these days in the research community's response to the Flynn effect, the observed phenomenon that raw scores on intelligence tests have been increasing ever since intelligence tests were invented. The best that the research community has been able to offer in response to the Flynn effect has been a multitude of unconvincing attempts to reconcile the Flynn effect to general intelligence ability—an approach that appears to have no scientific merit—along with the somewhat desperate hope that the Flynn effect will just quietly go away—a hope that has no professional merit.

This essay has made the argument that it is the totality of artificial construction accruing within the human environment (and also appearing universally on intelligence exams) that is the key to a more comprehensive understanding of human intelligence than can be offered by the standard description alone. Measurable intelligence—the entity directly being measured via the calibrated raw scores on intelligence tests—it is the result of the orthogonal combination of general intelligence ability and the totality of artificial construction. That is to say, an individual's raw performance on an intelligence test is determined by that individual's particular neural capacity to navigate and to master artificial construction, in combination with the total amount of artificial construction to which that individual has been exposed. Or stated as a relational equation, **measurable intelligence = general intelligence ability x artificial construction**. Therefore, what is being directly measured via an intelligence test is not just neural effectiveness, as implied by the standard description. What is being directly measured via an intelligence test is neural effectiveness as applied to the growing ocean of artificiality in which humans now live. Both aspects of this orthogonal combination must be taken fully into account before human intelligence can be thoroughly and successfully described.

I would like to conclude by claiming that this essay's alternative description of human intelligence—in some sense an augmentation to the standard description—possesses three distinct advantages that speak in its favor. The first advantage is that it offers a depiction of the material nature of human intelligence that is specific and observable, highlighting the formal characteristics of the world's many constructed artifacts, characteristics that exist right before our very eyes and that have been deeply fathomed via the tools of mathematics, science, logic and so on. Compare these precise descriptions of the structural aspects of the surrounding artificial environment to the vague offerings emerging from the domain of neuroscience (Haier, 2021)—the difference in specificity could not be greater.

The second advantage of this essay's alternative description of human intelligence is that it does not require any biologically or evolutionarily extraordinary alterations to the operations of the human brain, claiming instead the retention of the human neural system's long-standing role as a stimulus-response mechanism. By attributing the material source of intelligence to the artificial environment—and not to the neurons, synapses and biochemical activity inside the human head—the brain can remain tasked with simply *responding* to the *stimulus* of artificial construction, an operation for which it is already well suited. This allows general intelligence ability to be depicted as a stable component of human intelligence, likely existing at similar levels today within the human population as it did several hundred thousand years ago, exactly as to be expected for a characteristic determined primarily by neural and genetic factors.

The third advantage of this essay's alternative description of human intelligence is that it outlines a straightforward and observable explanation of the Flynn effect. With general intelligence ability remaining stable within the human population, and with measurable intelligence being the orthogonal combination of general intelligence ability and artificial construction, the Flynn effect can be described as being driven entirely by the increasing amount and complexity of artificial construction contained within the human environment, an increase unhindered by any biological limitations. And as an important corollary to this understanding regarding the Flynn effect, it can also be stated with conviction that the Flynn effect is not temporary, that it has been a fundamental part of humanity ever since the species' turn towards behavioral modernity, and it will continue to be a fundamental part of humanity into the foreseeable future.

References

American Psychological Association. (n.d.). Intelligence. In *APA dictionary of psychology*. Retrieved July 3, 2026, from https://dictionary.apa.org/intelligence

Amodei, D. (2024). Machines of Loving Grace. https://www.darioamodei.com/essay/machines-of-loving-grace

Anderson, K. M., & Holmes, A. J. (2021). Predicting individual differences in cognitive ability from brain imaging and genetics. In A. K. Barbey, S. Karama, & R. J. Haier (Eds.), *The Cambridge handbook of intelligence and cognitive neuroscience* (pp. 327–348). Cambridge University Press. https://doi.org/10.1017/9781108635462.021

Basten, U., Hilger, K., & Fiebach, C. J. (2015). Where smart brains are different: A quantitative meta-analysis of functional and structural brain imaging studies on intelligence. *Intelligence, 51*, 10–27. https://doi.org/10.1016/j.intell.2015.04.009

Berger, M. (1986). Toward an Educated Use of IQ Tests. In: Lahey, B.B., Kazdin, A.E. (eds) Advances in Clinical Child Psychology. Advances in Clinical Child Psychology, vol 9. Springer, Boston, MA. https://doi.org/10.1007/978-1-4613-9823-3_1

Boring, E. G. (1923). Intelligence as the tests test it. *New Republic, 36*, 35–37.

Bradshaw, J. L. (2002). The evolution of intellect: Cognitive, neurological, and primatological aspects and hominid culture. In R. J. Sternberg & J. C. Kaufman (Eds.), *The evolution of intelligence* (pp. 55–78). Lawrence Erlbaum Associates Publishers.

Bräuer, J., Hanus, D., Pika, S., Gray, R., & Uomini, N. (2020). Old and New Approaches to Animal Cognition: There Is Not "One Cognition". *Journal of Intelligence, 8*(3), 28. https://doi.org/10.3390/jintelligence8030028

Bru-Luna, L. M., Martí-Vilar, M., Merino-Soto, C., & Cervera-Santiago, J. L. (2021). Emotional Intelligence Measures: A Systematic Review. *Healthcare (Basel, Switzerland), 9*(12), 1696. https://doi.org/10.3390/healthcare9121696

Carl, N., & Woodley of Menie, M. A. (2019). A scientometric analysis of controversies in the field of intelligence research. *Intelligence, 77*, Article 101397. https://doi.org/10.1016/j.intell.2019.101397

Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies*. Cambridge University Press. https://doi.org/10.1017/CBO9780511571312

Christian, D. (2014). *This fleeting world: a short history of humanity.* Berkshire Publishing Group.

Christian, D. (2018). *Origin story: a big history of everything.* First edition. New York, Little, Brown and Company.

Colom, R., Jung, R. E., & Haier, R. J. (2006). Distributed brain sites for the g-factor of intelligence. *NeuroImage, 31*(3), 1359–1365. https://doi.org/10.1016/j.neuroimage.2006.01.006

Colom, R., Karama, S., Jung, R. E., & Haier, R. J. (2010). Human intelligence and brain networks. *Dialogues in clinical neuroscience, 12*(4), 489–501. https:// doi.org/10.31887/DCNS.2010.12.4/rcolom

Colom, R., García, L. F., Shih, P. C., & Abad, F. J. (2023). Generational intelligence tests score changes in Spain: Are we asking the right question? *Intelligence, 99*, 101772. https://doi.org/10.1016/j.intell.2023.101772

Coltheart M. (1999). Modularity and cognition. *Trends in cognitive sciences, 3*(3), 115–120. https://doi.org/10.1016/s1364-6613(99)01289-9

Deary, I. J. (2020). *Intelligence: a very short introduction.* Second edition. Oxford University Press.

Deary, I. J., Cox, S. R., & Hill, W. D. (2022). Genetic variation, brain, and intelligence differences. *Molecular psychiatry*, *27*(1), 335–353.

deLeyer-Tiarks, J. M., Caemmerer, J. M., Bray, M. A., & Kaufman, A. S. (2024). Assessment of Human Intelligence-The State of the Art in the 2020s. *Journal of Intelligence*, *12*(8), 72. https://doi.org/10.3390/jintelligence12080072

Detterman, D. K., & Daniel, M. H. (1989). Correlations of mental tests with each other and with cognitive variables are highest for low IQ groups. *Intelligence, 13*(4), 349–359. https://doi.org/10.1016/S0160-2896(89)80007-8

Dickens, W. T., & Flynn, J. R. (2001). Heritability estimates versus large environmental effects: the IQ paradox resolved. *Psychological review, 108*(2), 346–369. https://doi.org/10.1037/0033-295x.108.2.346

Dutton, E., van der Linden, D., & Lynn, R. (2016). The negative Flynn Effect: A systematic literature review. *Intelligence, 59*, 163–169. https://doi.org/10.1016/j.intell.2016.10.002

Flynn, J. R. (1984). The mean IQ of Americans: Massive gains 1932 to 1978. *Psychological Bulletin, 95*(1), 29–51. https://doi.org/10.1037/0033-2909.95.1.29

Flynn, J. R. (1987). Massive IQ gains in 14 nations: What IQ tests really measure. *Psychological Bulletin, 101*(2), 171–191. https://doi.org/10.1037/0033-2909.101.2.171

Flynn, J. R. (2007). *What is intelligence?: Beyond the Flynn effect*. Cambridge University Press.

Gardner, H. (1987). The Theory of Multiple Intelligences. *Annals of Dyslexia*, *37,* 19–35. http://www.jstor.org/stable/23769277

Gottfredson, L. S. (1998). The general intelligence factor. *Scientific American Presents, 9*, 24-29.

Gottfredson, L. S. (2002). *g*: Highly general and highly practical. In R. J. Sternberg & E. L. Grigorenko (Eds.), *The general factor of intelligence: How general is it?* (pp. 331–380). Lawrence Erlbaum Associates Publishers.

Gottfredson, L. S. (2007). Shattering logic to explain the Flynn Effect. *Cato Unbound*, November 8.

Graham, S. A., & Fisher, S. E. (2013). Decoding the genetics of speech and language. *Current opinion in neurobiology, 23*(1), 43–51. https://doi.org/10.1016/j.conb.2012.11.006

Griswold, A. (2024a). Rethinking the Flynn effect. In *Autistic Études*. iUniverse. https://www.grizzalan.com/autisticetudes/rethinkingtheflynneffect.html

Griswold, A. (2024b). Prototypical autism is transformatively atypical. In *Autistic Études*. iUniverse. https://www.grizzalan.com/autisticetudes/prototypicalautism.html

Haier, R. J., Jung, R. E., Yeo, R. A., Head, K., & Alkire, M. T. (2004). Structural brain variation and general intelligence. *NeuroImage, 23*(1), 425–433. https://doi.org/10.1016/j.neuroimage.2004.04.025

Haier, R. J. (2016). *The Neuroscience of Intelligence*. Cambridge: Cambridge University Press.

Haier, R. J. (2021). Are we thinking big enough about the road ahead? Overview of the special issue on the future of intelligence research. *Intelligence*, *89*(C). https://doi.org/10.1016/j.intell.2021.101603

Haier, R. J., Colom, R., & Hunt, E. (2023). *The Science of Human Intelligence* (2nd ed.). Cambridge: Cambridge University Press.

Henshilwood, C. S., & Marean, C. W. (2003). The Origin of Modern Human Behavior: Critique of the Models and Their Test Implications. *Current Anthropology, 44*(5), 627–651. https://doi.org/10.1086/377665

Hilger, K., Ekman, M., Fiebach, C. J., & Basten, U. (2017). Intelligence is associated with the modular structure of intrinsic brain networks. *Scientific reports, 7*(1), 16088. https://doi.org/10.1038/s41598-017-15795-7

Jacob, M. C., & Stewart, L. (2004). *Practical Matter: Newton's Science in the Service of Industry and Empire, 1687–1851*. Harvard University Press.

Jung, R. E., & Haier, R. J. (2007). The Parieto-Frontal Integration Theory (P-FIT) of intelligence: converging neuroimaging evidence. T*he Behavioral and brain sciences, 30*(2), 135–187. https://doi.org/10.1017/S0140525X07001185

Kihlstrom, J. F., & Cantor, N. (2000). Social intelligence. In R. J. Sternberg (Ed.), *Handbook of intelligence* (pp. 359–379). Cambridge University Press. https://doi.org/10.1017/CBO9780511807947.017

Klein, R. (2002). *The Dawn of Human Culture*. New York: Wiley.

Klein, R. G. (2009). *The human career: Human biological and cultural origins*. University of Chicago Press.

Kovacs, K., & Conway, A. R. A. (2016). Process Overlap Theory: A Unified Account of the General Factor of Intelligence. *Psychological Inquiry, 27*(3), 151–177. https://doi.org/10.1080/1047840X.2016.1153946

Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: can one construct predict them all?. *Journal of personality and social psychology, 86*(1), 148–161. https://doi.org/10.1037/0022-3514.86.1.148

Langer, N., Pedroni, A., Gianotti, L. R., Hänggi, J., Knoch, D., & Jäncke, L. (2012). Functional brain network efficiency predicts intelligence. *Human brain mapping, 33*(6), 1393–1406. https://doi.org/10.1002/hbm.21297

Liu, J., & Lynn, R. (2013). An Increase of Intelligence in China 1986-2012. *Intelligence, 41*(5), 10.1016/j.intell.2013.06.017. https://doi.org/10.1016/j.intell.2013.06.017

Marsman, A., Mandl, R. C. W., Klomp, D. W. J., Cahn, W., Kahn, R. S., Luijten, P. R., & Hulshoff Pol, H. E. (2017). Intelligence and Brain Efficiency: Investigating the Association between Working Memory Performance, Glutamate, and GABA. *Frontiers in psychiatry, 8*, 154. https://doi.org/10.3389/fpsyt.2017.00154

Meyer, A. F., Williamson, R. S., Linden, J. F., & Sahani, M. (2017). Models of Neuronal Stimulus-Response Functions: Elaboration, Estimation, and Evaluation. *Frontiers in systems neuroscience, 10*, 109. https://doi.org/10.3389/fnsys.2016.00109

Myers, S. M., Challman, T. D., Bernier, R., Bourgeron, T., Chung, W. K., Constantino, J. N., Eichler, E. E., Jacquemont, S., Miller, D. T., Mitchell, K. J., Zoghbi, H. Y., Martin, C. L., & Ledbetter, D. H. (2020). Insufficient Evidence for "Autism-Specific" Genes. *American journal of human genetics, 106*(5), 587–595. https://doi.org/10.1016/j.ajhg.2020.04.004

Nijenhuis, J.T., Cho, S.H., Murphy, R., & Lee, K.H. (2012). The Flynn effect in Korea: Large gains. *Personality and Individual Differences, 53*, 147-151. https://doi.org/10.1016/j.paid.2011.03.022

Nijs, D. E. L. W. (2015). Introduction: Coping with Growing Complexity in Society. *World Futures, 71*(1–2), 1–7. https://doi.org/10.1080/02604027.2015.1087223

Parellada, M., Andreu-Bernabeu, Á., Burdeus, M., San José Cáceres, A., Urbiola, E., Carpenter, L. L., Kraguljac, N. V., McDonald, W. M., Nemeroff, C. B., Rodriguez, C. I., Widge, A. S., State, M. W., & Sanders, S. J. (2023). In Search of Biomarkers to Guide Interventions in Autism Spectrum Disorder: A Systematic Review. *The American journal of psychiatry, 180*(1), 23–40. https://doi.org/10.1176/appi.ajp.21100992

Pietschnig, J., & Gittler, G. (2015). A reversal of the Flynn effect for spatial perception in German-speaking countries: Evidence from a cross-temporal IRT-based meta-analysis (1977–2014). *Intelligence, 53*, 145–153. https://doi.org/10.1016/j.intell.2015.10.004

Pietschnig, J., & Voracek, M. (2015). One Century of Global IQ Gains: A Formal Meta-Analysis of the Flynn Effect (1909–2013). *Perspectives on Psychological Science, 10*(3), 282-306. https://doi.org/10.1177/1745691615577701

Plomin, R., & von Stumm, S. (2018). The new genetics of intelligence. *Nature reviews. Genetics, 19*(3), 148–159. https://doi.org/10.1038/nrg.2017.104

Rączaszek-Leonardi, J., Krzesicka, J., Klamann, N., Ziembowicz, K., Denkiewicz, M., Kukiełka, M., & Zubek, J. (2019). Cultural Artifacts Transform Embodied Practice: How a Sommelier Card Shapes the Behavior of Dyads Engaged in Wine Tasting. *Frontiers in psychology, 10*, 2671. https://doi.org/10.3389/fpsyg.2019.02671

Rodgers, J. (2023). Eleven articles and 27 authors pay tribute to James Flynn: A summary and critique of special issue articles on the Flynn effect. *Intelligence, 101*. https://doi.org/10.1016/j.intell.2023.101794

Shaw, R. C., & Schmelz, M. (2017). Cognitive test batteries in animal cognition research: evaluating the past, present and future of comparative psychometrics. *Animal cognition, 20*(6), 1003–1018. https://doi.org/10.1007/s10071-017-1135-1

Simmons, P., & Young, D. (2010). *Nerve cells and animal behaviour (3rd ed.)*. Cambridge University Press. https://doi.org/10.1017/CBO9780511782138

Snyder, A. (2004). Autistic genius?. Nature 428, 470–471. https://doi.org/10.1038/428470a

Spearman C. (1904). "General intelligence," objectively determined and measured. *The American Journal of Psychology, 15*, 201–292. http://www.jstor.org/stable/1412107

Sterelny K. (2011). From hominins to humans: how sapiens became behaviourally modern. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 366*(1566), 809–822. https://doi.org/10.1098/rstb.2010.0301

te Nijenhuis, J., & van der Flier, H. (2013). Is the Flynn effect on g?: A meta-analysis. *Intelligence, 41*(6), 802–807. https://doi.org/10.1016/j.intell.2013.03.001

Terman, L. M. (1916). *The measurement of intelligence*. Houghton, Mifflin and Company. https://doi.org/10.1037/10014-000

Toga, A. W., & Thompson, P. M. (2005). Genetics of brain structure and intelligence. *Annual review of neuroscience, 28*, 1–23. https://doi.org/10.1146/annurev.neuro.28.061604.135655

Tooley, U. A., Bassett, D. S., & Mackey, A. P. (2021). Environmental influences on the pace of brain development. *Nature reviews. Neuroscience, 22*(6), 372–384. https://doi.org/10.1038/s41583-021-00457-5

Trahan, L. H., Stuebing, K. K., Fletcher, J. M., & Hiscock, M. (2014). The Flynn effect: a meta-analysis. *Psychological bulletin, 140*(5), 1332–1360. https://doi.org/10.1037/a0037173

van der Linden, M., & Borsboom, D. (2019). Affluence boosted intelligence? How the interaction between cognition and environment may have produced an eighteenth-century Flynn effect during the Industrial Revolution. *The Behavioral and brain sciences, 42*, e211. https://doi.org/10.1017/S0140525X19000190

Whitehouse, A., Varcin, K., Waddington, H., Sulek, R., Bent, C., Ashburner, J., Eapen, V., Goodall, E., Hudry, K., Roberts, J., Silove, N., Trembath, D. (2021). Interventions for children on the autism spectrum: A synthesis of research evidence. Autism CRC, Brisbane.

Wongupparaj, P., Wongupparaj, R., Morris, R. G., & Kumari, V. (2023). Seventy years, 1000 samples, and 300,000 SPM scores: A new meta-analysis of Flynn effect patterns. *Intelligence, 98*, 1–9. https://doi.org/10.1016/j.intell.2023.101750

Woodley, M. A. (2012). A life history model of the Lynn-Flynn effect. *Personality and Individual Differences, 53*, 152-156. https://doi.org/10.1016/j.paid.2011.03.028

Autism Redescribed

Introduction

Very few concepts have been as misunderstood as the phenomenon known as autism. Not recognized until the mid-twentieth century—despite almost certainly having been around for many millennia—autism was immediately labeled as a medical condition, one in need of both aggressive treatment and ideally a cure (Cook & Willmerdinger, 2015). The condition was initially calculated to be extremely rare and was assumed to be inevitably dire, and no one even thought to ask if it might have a useful purpose.

Those early beliefs still very much linger within the autism research community today, even though autism has now been established as not being extremely rare and not being inevitably dire (Chahboun et al., 2022). The majority of that community's time and effort is still being directed towards ascertaining an underlying medical explanation for autism, be it genetic, neurological, environmental or some combination of all of the above (Hodges et al., 2020), and a large amount of money is currently being spent on delivering a variety of treatments and "cures," everything from applied behavioral analysis (ABA) to symptom-suppressing drugs to such experimental remedies as stem cell therapy (Kaye et al., 2024). Ask almost any autism professional and you will still get the distinct impression that autism is something that would be better off eradicated, and certainly not something to be celebrated.

Nonetheless, since autism's discovery, and despite all the time, effort and money invested, the autism research community has made virtually no progress at all towards arriving at any useful understanding of the condition. To date, there are no genetic explanations of autism, there are no neurological mappings of autism, and there are no environmental accounts of autism, meaning there are also no productive combinations of all of the above (Klin, 2018; Myers et al., 2020; Parellada et al., 2023). And as for the so-called treatments and cures, they bear a remarkable similarity to errant darts being thrown at a board, with nothing in the way of objective evidence to indicate they have improved the lives of autistic individuals beyond receiving no treatment at all (Lyra et al., 2017). Ask almost any autism parent or autistic individual and you will get from them the distinct impression that the autism research community is still wandering in the weeds, forever long on promise and hope, but conspicuously short on actual knowledge and actionable results.

Therefore, I claim it is long past time to take a fresh look at autism, and especially at the now dubious assumption that autism must be a medical condition. A new description is needed—the old one is proving to be wrong.

Of the hundreds if not thousands of autism research teams now comprising the field, only one has embraced this notion of taking a novel approach to describing autism. Laurent Mottron's research laboratory, based out of Montreal, Canada (hereafter referred to as the Mottron team), has over the past two decades offered several innovative models and unique perspectives that depict autism in a less stereotyped way, primarily through jettisoning the insistence on autism being a disorder and substituting instead a representation of the condition as a minority yet viable form of human possibility. The Mottron team's most recent efforts along these lines have incorporated a dual approach, first with a detailed and cogent description of what the team labels as *prototypical autism*, a highly homogenous set of observable characteristics that clearly distinguish autistic children from their non-autistic counterparts, as well as from those who might be receiving a diagnosis under the now extremely loose official diagnostic guidelines but who for various reasons do not fit the usual autistic profile (Mottron, 2021). The second part of the Mottron team's recent approach is to categorize autism as an *asymmetric developmental bifurcation (ADB)*, similar to other identifiable bifurcations such as left-handedness, twin pregnancy and breech presentation, conditions that defy overt medical explanation and yet emerge as persistent biological alternatives (Mottron & Gagnon, 2023).

I have written previously about prototypical autism, highlighting both the successes of this description as well as its shortcomings (Griswold, 2024), and here I propose to do something similar for the Mottron team's depiction of its asymmetric developmental bifurcation model, especially as presented in the team's recent paper *Asymmetric developmental bifurcations in polarized environments: a new class of human variants, which may include autism* (Mottron et al., 2025), a depiction which certainly casts new and meaningful light on autism as a viable human alternative, but a depiction which can also be improved.

There are two pressing reasons for developing a more thorough and accurate description of autism. The first is that the medical approach is actually doing some harm. Of the more valuable achievements that arise from the Mottron team's detailed outlining of prototypical autism and the ADB model is that the team provides abundant evidence that there is a natural and predictable course of autistic development, a course which is certainly different from typical development but which can be effective nonetheless, leading to improved outcomes and more productive and fulfilling autistic lives (Jacques et al., 2018). Unfortunately, nearly all the interventions that result from the medical model of autism serve only to thwart this natural course of autistic development, funneling autistic children into routines and circumstances that do exactly the opposite of what they need. Thus, we have been mistreating entire generations of autistic individuals due solely to professional ignorance, and this mistreatment is overdue to come to an end.

The second reason for developing a more thorough and accurate description of autism is that the phenomenon, when properly understood, becomes a surprisingly key component in the deciphering of recent human history, accounting for the underlying mechanisms of human behavioral change, and providing a logical explanation for the sudden atypicality of the human species. A strength of the Mottron team's approach is that it sets the stage for this understanding by highlighting the autistic perceptual and behavioral biases towards the physical, structural and raw informational aspects of the surrounding world, and contrasting these biases to the conspecific preferences evinced by the non-autistic members of the population. A weakness of the Mottron team's approach is that the team then fails to recognize and/or to acknowledge that these perceptual and behavioral differences mirror exactly the distinction between the modern form of *Homo sapiens* individuals and their purely animal ancestors. This essay will examine how recent human history has been marked by a continuous transition from a purely non-autistic form of perception and behavior to a form much more in line with what is experienced naturally by autistic individuals. That is to say, the species overall has been becoming more autistic-like in its perceptual and behavioral characteristics as time progresses. This is not a coincidence, and therefore, it is not hyperbole to say that an accurate description of autism is the key to understanding the transformative course of modern humanity.

Conspecifics

Perhaps the most promising feature of the Mottron team's recent ADB paper is its more liberal employment of the word *conspecifics*. By my count, there are at least seven uses of the term and its variants to be found within the paper, quite possibly a new record for autism research. I myself have been making the argument over the past twenty years (Griswold, 2007, 2017) that perceptual attention towards and interaction with the other members of the species, or the significant lack thereof, determines the fundamental distinction between non-autistic and autistic individuals, and it would appear the Mottron team now in essence agrees.

In the team's own words, the defining distinction between non-autistic and autistic individuals is that the former evince a *social bias* in their information processing, whereas the latter do not, but the team then goes on to explain, at considerable length, what exactly is meant by the phrase *social bias*, with almost the entirety of that explanation revolving around the word *conspecifics*. When non-autistic children engage with their environment they demonstrate a marked and natural preference for those features associated with other human beings. This can be as straightforward as increased attention given to human faces, human voices, human touch, etc., and includes an obvious desire for joint and shared participation in various human activities. Furthermore, as the Mottron team rightly points out, this conspecific influence extends beyond just direct human interaction, such as when dolls and other objects are treated as human agents, and when the non-human structural world is explored primarily at the urging, prompting and approval of caregivers and peers. These behaviors might seem to be so typical as to make their significance easily overlooked, but any sober reflection on the natural proclivities of non-autistic children reveals that a strong conspecific influence lies at the very center of these children's entire worldview.

In contrast, the Mottron team describes the autistic child as engaging his or her environment without reliance upon this social bias, that is, without strong attention towards or influence from human conspecifics. There are two ways to then characterize this style of autistic engagement, one via the absence and one via the presence of distinguishing traits, including traits outlined in the official autism diagnostic manual (American Psychiatric Association, 2013). The absent traits would include such things as social reciprocity, joint attentive activities, relationship development, communicative language, etc., all evidence of a significant detachment from conspecifics compared to that of non-autistic peers. The present traits would include various heightened interests towards and interactions with the physical and structural aspects of the environment, for instance a prolonged gaze upon rotating and geometrical objects, persistence in repetitive movements, insistence on the same routine, scrutiny of the formal aspects of language (the shapes and sequences of numbers and letters, for example), and so on. The Mottron team notes that even when autistic children do happen to engage with conspecifics they often do so in an unusual manner, for instance by regarding human faces not for their expressive content but instead for their symmetrical and other physical features (Pavlova et al., 2017). The clear lesson to be derived from any impartial observation of autistic individuals, especially during the critical age range of around two to five years, is that they do not organize their perceptual and behavioral world primarily around human conspecifics, as non-autistic children almost invariably do.

This conspecifically themed manner of categorizing non-autistic and autistic differences has several merits over the medical model. For one, it provides an affirmative and detailed description of the observable characteristics of non-autistic individuals, which is much more informative than blandly presenting these individuals as the nondescript norm. Also, this conspecifically themed manner of categorization remains nonjudgmental towards autistic characteristics, treating them as an alternative and consistent set of observable traits and not a presumed list of disorders that need to be cured, a far more scientific approach to studying the condition. Finally, given the fifty plus years of null results in the many attempts to uncover genetic, neurological and environmental explanations of autism, it is both refreshing and encouraging to see a research team take a step back from this apparently fruitless obsession with underlying causes, and refocus efforts and attention towards describing what non-autistic and autistic individuals actually do. *All* individuals absorb and react to their environment in a meaningful, productive and watchable fashion, it just happens that non-autistic and autistic individuals do so in an entirely different way, and any careful observation would reveal that the primary distinction between these two cohorts arises almost entirely from the relative influence, or non-influence, of human conspecifics.

Although the Mottron team is certainly to be congratulated for taking this less prejudiced and more scientific approach to describing autism, and for being perhaps the first autism research team to fully recognize and to appreciate the importance of conspecific themes within its depictions of prototypical autism and the ADB model, I do have some suggestions for improvement. In the first place, I would drop the use of the phrase *social bias* altogether. If the team feels the need to take entire paragraphs to explain exactly what is meant by these words, then perhaps they are not an ideal choice. I myself in recent years have leaned towards use of the phrase *conspecific perception* to label the characteristic lying at the heart of the distinction between autistic and non-autistic individuals, but to be honest, a label such as *conspecific bias* would work just as well. The trouble with the Mottron team's phrase lies solely in the word *social,* which has much too broad a connotation for the purpose at hand, making it sound as though what distinguishes autistic individuals from their non-autistic peers is something like a lack of desire to shake hands properly or to wave hello at the correct moment, when of course the distinction runs considerably deeper than that. The word *conspecific* is more targeted, more concise, has a richer implication, and makes it clear that autistic characteristics are derived not from social apathy or dysfunction, but instead from an entirely different worldview.

Also, I believe the Mottron team should acknowledge that the conspecific bias evinced by the non-autistic members of the population is not just typical for the human species, it is also typical across the entire animal kingdom. The organisms of almost every animal species give clear evidence of a strong conspecific influence in their approach to their surrounding world, displaying increased attention towards and interaction with the other members of their own species (Lickliter, 1991 ; Nunes et al., 2020). Lions perceive and engage primarily with other lions, honeybees perceive and engage mostly with other honeybees, etc. The reason of course for this universal presence of conspecific bias is that the characteristic is a key component in survival and procreation. How would potential mates be discovered, how could offspring be tracked and cared for, how could pack hunting or group defense be expected to work if organisms did not have preferential awareness and attention for the other members of their own species? In general, biological perceptions and behaviors are organized in large measure around conspecifics, and thus, there is no mystery behind the source of the conspecific bias displayed so prominently by non-autistic humans—it is a characteristic forged originally and robustly in the long-burning furnace of evolutionary time.

And this is what makes autistic individuals so particularly remarkable, because they are not just atypical within the species, they are atypical across the entire biological world. To experience a diminished influence from conspecifics in the processing of one's environment and in the development of one's worldview is so outside the norm as to essentially defy the very dictates of biology and evolution. And as if that were not noteworthy enough, all this is taking place within a species that has itself transitioned into an existence utterly unlike that of any other species, transforming from being a pure animal focused entirely on the survival-and-procreative aspects of its natural environment to being an unquestioned master of the physical, structural, informational and artificial world (Christian, 2018). Would it be that farfetched to think that this newfound atypicality of the human species might have something to do with the significant presence of individuals within the population who appear to be naturally inclined to develop an alternative form of information processing, one not organized primarily around conspecifics, but instead organized mostly through the physical and structural features of the environment? I will have more to say about this atypicality of both autism and the human species later on, but for now I will simply encourage the Mottron team to consider that its lucid and conspecifically themed descriptions of autistic characteristics have implications that go beyond just developmental psychology.

Bifurcation

The type of developmental bifurcation outlined in the Mottron team's ADB model has the following characteristics:

- The bifurcation results in two primary outcomes, one for the vast majority of the population, and the other for a small but significant minority of the population.
- The realized outcome is influenced to a significant degree by hereditary factors, but is not the result of any simple, or even ascertainable, genetic cause.
- The realized outcome also appears to be influenced by environmental factors, but again is not the result of any simple, or even ascertainable, material cause.
- With respect to the bifurcation, each outcome group is both highly homogenous within itself and also unambiguously distinct from the other.

A potential limitation of this model is that it appears to have modest scope, at least with respect to humans, since there seem to be very few conditions known to fit well to the above characteristics. Besides autism, the Mottron team offers only three other examples—left-handedness, twin pregnancy and breech presentation—and this sparse applicability means the model ends up sounding somewhat esoteric. That does not, however, disqualify it from consideration, and the Mottron team's recognition of the model's aptness to the known facts regarding autism is to be commended. But the real brilliance within this model is that it provides a logical framework for describing the genesis of autistic characteristics, and for demonstrating that these characteristics are the natural, indeed the only, plausible consequence for an organism experiencing a diminished influence from conspecifics.

Here is what I am driving at. In each provided instance of the ADB model, there are two different ways to characterize the bifurcation with respect to the minority outcome. One way is by *negating the majority characteristic*, and the other is by *overtly describing the minority characteristic*. For instance, with handedness, the minority outcome can be negatedly labeled as not being right-handed, or overtly described as being left-handed. For pregnancy, the minority outcome can be negatedly labeled as not a single fetus, or overtly described as twin (or multiple) fetuses. For birthing, the minority outcome is *not* the cephalic position, or alternatively *is* breech presentation. And finally for autism, the minority outcome can be negatedly described as not experiencing a conspecific bias (or social bias, as the Mottron team would say) in the individual's information processing, or alternatively, the outcome can be overtly described as an unusually strong orientation towards the physical, structural, formal and informational aspects of the surrounding world.

In the first three cases, it is obvious that the two different ways of characterization are equivalent, so obvious and so equivalent that the minority outcome emerges as the sole and natural alternative to the majority outcome. For instance, if a human is going to have a dominant hand, and the contextual circumstances—be they hereditary, environmental, random, or otherwise—do not allow for right-handedness, then left-handedness emerges as the sole and natural alternative. If a human conceives, and the contextual circumstances do not create a single fetus, then multiple fetuses must result. If a human baby is soon to be delivered, and the contextual circumstances have not ordained the cephalic position, then breech presentation becomes inescapable. No special mechanism is needed to establish or to explain any of these minority outcomes, because in each instance that outcome emerges naturally as the inevitable alternative.

But can this same logic be applied to autism? At the very least, it must be admitted that the equivalency between the two different ways of characterizing autism is not so immediately obvious. Does the significant diminishment of conspecific influence during a child's developmental years *necessitate* a strong orientation towards the physical, structural and formal aspects of the environment? I will argue that the answer to this question is actually yes, and along the way, I am afraid I must also insist that the Mottron team has gotten this part of its description wrong.

As a human child develops and matures, it must begin to productively process its physical environment and to organize its sensory experience (Lewkowicz, 2014; Monesson & Scott, 2010). To not do so would leave the child in a state of perceptual and behavioral chaos, with every feature from the surrounding world having a haphazard impact, meaning no feature could have an overriding and effective influence. Every sight, every sound, every tactile impression, all of it would form into nothing but a confused jumble, making developmental progress essentially impossible. As it happens, biological need brings some order to this potentially tumultuous state of affairs—hunger, thirst, fear, temperature regulation, sexual drive, all these bring a degree of focus and organization to an individual's experienced circumstances. And as non-autistic children demonstrate on an almost continuous basis, conspecific humans also play a pronounced role in the regulation and arrangement of a typical child's sensory, perceptual and behavioral world. From the manifold of sensory impressions, what emerges prominently and naturally for a non-autistic child are human faces, human voices, human smells, human touch, etc., and from the desire to act comes an instinctive proclivity to do so in concert with other humans, and from the will to explore comes the deeply felt and accompanying urge to heed the promptings and approvals of caregivers and peers. In the filtering, processing and organization of a non-autistic child's environmental experience what emerges naturally and predominantly are those features associated both directly and indirectly with other human beings, and therefore, for the non-autistic child, its world becomes first and foremost a human-centered world, a human-grounded world, and *not* a chaotic world.

So what must be the corresponding consequence for the autistic child, who will not experience a significant conspecific influence as it develops and matures? Biological need does provide some degree of organization for the autistic child, but it is clear from the developmental challenges faced by nearly all autistic children that biological need by itself is not nearly enough. Without the organizational assistance that conspecific influence provides, autistic children are in constant danger of becoming stuck within a state of sensory, perceptual and behavioral chaos, and thus, there is no mystery behind the reason that autistic children remain at developmental risk—they are missing a key driver of experience coalescence, a driver not just for the human species, but indeed for nearly the entire animal kingdom. Without conspecific bias, autistic individuals find themselves swimming against the biological and evolutionary tide.

But the fact that most autistic children do not remain stuck within a state of sensory, perceptual and behavioral chaos is the strong evidence that there is an alternative organizing principle at work within these children. And as has been suggested already, that alternative organizing principle is being provided by the unusually strong orientation these children take towards the physical, structural and formal aspects of the environment (spinning objects, symmetrical shapes, repetitive movements and routines, rhythmic sounds, etc.). Instead of coalescing their experience primarily around conspecifics, autistic children tend to focus and to arrange their world upon those structural and formal features that can be found somewhere near at hand, and therefore, for an autistic child, its world becomes first and foremost a structure-centered world, a structure-grounded world, and thereby *not* a chaotic world.

But why these particular features, you might ask? Why the physical, structural and formal aspects of the environment? Why do autistic children orient their sensory, perceptual and behavioral proclivities in this particular way? It is here, in the answering of this question, that the Mottron team and I part ways.

It is not always easy to tell for sure, but based upon various papers that have appeared over the years, it would seem the Mottron team subscribes to the notion that autistic characteristics are fundamentally the product of a special neural mechanism. That is to say, the team *begins* with the idea that autistic brains are somehow constructed differently than non-autistic brains (see for instance (Bernhardt et al., 2025), (Hyde et al., 2010), (Samson et al., 2012), etc.), and as a direct result of these differently constructed brains, autistic individuals thereby process their environmental information in a neurally unique fashion (see such concepts as enhanced perceptual functioning, veridical mapping, global and local processing, top-down and bottom-up hierarchies, and so forth (Bouvet et al., 2014; Mottron et al., 2006, 2013)). For me, there are several problems with this approach, one of which is that it is antithetical to the ADB model. Recall that in the three other examples the Mottron team provides for this model, the minority outcome emerges as the natural and sole alternative to the majority outcome, with no special mechanism required. The trouble with assuming a special neural mechanism for autism is that this mechanism could have theoretically produced just about any outcome, for instance a processing bias centered around orangutans, or around cloud formations, or around just about anything at all—it did not *have* to produce the characteristics associated with autism. And in the case of autism, such a special neural mechanism would need to be *doubly* special, since it would have to account both for the overriding (or suppressing) of the default tendency towards conspecific bias, and also for the producing of the alternative tendency towards a bias for the physical, structural and informational aspects of the surrounding world, and in fact, there would be no compelling *neural* reason that both these types of biases could not have existed within the same individual at once. All this would be the equivalent of saying that to account for left-handedness, one would need a special neural mechanism capable of both overcoming the default tendency towards right-handedness, as well as overtly producing the alternative tendency towards left-handedness, with again there being no compelling *neural* reason that both these tendencies could not have existed within the same individual at once. Left-handedness is more concisely explained by simply noting it is the natural and only alternative to right-handedness, with any neural differences not being the *cause* of left-handedness, but merely its result. Ideally, similar logic should be applied to autism. If the ADB model is going to be meaningful and effective, it should produce only *pure* bifurcations, ones in which the minority outcome follows naturally and inevitably from the absence of the majority outcome. A special mechanism ruins this purity.

One more thing. The Mottron team's approach provides no applicable explanation for sensory issues. It is well known (indeed, it is now a major criterion within the official diagnostic guidelines) that autistic individuals frequently experience a wide assortment of sensory issues—hypersensitivity, hyposensitivity, synesthesia (Hazen et al., 2014; Kern et al., 2006). Over the years, the Mottron team has remained relatively silent about these sensory issues, and this reticence remains on full display within the ADB paper, where the mention of sensory matters is reduced to one scare-quoted phrase within a parenthetical remark. I suspect the reason for this silence is that a special neural mechanism on its face has nothing to say about sensory matters, unless of course one wishes to render this neural mechanism now *triply* special and have it also be the direct and active cause of an autistic individual's sensory idiosyncrasies. But otherwise, under the Mottron team's approach, there is no compelling reason to expect any sensory differences between non-autistic and autistic individuals. Non-autistic individuals would possess a type of neural mechanism that favors conspecifics, and with this mechanism would process their environment primarily around other humans, and assuming the mechanism works as advertised, no sensory troubles should arise. Autistic individuals would possess a type of neural mechanism that favors the structural and informational aspects of the environment, and with this mechanism would process their environment primarily around objects and other formal features, and again assuming the mechanism works as advertised, no sensory troubles should arise. The mechanisms would of course be different, but as long as each was working as expected, there would be no reason for sensory difficulties in either case. This inability to account for sensory issues—which are really quite common in autism, especially at the younger ages—is to me a glaring weakness in the Mottron team's approach.

I believe what is called for here is a prudent use of Occam's razor, lopping off any mention of special neural mechanisms altogether. These mechanisms are entirely unnecessary. Following the prescription of the ADB model and eyeing the examples of left-handedness, twin pregnancy and breech presentation, the place to *begin* with autism is not somewhere inside the human skull but instead with autism's one fundamental negation: autistic individuals do *not* experience conspecific bias in the engagement and processing of their contextual world. From this one negation alone, and without adding anything extraneous, it is straightforward to demonstrate that the observable characteristics of autism inevitably follow.

If an autistic child is going to develop and mature, then that child, just as non-autistic children do, must organize and integrate his or her sensory, perceptual and behavioral experience. And of course an autistic child finds itself at an immediate disadvantage in this critical task, because it does not possess a primary organizing principle that exists within non-autistic children, namely the built-in ability to filter, process and organize the environment around other human beings. Without this ability, the autistic child finds itself on the verge of a sensory, perceptual and behavioral chaos, and herein lies the direct explanation of the sensory issues experienced in autism. Of all the developmental tasks a young child faces, obtaining a sensory grounding is perhaps the most basic. The sensory field is broad and multivariate, and without some means of filtering and foregrounding the overwhelming multitude of impressions that arises from this field, the child is going to have very little success in organizing and integrating its experience. Non-autistic children bring order to the sensory field in large part by focusing on conspecifics and filtering out much of the rest, naturally honing in on human faces, human touch, human activities, etc., and in this manner non-autistic children achieve their sensory grounding. Autistic children, lacking conspecific bias and unfestooned with special neural mechanisms, initially struggle to achieve their sensory grounding, sometimes overcome by impressions that are not really important (hypersensitivity), sometimes oblivious to impressions that actually are important (hyposensitivity), and sometimes confused in the task of separating and integrating sensory modalities (synesthesia). This motley range of sensory issues is the strong evidence that autistic children are not experiencing something like a neurally induced sensory dysfunction, but instead are experiencing a more generalized difficulty with achieving sensory grounding, dealing with the very real effects of a looming sensory chaos.

So what is an autistic child to do? If there were no alternative to conspecific bias for achieving sensory organization, then developmental progress would be nearly impossible. But as it happens, there is an alternative to conspecific bias, one that most autistic children do take to at least some degree. This alternative is, fitting quite nicely into the ADB model, the sole and natural alternative.

The environment, including the sensory field, is indeed broad and multivariate, but it is not random; it is not entirely chaotic. Within the natural world there is a good deal of inherent structure that exists within the surroundings, for instance the geometrical shapes and symmetries induced by gravity, the repetitions of the meteorological seasons, the regularities of celestial motion, and so on. And in the modern human world, where artificial construction abounds, there is an enormous amount of form and structure to be found at almost every turn. These structure-rich environmental features can be categorized under a wide variety of concepts—symmetry, repetition, pattern, number, logic, etc.—but what these concepts all have in common is that they are antithetical to chaos, they provide intrinsic signal against the background noise. Autistic children, facing a looming sensory chaos, and unable to break this chaos via the foregrounding of conspecifics, resort to the only alternative available, latching onto those environmental features that inherently contain chaos-breaking structure, that inherently provide some signal against the relentless noise. Ceiling fans are cherished not for their ability to cool mom and dad, but for their embodiment of symmetry and repetition. Toys are lined up not with the intent to entertain the grandparents, but from the urgent need to create geometrical form. Movements and sounds are repeated ad infinitum not with the purpose of annoyance, but with the desire to introduce regularity into an otherwise unregulated world. Young autistic individuals, struggling to make developmental progress and to obtain their sensory grounding, obsess over the many different types of structure that their environment inherently contains, because for them, there really is no other choice.

And that is autism in a nutshell. No special mechanism required. No need to go searching for genetic, neurological and/or environmental dysfunction. Fundamentally, autistic children do not experience a conspecific bias in their engagement with their surrounding world, and the natural consequence of this negation is that autistic individuals must take the only other pathway available, seeking out those chaos-breaking structural features that can be found within the environment, and ultimately developing a worldview informed primarily by these structural features. This outcome certainly will engender some neural differences in autistic individuals, but these neural differences are not the *cause* of autism, they are merely its *effect*. Instead, the observable characteristics of autism all follow solely and inevitably from the significant diminishment of conspecific bias in the processing of the contextual world—autism is a pure bifurcation.

Atypicality

If I were to ask you which group of animals organizes its experience primarily around the inanimate, physical, structural and informational aspects of its lived environment, how would you reply? If you were to say autistic individuals, you would be correct. But if you were to say modern human beings, you would also be correct. Is this a coincidence?

Homo sapiens has transformed, in a remarkably brief period of time, from being a perfectly typical species to being by far the most atypical collection of creatures this planet has ever seen. Approximately two hundred thousand years ago, humans were simply animals, living in an entirely natural setting and scratching out the same kind of existence as was every other beast—eating and drinking, fighting and fleeing, mating and rearing—day after day after day (Klein, 2009). It had been that way for millions of years, and across the entire animal kingdom, it had been that way for *hundreds* of millions of years. But today, most humans live in settings that are more artificial than natural, and engage in a multitude of behaviors that extend far beyond what is needed for survival and procreation alone—writing, hammering, driving, dancing the Merengue—the list goes on and on. And undergirding this unprecedented alteration of behavior is a layer of artifacts now blanketing almost every corner of the Earth's surface—roads, buildings, books, phones—again, the list goes on and on. There have been many suggestions offered in recent years aimed at explaining these disruptive and transitional events—language genes (DeSalle et al., 2026), neural alterations (Klein, 2002), collective learning (Baker, 2014), shared myths (Harari, 2015), etc.—but none of these proposals have been anything close to compelling. It remains one of the great unanswered questions of science: how did *Homo sapiens* transform from being pure animal not that long ago to being the clothes-wearing, fast-talking, sports car-driving version we can observe today? How and why did the human species become so utterly atypical?

What is both fascinating and unusual about the fact that autistic individuals have a natural proclivity towards an intense engagement with the inherently structural features to be found within the environment is that, despite these features having been around from the beginning of time, they have gone almost entirely unnoticed by the rest of the animal kingdom.

Symmetry, repetition, pattern, number, logic, etc.—these concepts do exist within the natural world, they can theoretically be taken advantage of (as humans have now abundantly demonstrated), and yet organisms in general have never seemed to take even the slightest bit of notice. Animal creatures do not widely construct, they do not abundantly count, they do not experiment with pattern, repetition and form. What animal creatures do is they survive and procreate, and they appear to do so with such perceptual and behavioral intensity that they remain nearly oblivious to everything else. The primary drivers of this perceptual and behavioral intensity are biological need and conspecific bias, the two main influences that determine a typical organism's entire worldview. These two influences are critically important for survival and procreation, but they also have such an intense impact that they lock each organism into an existence consisting of nothing *but* survival and procreation, effectively blinding the organism to every other possibility. This is why animal behavior has remained so remarkably consistent, both across species and across time. Following the pathway laid out by biological need and conspecific bias, animal creatures engage their environment in the most predictable and unerring of ways—eating and drinking, fighting and fleeing, mating and rearing—day after day after day.

And of course what can be said about animal creatures in general could also have been said about the genus *Homo* for literally millions of years, right up until around two hundred thousand years ago, right up until everything began to change (Sterelny, 2011). Something altered the predictable pathway for human beings, altered it in the most dramatic fashion, igniting and fostering the remarkable transformation that can still be observed taking place all around us today. What changed, you might ask? Well, what changed is that humans began to notice the inherent structure contained within the environment and began to take increasing advantage of it. Humans began to turn their perceptual and behavioral attention towards symmetry, repetition, pattern, number, logic, etc.

Conventional wisdom would have us believe that humans at some point must have undergone a type of genetic and/or neural mutation, and as a result of this mutation, the human brain became suddenly "smarter," now able to recognize and to process the structural and informational aspects of the environment in a manner no other species, including humans themselves, had ever managed to do before (Gabora & Steel, 2020). But how likely is this scenario? In the first place, the supposed mutation remains entirely unspecified—there have been no legitimate genetic or neurological findings that have come anywhere near pinpointing the source of this unprecedented and significant alteration, and given that the cerebral structures implicated in intelligence are known to be numerous and extremely far-flung throughout the human brain (Haier et al., 2004), and given that the genetic underpinnings for intelligence are known to be massively multivariate and spread all along the human genome (Toga & Thompson, 2005), it would seem any notion of a targeted mutation must be nothing more than an ill-considered pipe dream. And whatever mutations were supposedly involved in triggering the human turn, they would have had to have been spread population wide in a very short period of time, because these supposed mutations cannot be present in just *some* human beings, they have to be present in nearly *all* human beings, since the entire population now processes its structural and informational environment as a matter of daily course. To me, the conventional wisdom sounds too biologically and evolutionarily fantastic, to the point of being downright implausible.

There is a more sober alternative.

What would have been the foreseeable consequence if a significant presence of autistic individuals had gained an ongoing purchase within the human population, beginning sometime around two hundred thousand years ago? As has already been discussed, these autistic individuals would have been naturally inclined to develop a worldview informed primarily by the structural and informational aspects of their environment, a worldview informed primarily by symmetry, repetition, pattern, number, logic, etc. The initial source of these aspects would have been nature itself—the effects of gravity, celestial motion, etc.—because of course no artificial constructs had yet to come into existence. But these early autistic individuals, just as we can witness with autistic children today, would have been prone to repurposing the elements of their environment, would have been prone to fabricating artifacts that could satisfy their sensory craving for structure and form. These would have been the very first instances of artificial construction, that same artificial construction that now blankets the entire human world and serves as the foundation for a multitude of novel and modern human behaviors. Furthermore, these anomalous autistic activities, unprecedented within the animal kingdom, they would not have gone unnoticed. The non-autistic members of the population, not naturally inclined to perceive inherent structure but acutely inclined to pay attention to what other humans do, would have found themselves curious about these strange new features being introduced into their surroundings by a portion of their human brethren, and would have been prone to mimicking such behaviors and constructions, because non-autistic individuals are prone to mimicking *all* human activities. Thus would have begun a productive and accumulating symbiotic relationship between the autistic and non-autistic members of the population, with the autistic members forging a pathway into a strange new world of pattern, repetition, number, and so on, and with the non-autistic members conspecifically following their lead. The result has been a human species moving further and further away from the perceptions and behaviors of its purely animal past, and moving inexorably towards those perceptions and behaviors that are forged primarily out of artificial construction—perceptions and behaviors strikingly autistic-like in nature. In a sense, the human species has become increasingly infected with the overt characteristics of autism.

These ideas will no doubt sound strange to most ears, and especially to those who subscribe to the medical model of autism, and who therefore cannot fathom how autism might be serving a useful purpose. But consider what an enormous coincidence the alternative entails. Assume that the conventional wisdom is correct, and that the human transformation is indeed the result of something like a biological mutation, and has nothing to do with autism. The consequence of this assumption is the following three assertions:

1. Autistic individuals are distinguished in large measure by their strong perceptual and behavioral orientation towards the structural, formal, informational and artificial aspects of their environment.
2. Modern humans are distinguished in large measure by their strong perceptual and behavioral engagement with the structural, formal, informational and artificial aspects of their surrounding world.
3. The two previous assertions have nothing to do with each other.

That would be one heck of a coincidence, and I for one refuse to accept it. But apparently I am going to stand alone in this refusal for a rather long time. This is why I sometimes get so frustrated with the Mottron team. That team has itself been leading the way in highlighting how autistic individuals have a distinct and observable form of development and behavior, determined primarily by an intense engagement with the physical, structural and other formal features of the surrounding world. And that team also surely recognizes, being a *scientific* team, that modern humanity is being built on a foundation of increasingly accurate interaction with and understanding of the physical, structural and other formal features of the contextual world. And yet that team shows no willingness at all to consider a connection between these two nearly identical concepts. The shortsightedness of current scientific practice—even the *best* of current scientific practice—never ceases to amaze me.

Natural Autistic Development

Where the Mottron team's efforts do shine more clearly are in the team's lucid and detailed description of autistic development, especially during the critical age range of around two to five years. This is accomplished mostly via the team's outlining of the characteristics of prototypical autism, and is supplemented nicely by the team's reference to the ADB model, which provides the framework, as described above, for demonstrating how autistic development is the natural, progressive and predictable consequence of a diminished reliance upon conspecific bias, and is not just some stunted form of typical development, as the medical model of autism would have one believe. Autistic individuals can and do go forward, but via a different pathway than do non-autistic individuals, and the Mottron team has been the only autism research team both courageous and perspicacious enough to insist that this distinctive form of autistic development is an observable and unalterable fact.

Regrettably, the remainder of the autism research community goes in exactly the opposite direction, focusing on autism as a broken form of non-autism, as a biological disorder—an *unspecified* biological disorder, mind you—that needs to be fixed. The most damaging consequence of this unproven approach is that natural autistic development is almost never supported, and in many cases is actively hindered. ABA programs universally are designed to reward behaviors that align with the characteristics of typicality, and to punish behaviors that align with the characteristics of autism (Leaf et al., 2022). Drugs are routinely administered to suppress autistic-like "symptoms," even at the unconscionable cost of effectively stupefying the patient (Hellings, 2023). And stem cell and other experimental remedies are judged to be promising only to the degree they can transform autistic children into near replicas of their non-autistic peers (Nabetani et al., 2023). To an autistic child attempting to gain his or her sensory, perceptual and behavioral grounding, these so-called interventions must be frustrating at best and debilitating at worst, since they deliberately thwart the only means this child has available to it to effectively engage and assimilate its surrounding world, imposing instead an alternative type of engagement that this autistic child, by definition, has no ability to accommodate.

Imagine if the circumstances were turned around. What could be expected to happen if autistic characteristics were taken to be the ideal target, and non-autistic characteristics were presumed to be the disorders needing to be cured? Picture non-autistic children being routinely deprived of human touch, human smiles, human voices, being frequently punished for attempting to participate in conversations and other joint attentive activities, being constantly drugged for insisting too forcefully that their geometric toys could be treated as conspecific agents. Does anyone think this approach would be productive, or that such a regimen could successfully transform non-autistic children into near replicas of their autistic peers? Not only would these non-autistic children be deprived of their natural course of development, they would also be deprived of the secondary effects. Once a typical child has gained his or her sensory grounding and has started its developmental journey via conspecific influences, that child can then leverage these foundations into encounters with a broader perceptual and behavioral world, including a modern world filled ubiquitously with countless instances of non-human structure and form. When a non-autistic child is allowed and encouraged to develop naturally, it gains access to everything, both conspecific influences early on and non-conspecific influences eventually. But thwart a non-autistic child's natural course of development, and that child will gain access to nothing.

It is essentially no different for autistic children, other than to note that the natural developmental pathway runs in the opposite direction. Ideally, autistic children would be allowed and encouraged to engage their environment in accordance with their own internal preferences, focusing in the early years on inherent structure and form, with limited expectation of any conspecifically themed encounters. Admittedly, this pathway will take longer than it does for non-autistic peers, and will require more patience and support—after all, this type of development runs counter to millions of years of biology and evolution, and also does not fit easily into the population's norms. But in most instances there will be rewarding secondary effects. Autistic children, once they have obtained their sensory grounding, will—just as non-autistic children do—leverage this foundation into a broader engagement with the perceptual and behavioral world, including a belated connection to the expectations and activities of the human species. Most autistic children can be observed following this course today, exhibiting developmental changes after the age of five that include improved communication skills, increased involvement in joint attentive activities, greater awareness of expectations and roles within a broader human society, etc., and it can be anticipated that such outcomes would be more common if natural autistic development were more widely fostered instead of hindered. Some autistic children take this secondary developmental leap to such a large degree that they are then mistakenly reclassified as having "lost" their autism (Fein et al., 2013), proving once again that within the medical model of autism, everything associated with the condition, even its successes, must somehow be "fixed." The reality, however, is that autistic individuals, whatever their ultimate outcome may be, are always going to be autistic individuals, their worldview having been shaped very early on and in a fundamentally different way. Therefore, the goal of an autistic upbringing should not be to turn the individual into a non-autistic replacement—a goal with essentially zero chance of success. The goal should be to allow and to encourage the child to follow its natural course of development and to become the best *autistic* individual he or she can be.

Conclusion

If the first rule of medicine is to do no harm, then the autism research community has a great deal to answer for. The medical model of autism has been in existence for nearly a century now, and not only has it failed to deliver even the most basic understanding of the condition, it has also produced a troubling legacy of unwarranted trauma for one of the most important segments of the human population. To focus solely and aggressively on only the difficulties that come with autism, to mindlessly overlook the condition's unique characteristics and unusual benefits, to confidently label autism as a disorder without being able to *specify* the disorder, and to subject entire generations of children to unproven and disruptive treatments and cures, this has been an ongoing travesty of the highest order, a shameful and lasting blight upon science itself. What will it take to wake up this community, to get it to rethink its pernicious ways? Apparently not endless decades of null results trying to concoct medical explanations for autism, and apparently not the existence of more thoughtful alternatives, such as those of the Mottron team. No, I suspect this community will remain cloaked within its reckless negligence for quite some time, blissfully unaware of all the damage it wreaks, an odious example of the detrimental impact of willful professional ignorance.

It is long past time to recognize that autistic individuals are humanity's misunderstood treasure. They are the original source of lateral thinking within this species, of constructive innovation, of the types of perceptions and behaviors that have advanced *Homo sapiens* beyond just survival and procreation alone. No one is suggesting that autism does not produce a variety of challenges—having a significant lack of conspecific bias does place autistic individuals on a precarious developmental path, one that runs counter to the normal dictates of biology and evolution, and one that chafes against population norms. But the glorious irony here is that these anomalous and contrarian characteristics of autism are the very reason humanity has been able to alter its once extremely predictable course, transforming from pure animal into the atypical and structure-aware creatures we observe today. Humans are no longer bound by the chains of biological need and conspecific bias, they are no longer slaves to the dictates of evolution. And for the gift of this unprecedented freedom, humans have mostly autism to thank.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Baker, D. (2014). Standing on the shoulders of giants: Collective learning as a key concept in Big History. In L. Grinin, D. Baker, E. Quaedackers, & A. Korotayev (Eds.), *Teaching and researching Big History: Exploring a new scholarly field* (pp. 41-64). Uchitel Publishing House.

Bernhardt, B. C., Valk, S. L., Hong, S.-J., Soulières, I., & Mottron, L. (2025). Autism-related shifts in the brain's information processing hierarchy. *Trends in Cognitive Sciences, 29*(10), 942–955. https://doi.org/10.1016/j.tics.2025.04.008

Bouvet, L., Donnadieu, S., Valdois, S., Caron, C., Dawson, M., & Mottron, L. (2014). Veridical mapping in savant abilities, absolute pitch, and synesthesia: an autism case study. *Frontiers in psychology, 5*, 106. https://doi.org/10.3389/fpsyg.2014.00106

Chahboun, S., Stenseng, F., & Page, A. G. (2022). The changing faces of autism: The fluctuating international diagnostic criteria and the resulting inclusion and exclusion-A Norwegian perspective. *Frontiers in psychiatry, 13*, 787893. https://doi.org/10.3389/fpsyt.2022.787893

Christian, D. (2018). *Origin story: a big history of everything*. First edition. New York, Little, Brown and Company.

Cook, K. A., & Willmerdinger, A. N. (2015). *The history of autism*. Furman University Scholar Exchange. https://scholarexchange.furman.edu/schopler-about/1

DeSalle, R., Lepski, G., Arévalo, A., Bobo, D., LaVergne, N., Miyagawa, S., & Tattersall, I. (2026). Natural selection and language genes in humans. *Scientific Reports*. https://doi.org/10.1038/s41598-026-39032-2

Fein, D., Barton, M., Eigsti, I. M., Kelley, E., Naigles, L., Schultz, R. T., Stevens, M., Helt, M., Orinstein, A., Rosenthal, M., Troyb, E., & Tyson, K. (2013). Optimal outcome in individuals with a history of autism. *Journal of child psychology and psychiatry, and allied disciplines, 54*(2), 195–205. https://doi.org/10.1111/jcpp.12037

Gabora, L., & Steel, M. (2020). A model of the transition to behavioural and cognitive modernity using reflexively autocatalytic networks. *Journal of the Royal Society, Interface, 17*(171), 20200545. https://doi.org/10.1098/rsif.2020.0545

Griswold, A. (2007). On the presence of autism within the human population. In *Autistic Symphony*. iUniverse. https://www.grizzalan.com/autisticsymphony/presence.html

Griswold, A. (2017). Conspecifics. In *Concerto for Intelligence*. iUniverse. https://www.grizzalan.com/concertoforintelligence/conspecifics.html

Griswold, A. (2024). Prototypical autism is transformatively atypical. In *Autistic Études*. iUniverse. https://www.grizzalan.com/autisticetudes/prototypicalautism.html

Haier, R. J., Jung, R. E., Yeo, R. A., Head, K., & Alkire, M. T. (2004). Structural brain variation and general intelligence. *NeuroImage, 23*(1), 425–433. https://doi.org/10.1016/j.neuroimage.2004.04.025

Harari, Y. N. (2015). *Sapiens: A brief history of humankind*. HarperCollins.

Hazen, E. P., Stornelli, J. L., O'Rourke, J. A., Koesterer, K., & McDougle, C. J. (2014). Sensory symptoms in autism spectrum disorders. *Harvard review of psychiatry, 22*(2), 112–124. https://doi.org/10.1097/01.HRP.0000445143.08773.58

Hellings J. (2023). Pharmacotherapy in autism spectrum disorders, including promising older drugs warranting trials. *World journal of psychiatry, 13*(6), 262–277. https://doi.org/10.5498/wjp.v13.i6.262

Hodges, H., Fealko, C., & Soares, N. (2020). Autism spectrum disorder: definition, epidemiology, causes, and clinical evaluation. *Translational pediatrics, 9*(Suppl 1), S55–S65. https://doi.org/10.21037/tp.2019.09.09

Hyde, K. L., Samson, F., Evans, A. C., & Mottron, L. (2010). Neuroanatomical differences in brain areas implicated in perceptual and other core features of autism revealed by cortical thickness analysis and voxel-based morphometry. *Human brain mapping, 31*(4), 556–566. https://doi.org/10.1002/hbm.20887

Jacques, C., Courchesne, V., Meilleur, A.-A. S., Mineau, S., Ferguson, S., Cousineau, D., Labbe, A., Dawson, M., & Mottron, L. (2018). What interests young autistic children? An exploratory study of object exploration and repetitive behavior. *PLoS ONE, 13*(12), Article e0209251. https://doi.org/10.1371/journal.pone.0209251

Kaye, A. D., Allen, K. E., Smith Iii, V. S., Tong, V. T., Mire, V. E., Nguyen, H., Lee, Z., Kouri, M., Jean Baptiste, C., Mosieri, C. N., Kaye, A. M., Varrassi, G., & Shekoohi, S. (2024). Emerging Treatments and Therapies for Autism Spectrum Disorder: A Narrative Review. *Cureus, 16*(7), e63671. https://doi.org/10.7759/cureus.63671

Kern, J. K., Trivedi, M. H., Garver, C. R., Grannemann, B. D., Andrews, A. A., Savla, J. S., Johnson, D. G., Mehta, J. A., & Schroeder, J. L. (2006). The pattern of sensory processing abnormalities in autism. *Autism : the international journal of research and practice, 10*(5), 480–494. https://doi.org/10.1177/1362361306066564

Klein, R. (2002). *The Dawn of Human Culture*. New York: Wiley.

Klein, R. G. (2009). *The human career: Human biological and cultural origins*. University of Chicago Press.

Klin A. (2018). Biomarkers in Autism Spectrum Disorder: Challenges, Advances, and the Need for Biomarkers of Relevance to Public Health. *Focus (American Psychiatric Publishing), 16*(2), 135–142. https://doi.org/10.1176/appi.focus.20170047

Leaf, J. B., Cihon, J. H., Leaf, R., McEachin, J., Liu, N., Russell, N., Unumb, L., Shapiro, S., & Khosrowshahi, D. (2022). Concerns About ABA-Based Intervention: An Evaluation and Recommendations. *Journal of autism and developmental disorders, 52*(6), 2838–2853. https://doi.org/10.1007/s10803-021-05137-y

Lewkowicz D. J. (2014). Early experience and multisensory perceptual narrowing. *Developmental psychobiology, 56*(2), 292–315. https://doi.org/10.1002/dev.21197

Lickliter, R. (1991). Context and animal behavior: II. The role of conspecifics in species-typical perceptual development. *Ecological Psychology, 3*(1), 11–23. https://doi.org/10.1207/s15326969eco0301_1

Lyra, L., Rizzo, L. E., Sunahara, C. S., Pachito, D. V., Latorraca, C. O. C., Martimbianco, A. L. C., & Riera, R. (2017). What do Cochrane systematic reviews say about interventions for autism spectrum disorders?. *Sao Paulo medical journal = Revista paulista de medicina, 135*(2), 192–201. https://doi.org/10.1590/1516-3180.2017.0058200317

Monesson, A. and Scott, L.S. (2010). Perceptual Development. In *The Corsini Encyclopedia of Psychology* (eds I.B. Weiner and W.E. Craighead). https://doi.org/10.1002/9780470479216.corpsy0657

Mottron, L., Dawson, M., Soulières, I., Hubert, B., & Burack, J. (2006). Enhanced perceptual functioning in autism: an update, and eight principles of autistic perception. *Journal of autism and developmental disorders, 36*(1), 27–43. https://doi.org/10.1007/s10803-005-0040-7

Mottron, L., Bouvet, L., Bonnel, A., Samson, F., Burack, J. A., Dawson, M., & Heaton, P. (2013). Veridical mapping in the development of exceptional autistic abilities. *Neuroscience and biobehavioral reviews, 37*(2), 209–228. https://doi.org/10.1016/j.neubiorev.2012.11.016

Mottron, L. (2021), A radical change in our autism research strategy is needed: Back to prototypes. *Autism Research, 14*: 2213-2220. https://doi.org/10.1002/aur.2494

Mottron, L., & Gagnon, D. (2023). Prototypical autism: New diagnostic criteria and asymmetrical bifurcation model. *Acta psychologica, 237*, 103938. https://doi.org/10.1016/j.actpsy.2023.103938

Mottron, L., Lavigne-Champagne, A., Bernhardt, B., Dumas, G., Jacquemont, S., & Gagnon, D. (2025). Asymmetric developmental bifurcations in polarized environments: A new class of human variants, which may include autism. *Molecular Psychiatry, 30*(12), 6155–6164. https://doi.org/10.1038/s41380-025-03275-8

Myers, S. M., Challman, T. D., Bernier, R., Bourgeron, T., Chung, W. K., Constantino, J. N., Eichler, E. E., Jacquemont, S., Miller, D. T., Mitchell, K. J., Zoghbi, H. Y., Martin, C. L., & Ledbetter, D. H. (2020). Insufficient Evidence for "Autism-Specific" Genes. *American journal of human genetics, 106*(5), 587–595. https://doi.org/10.1016/j.ajhg.2020.04.004

Nabetani, M., Mukai, T., & Taguchi, A. (2023). Cell Therapies for Autism Spectrum Disorder Based on New Pathophysiology: A Review. *Cell transplantation, 32*, 9636897231163217. https://doi.org/10.1177/09636897231163217

Nunes, A. R., Carreira, L., Anbalagan, S., Blechman, J., Levkowitz, G., & Oliveira, R. F. (2020). Perceptual mechanisms of social affiliation in zebrafish. *Scientific reports, 10*(1), 3642. https://doi.org/10.1038/s41598-020-60154-8

Parellada, M., Andreu-Bernabeu, Á., Burdeus, M., San José Cáceres, A., Urbiola, E., Carpenter, L. L., Kraguljac, N. V., McDonald, W. M., Nemeroff, C. B., Rodriguez, C. I., Widge, A. S., State, M. W., & Sanders, S. J. (2023). In Search of Biomarkers to Guide Interventions in Autism Spectrum Disorder: A Systematic Review. *The American journal of psychiatry, 180*(1), 23–40. https://doi.org/10.1176/appi.ajp.21100992

Pavlova, M. A., Guerreschi, M., Tagliavento, L., Gitti, F., Sokolov, A. N., Fallgatter, A. J., & Fazzi, E. (2017). Social cognition in autism: Face tuning. *Scientific reports, 7*(1), 2734. https://doi.org/10.1038/s41598-017-02790-1

Samson, F., Mottron, L., Soulières, I., & Zeffiro, T. A. (2012). Enhanced visual functioning in autism: an ALE meta-analysis. *Human brain mapping, 33*(7), 1553–1581. https://doi.org/10.1002/hbm.21307

Sterelny K. (2011). From hominins to humans: how sapiens became behaviourally modern. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 366*(1566), 809–822. https://doi.org/10.1098/rstb.2010.0301

Toga, A. W., & Thompson, P. M. (2005). Genetics of brain structure and intelligence. *Annual review of neuroscience, 28*, 1–23. https://doi.org/10.1146/annurev.neuro.28.061604.135655

Human History Redescribed

Introduction

One of the more remarkable features of the human species in the early twenty-first century is how little the species has come to understand itself. This shortfall has been made all the more obvious by the contrasting way in which the species has, over the last two hundred years or so, gained such an impressive breadth and extraordinary depth of knowledge about the contextual surroundings in which humans live. The laws of motion and gravity. Relativity theory. Quantum mechanics. The theory of evolution. Genetics. The structure of atoms. Electromagnetism. Biochemistry. Five hundred years ago *none* of these topics were understood to even the slightest degree of sophistication, and yet today each has blossomed into a description that is comprehensive, precise and abundantly productive. From quark to cosmos, from Big Bang to farthest light-year reach, so thoroughly has recent humanity fathomed the heretofore mysteries of its lived environment that one might reasonably wonder if there can be much of anything left still to be learned (Horgan, 1996).

But what can we say about ourselves? Have we yet to explain the human species, explain it to even the slightest degree of sophistication? This is not an insignificant task, because humanity is, above all else, entirely without precedent, without precedent across the entire reach of the known material world, and without precedent over the exceedingly long course of Earth's biological past. If it were not for recent humanity and its enormously transformative activities, there would not be a single insight into the nature of physics, chemistry, biology, mathematics, and all the rest—there would not be a universe reflecting back upon itself. Modern humanity has been the sole engine driving a massive, explosive and consequential metamorphosis that can still be witnessed taking place all around us today—taking place in fact at an accelerating pace—and yet we comprehend the fundamental workings of that engine hardly at all.

The essential question that needs to be answered from the events of human history is this: how did this species go from being purely animal not more than a couple hundred thousand years ago, to being the unprecedented collection of creatures we observe today? Going no further back than the twitch of a geo-biological eye, humans were simply animals just like all the other animals, constrained by the laws of evolution and nature, confined inside the chains of survival and procreation, living out the same repetitive existence as did every other beast—eating and drinking, fighting and fleeing, mating and rearing—day after day after day (Klein, 2009). This had been the prescribed course of existence for biological life upon this planet's surface for literally hundreds of millions of years, and had been the prescribed course of existence for humans themselves for many hundreds of thousands of years, so what could have possibly been expected to change?

But change it did.

There are now eight billion humans living on Earth, several orders of magnitude beyond what could be naturally expected (Muttarak & Wilde, 2022). And these humans—still animals, and still engaged in animal behaviors—have supplemented their animal existence (some might say, *overwhelmed* their animal existence) with a gargantuan array of artificial behaviors that two hundred thousand years ago would have been utterly inconceivable. Talking, writing, dressing, cooking, calculating, driving, flying, sculpting, architecting, farming, shaving, bartending, jaywalking, oboe playing, throwing dice, dancing the Merengue—the list goes on and on. Plus let us take a good look around ourselves. For almost every person reading these words, he or she will find themselves not immersed in a natural setting—as would have been invariably the case two hundred thousand years ago—but instead will find themselves surrounded by a ubiquitous cornucopia of artificial construction, construction influencing every perception and every behavior to the point of relentlessness. From the window of my apartment alone, here is what I can see: a parking lot containing hundreds of automobiles, each composed of parts far too numerous to catalog, each painted in a color of the most bizarre hue, each sporting a license plate comprising the letters and digits of some unorthodox bureaucratic language; and surrounding the parking lot, there are several other buildings, each containing dozens upon dozens of symmetrically arranged rooms, each room chock-full of various gewgaws and accoutrements, such as clocks, books, desks, refrigerators, faucets, hair dryers, laptops, door knobs, salt shakers, ornamental bird cases, slow cookers, fast cookers—the list goes on and on; and interspersed among the parking lot and the buildings there is so much more to see, lines painted across the roads, transformers attached to poles, billboards screaming what to buy, a plastic playground, high tension wires crisscrossing hither and thither, lampposts dotting the asphalted landscape, trash cans, benches, cellphone towers, traffic lights, traffic signs—the list really does go on and on. But what of nature? What of that once ever-present human companion, the vines, the trees, the grasslands, flower-strewn streams, insects buzzing and crawling all around, birds flocking constantly overhead, a gazelle or two hurtling past? What from my window can I see that might be reasonably categorized as natural? The answer of course is that I can see almost nothing of nature, it has been almost entirely eclipsed from view. Some patches of grass here and there, but these have been cut and manicured by the groundskeeper, and a smattering of saplings, most of them brought in for a purpose and most of them planted neatly in rows. And then there is that lovely crescent moon hanging low in the western sky, right next to the blinking lights of a jumbo airplane passing by.

There is *nothing* normal about a modern scene. There is *nothing* ordinary about the current situation. The essential question that needs to be answered from the events of human history is this: what the hell has happened here?

And for that matter, what the hell is *still* happening here?

Three Major Histories

In order for a history to be compelling, it requires two main ingredients:

1. A temporal series of dynamic events; and
2. A structural framework underlying those dynamics.

A broken machine is not going to produce a fruitful history, because nothing will ever change. Neither is it useful to recount the outcomes of a roulette wheel, for although the wheel does provide a temporal series of dynamic events, there is no orderly scheme underlying them. (Similarly, the rote date-and-place memorization rituals found inside many secondary school classrooms provide yet another example of uncompelling history.)

There exist three large-scale chronicles that do fit the above criteria for a compelling history. The first of these is the history of the cosmos (Ratra & Vogeley, 2008), beginning with the Big Bang and its resultant fast and cooling expansion, producing protons, neutrons and electrons, and leading to star formation and then star deaths, the cauldrons out of which were forged the chemical elements, as well as the raw material of countless galaxies and solar systems, including eventually our own. Thus, the narrative of the cosmos unfolds as a series of progressing stages, each shaped precisely via a regimen of underlying laws, such as gravity, the nuclear forces, and thermodynamics. Indeed, of the three major histories, this is the one that appears to be the most thoroughly comprehended, so much so that today's scientists can express an extreme degree of confidence when predicting the universe's ensuing course.

The second major history is that of biological and evolutionary life upon the planet Earth (Gee, 2021), including life's primordial beginnings almost four billion years ago, near underwater sea vents or perhaps in nutrient-rich tidal pools, followed by a more than three-billion-year dominance of the single-celled organisms—the prokaryotes and the eukaryotes—supplemented on occasion by multicellular variants that would eventually open the way, starting around 600 million years ago, to the establishment of big life—the complex types of flora and fauna we can observe on the lands and in the oceans today. This entire timeline, sprinkled liberally with both mass extinctions and adaptive explosions, has not been merely the product of chaos and random chance, but has been guided at every step along the way by the regulative movements of tectonic plates, the governance of meteorological and atmospheric conditions, the dictates of organic chemistry and genetics—all brought together under the unifying principles of Darwin's subversive idea. Earth's evolutionary record tells a rich, variable and structure-filled story, one that biologists and geologists can now outline deeply and accurately, even if the massively disruptive influence of the human epoch has rendered the story's future unpredictable.

Perhaps somewhat counterintuitively, although Earth's overall biological story does produce a compelling history, the narrative of any particular species within that story does not. Asian badgers, western honey bees, common sunflowers, giant armadillos, red maples, *Sigillaria alveolaris*, brown marmorated stink bugs, swordfish, beef tapeworms, *Hallucigenia sparsa*—who could be bothered to write the complete history of any of these species, and even if such a chronicle were cobbled together, who would feel the need to read it? The issue here is a lack of dynamics. The events of every species follow essentially the same course. If you know the history of Asian badgers, you in essence know the history of every other animal species—the species emerges into existence due to genetic mutations and various geological, meteorological and other evolutionary pressures, the species then surges and comes to permeate its most fit environment, and then due to further genetic mutations and/or changing contextual conditions, the species transforms into yet another species or otherwise disappears. It is the same story played out again and again, and as if this repetitiveness were not stifling enough, note that the events of each organism within a species—and indeed the events of each organism across *every* species—are similarly constrained. If you know the history of any *particular* Asian badger, you essentially know the history of *all* Asian badgers, as well as the history of every other animal creature—the organism is born or hatched and reared, strives to obtain food, water and sexual mates, endeavors to ward off predators, then sooner or later (usually sooner) loses this struggle and dies. The narrative never deviates in any significant way, but follows religiously the same outline again and again and again. This is perhaps the most underappreciated aspect of biological and evolutionary existence—it is constrictive to an immense degree. The intense battle for survival and procreation, whatever else might be said about it, sentences its subjects to a perceptual and behavioral prison. And if the size and structure of that prison itself has changed dramatically, consequentially and systematically over the last four billion years, the holding cells within that prison, as well as the activities of the prisoners contained, these have changed hardly one iota, since the beginning of biological time.

Remarkably, there has been no exception to these constrictive biological and evolutionary rules … no exception, that is, until around a couple hundred thousand years ago.

The third major history is that of recent humanity. The word *recent* is necessary, because the genus *Homo* and its bipedal precursors did not go beyond constrained animal existence for nearly seven million years, a period of time for which human history remained entirely commonplace, and entirely bestial. Therefore, from this sentence on, when I employ the phrase *human history*, it will be intended as *recent* human history, the only period of time for which human existence has been noteworthy.

It might be objected that this third history is not large enough in scale to be placed alongside the other two. The history of the cosmos covers the entirety of time and stretches across the immense expanse of the universe. And the history of biological life has lasted for nearly four billion years and has reached almost every corner and crevice of the Earth's surface. But what human history lacks in temporal and spatial expanse, it more than makes up for in explosiveness. Anthropologists remain uncertain exactly when to mark the start of recent human history—two hundred thousand years ago is at best an estimate, it might be somewhat sooner or somewhat later (Sterelny, 2011). But until roughly that time, humans had given almost no evidence of their impending transformation—a limited control of fire perhaps, which does suggest some advancement beyond typical animal abilities. And yet what little advancement there had been must have remained inchoate for quite some time, for it was not until around sixty or seventy thousand years ago (during what is sometimes labeled as the *cognitive revolution*) that the signs of human change began to be unmistakable, including a growing abundance of extraordinary artifacts—beads, structured weapons, awls to make clothing, bone carvings, cave paintings, etc.—all giving support to the launching of a great migratory expansion, one that would soon conquer nearly the entire Eurasian land mass and would send out initiatory shoots into Australia and the Americas. As astonishing as these activities were, they soon were surpassed by another revolution, the *agricultural revolution*, beginning in the Fertile Crescent a little more than ten thousand years ago. Spurred by the introduction of domesticated animals and plants, humans began bursting forth an entirely new and ever-growing set of manmade constructions—houses, irrigation trenches, pottery wheels, plows, ships, monuments, papyrus scrolls—and humans began coalescing into ever-larger communities, adhering these communities together with unique and formalized systems of behavior, such as codified laws, money, literature and religion. By five hundred years ago, the complete human conquest of the terrestrial world, as well as the continuing expansion of human behavior and human invention, these had become stunning to an unparalleled degree, and yet humans were in no way finished, in fact had just barely begun. The *scientific revolution* introduced yet another round of staggering change and another blanketing plethora of new contraptions: steam engines, railroads, factories, telephones, trucks, radio, television. Almost every artifact I can see from my apartment window embodies a concept that did not exist as recently as a couple hundred years ago, and as if the magnitude of all this unrivaled alteration were not nearly enough, humans now find themselves on the cusp of yet one more revolution, the *artificial life revolution*, bolstered by microchips, robotics, machine learning, bioengineering, and an entire host of digital, medical and electronic innovation. The pace of human change was astounding enough ten thousand years ago, and became astounding by many more multiples one thousand years ago, and turned astounding exponentially one hundred years ago. I have no words to describe today.

We humans cannot truly appreciate the extraordinary contours of human history, because we have lived so deeply ensconced inside its developing folds. But from any other perspective, human history has all the earmarks of a violent conflagration, one that must be blazing nearly out of control. And as best I can tell, other than perhaps the Big Bang, there has been no transformational equivalent to human history anywhere and at any time within the known universe.

The Broadening Approach to Human History

As the outline of its narrative has expanded over the years, human history's methodology has needed to broaden as well. During the days of Herodotus and Thucydides, geographical awareness reached not much farther than Mediterranean shores, and temporal familiarity encompassed only a handful of generations. Therefore, the earliest human histories were developed invariably from a local and tribal perspective, focused primarily on communal and present concerns—leaders, rebellions, tyrants, battles, conquests, famine, etc. This approach to human history remained predominant for quite some time, and is still witnessed today in many scholarly and popular offerings. But as human spatial awareness began to extend farther and farther around the globe, and as human temporal familiarity began to reach further and further back in time, the local and tribal perspective and the communal and present concerns began to lose more and more of their relevance. The events were now happening on a much grander scale, and the questions to be answered were becoming appreciably larger in scope. More was going to be needed than just an explanation of why King So-and-so had decided to cower inside his castle, or how General Huffington had managed to so badly blunder the war.

Social history, cultural history, economic history, comparative history, religious history, these began rising to the fore, with a larger and larger swath of the human population being taken into consideration, beyond just the political and military figures. Perhaps the most famous and influential example of these efforts was that of Friedrich Engels and Karl Marx, with their passionate and analytic account of the struggles of the proletariat. But following this path all the way to its splintered extreme, these days we must deal with a postmodernist frenzy for the study of countless marginalized groups—indigenous histories, ethnic histories, feminist histories, LGBTQ+ histories, disability histories, homeless histories, incarceration histories (another list that goes on and on). Judging by the ineffectualness of these efforts outside academic walls, and even occasionally within, it remains doubtful whether the more challenging questions of human endeavor can be addressed fruitfully in piecemeal (Kaiser, 2020).

More promising and more engaging has been the persistent movement towards considering humanity as a whole, and even further, considering humanity within the entirety of its physical and biological context. By the early twentieth century, the known background of human history reached all the way back to the Archean Eon and stretched as wide as a galaxies-filled universe. H. G. Wells, in his ambitious *The Outline of History* (Wells, 1920), published shortly after the First World War, demonstrated the possibility and the effectiveness of an all-encompassing approach to human history. The details were not always accurate and were sometimes incomplete, mostly because the science was still young, but over the next one hundred years, corrections would be made and knowledge gaps filled in. Today, an all-encompassing approach to human history has been elevated to an established discipline, recognized primarily through David Christian's project of Big History (Christian, 2018), one that fully embraces the three major historical accounts, that of the cosmos, of biological life, and of humanity. But make no mistake, Big History *is* a *human* history, its thorough rendition of the time of the cosmos and of Earth's biological past serving as necessary and informative preamble, highlighting the two paradoxical features that render the human part of the story so beguiling and so unique: one, the events of human history have happened in a near infinitesimal sliver of time, and two, the events of human history have been so transformative as to have divorced this species from its purely animal past and to have brought this species to an awareness of *all* space and of *all* time.

Unfortunately, this successful broadening in approach towards the events of human history has not been matched by an equally successful plumbing of human history's depths. We know far more about the *what* of human history than we do about the *how* and *why*. These barren circumstances are not due to a lack of guessing, the number of hypotheses that have been promoted to explain the reasons underlying humanity's remarkable transformation constitute an enormous multitude—evolution, collective learning, shared myths, increased brain size, neural reconfiguration, social constructions, cultural thinking, memes, language genes, language instinct, modular minds, guns, germs and steel, and so forth (Bingham, 2000; Baker, 2014; Harari, 2015; Hofman, 2014; Klein, 2002; Gravel-Miguel & Coward, 2024; Finkel & Lamm, 2025; Blackmore, 2001; DeSalle et al., 2026; Pinker, 1994; Kurzban, 2010; Diamond, 1997). But of course the sheer volume alone of these many conjectures betrays that none of them have been convincing. And I would take the criticism a little further than that, for these hypotheses reveal a lack of innovative effort, a collection of ordinary and predictable solutions to what is an atypical and unprecedented phenomenon. Human history falls well outside the norm, so it is not unreasonable to begin searching for some nonconforming answers to its fundamental questions. A deep understanding of human history is going to require more than just a simple falling back upon some shibboleths.

Shibboleths

There are two types of insufficiency in the solutions typically offered to explain the transformative mechanics of human history. The first type of insufficiency is that the characteristics of the offered solution (for instance, evolution) fail to match the characteristics of the problem needing to be solved. The second type of insufficiency is that the offered solution (for instance, collective learning) is presented as an *explanation* of human history, when in fact it is the characteristic itself that *needs to be explained*.

It is not surprising that *evolution* is the first word that comes to mind when attempting to uncover the impetus driving human change. In the biological realm, no idea has been more productive than Darwin's theory regarding natural selection, adaptation, common descent, etc., especially when married to the variety-producing mechanisms of genetics. These concepts have effectively stitched together the many shifting pieces of Earth's long and complex organic narrative, giving that narrative an underlying structure and a logical foundation. And because humans are biological creatures and because humans have clearly been undergoing a significant change, what could be more natural than to assume evolution must once again be somewhere on the scene. But if *evolution* is the first word that comes to mind when attempting to uncover the impetus driving human change, the second word has to be *nonsense*.

The problem here is that the characteristics of evolution and the characteristics of recent human history do not match—in fact, they run counter to each other. If anything, recent human history is not so much evolutionary as it is *anti*-evolutionary—it defies nearly every edict that evolution proclaims. Evolution sees organisms mutate to fit to their prevailing environment, whereas history has seen humans mutate their lived environment to fit to their own needs. Evolution utilizes an element of randomness at its change-producing core, whereas history produces transformations that appear to be purposeful and directed. Evolution plays out over an extremely long and measured expanse of time, whereas human history has unfolded suddenly and at an accelerating pace. Evolution locks its organisms into a perceptual and behavioral stasis, fixating them almost exclusively on the immediate needs of survival and procreation, whereas history has witnessed humans breaking these chains of perceptual and behavioral stasis, opening their senses and their activities to the broad richness of an entire universe. Evolution works to maintain an organic equilibrium, and has done so for nearly four billion years, whereas human history has produced, in a minute fraction of that time, a stunning blow to the balance of nature, now in danger of spiraling completely out of control (Rohde, 2013). Evolution generates predictable and repetitive outcomes for every species and for every organism, whereas human history churns out nothing but unprecedented events.

If the changes of human history were biological and natural, then evolution would make for a perfectly reasonable hypothesis to describe what has been going on. But the changes of human history are not biological or natural at all, the changes of human history have been entirely artificial. In the first place, there is zero evidence that today's humans are physically different in any essential way from what they were two hundred thousand years ago. Despite all the popular conjecture, no language genes have ever been identified, no neural reconfiguration has ever been isolated, and no significant organic alteration of any particular kind has been elucidated in any detail. The logical conclusion to be drawn—which by the way, fits far more cleanly to the glacially slow logistics of evolution—is that for all practical purposes, today's average *Homo sapiens* individual is biologically indistinguishable from the average *Homo sapiens* individual to be found at human history's dawn. Furthermore, we can observe quite easily with our very own eyes (no postdoctoral degree required, no government funding needed) that the changes of human history are overwhelmingly artificial, and not natural. When from my apartment window I observe another human walking through the massively synthetic scene, I indeed see a creature that is starkly and fundamentally different from the type of creature I might have observed walking across the African savanna two hundred thousand years ago, but note this, every single one of those differences is a *constructed* difference. The parking lot wanderer is not naked, is not searching for nuts and berries, is not reeking of sweat, urine and excrement, and is not engaging in wanton sex, even though all these possibilities remain entirely available. Instead, this animal creature is clothed, tattooed, wearing ornamental jewelry, shaved, coiffed, bathed, manicured, perfumed, etc., and this animal creature is mumbling to itself, humming a tune, checking on its phone, fumbling with its keys, and soon enough this animal creature will drive off in its car, will obey the painted lines and the traffic lights on the way home, will park in a garage, will sleep on a mattress, will awaken to an alarm clock, will pull a juice container from the refrigerator, will cook oatmeal on the stove, will eat with forks, spoons and knives, will plan a trip on its new computer, and will fly off to Hawaii for some much-needed R&R. Not a single one of these behaviors could be described as natural, and not a single one of these behaviors could have been observed two hundred thousand years ago. Evolution makes for an excellent explanation of biological and natural change, but evolution has nothing to do with human history.

What about cultural evolution, the university denizens will object. What about evolutionary psychology? What about memetics? What about the many scholarly attempts to explain the changing course of human history not with *biological* evolution, but instead with the application of evolutionary processes to the cultural, social, technological and other non-organic domains? I am not certain I actually need to make answer to these distortions of evolutionary theory, other than to point out the foolishness of pounding square pegs into round holes, but let me highlight a few items to consider. One, the *biological* form of evolutionary theory possesses a mountain of tangible evidence, whereas the *offshoot* forms of evolutionary theory rely upon statistical models, theorizing and just-so stories (Richerson & Boyd, 2005), the scientific equivalent of pixies and fairy dust. Two, biological evolution makes meaningful and observable use of genes, nature's chemical carriers of both replication and random variation, whereas cultural evolution resorts to the concepts of memes or other speculated forms of replication, unobserved, unspecified and ethereal entities that appear to have been suggested for convenience and appear to be anything but random (Brodie, 1996). Three, in order to make their alternative forms of evolutionary theory fit to the accelerating contours of human history, academicians have mostly severed their alternative evolutionary characteristics from the characteristics of biological evolution: biological evolution is slow, whereas cultural evolution can be incredibly fast; biological evolution depends upon the surrounding environment, whereas cultural evolution depends upon ideas and brains; biological evolution drifts chaotically, whereas cultural evolution steadily advances; biological evolution is applicable to every species, whereas cultural evolution remains privileged to human society alone.

Like all changes associated with human history, cultural, social and technological changes are artificial changes, and artificial changes possess a myriad of possible underlying mechanisms. Evolution is but one of these possible underlying mechanisms, and in almost every circumstance, it is not the correct choice. A chess game, for instance, undergoes many alterations as the pieces are moved about the board, but who would think it logical or helpful to apply evolutionary processes to explain such alterations. A chess game does not evolve. Neither does human history.

I am of course not the first person to make such statements. There are many historians, scientists and other academicians who recognize that the slow-moving, natural and random features of evolution make for an extremely poor fit to the accelerating, constructed and purposeful variations produced by human history. But having successfully avoided the fallacy of the golden hammer, far too many of these historians, scientists and other academicians then fall victim to a different kind of mistake, that of confusing cause and effect. This can be witnessed in a variety of statements plastered throughout both the scholarly and popular literature. For instance, it is often said that humans have progressed to their current circumstances due to their superior intelligence, or that humans have shed their animal past by leveraging the power of language, or that humans have mastered their surroundings by engaging in collective learning, or that humans have achieved behavioral modernity via advanced social structures, shared myths, and the accumulative transmission of cultural knowledge from generation to generation. I would not argue against the importance of any of these concepts for a thorough understanding of human history—intelligence, language, collective learning, advanced social structures, and all the rest, these are key elements of any cogent description of human transformation, they are the milestone markers along the highway of human change. But what I would argue against is the notion that any of these concepts is capable of explaining itself. These are not the *causes* of human history, these are simply its *effects*. These are not the *explanations* of human change, these are the changes that *need to be explained*.

Two hundred thousand years ago, humans were simply animals, no less and no more. They possessed the same general characteristics as did all the other animals. Therefore, two hundred thousand years ago, there was no intelligence, there was no language, no collective learning, no advanced social structures, no shared myths, no accumulative cultural transmission, etc., and it had been that way for millions of years. Exactly what is being suggested when one uses one of these concepts to explicate the unique events of human history, that this concept just somehow magically appeared out of thin air and from it everything else then followed? How convenient.

Consider collective learning, the ability to share, store, accumulate, and pass along information from generation to generation, the preferred solution within the discipline of Big History for explaining how humans progressed from being unremarkable primates to being unquestioned masters of the modern world (Christian, 2023). Tell me, how is collective learning supposed to work without some communicative conventions already in place, without a degree of sophisticated temporal and spatial awareness, without a prior methodology of generational permanence, and without a broadened perception for the surrounding environment that goes well beyond that which is required for survival and procreation alone? Try to imagine another wild animal species spontaneously breaking out in a fit of collective learning. Has anyone witnessed some beavers of late gathering to share the newest in dam building techniques? Who has witnessed a pack of lions comparing maps of gazelle migration patterns and then passing along the more promising routes to the kids? Collective learning already presupposes an entire layer of intricate and established technique, and therefore it is absurd to think that collective learning will just spontaneously emerge. The same is true for language, for advanced social structures, for shared myths, etc. (and I will have more to say about intelligence later on).

The question to be asked is not which of these concepts explains the rest, or which of these concepts is the most fundamental force driving human history. The question to be asked is how is it possible that any of these concepts exist at all. They did not exist throughout Earth's long biological past, and did not exist anywhere else within the entire animal kingdom, and did not exist in humans themselves for a very long period of time. How did humanity ever manage to cross that enormous divide, from possessing *none* of these productive concepts to soon possessing a plethora of them? We might not yet know the answer, but the one thing we can say for certain is that none of these concepts is capable of explaining itself. If we are looking for the root cause of human history, if we are seeking a fundamental driving force, we are going to have dig much deeper, and perhaps dig in an unusual place.

A History of Artificial Construction

To avoid speculation and to concentrate only on observable facts, the discipline of human history needs to address more thoroughly the notion of artificial construction. Artificial construction is straightforward to define: it consists of every feature found within the human environment that owes its existence to fabrication and design; that is to say, all the features that have not arisen naturally. As has been suggested, for most twenty-first century humans, their world has become a ubiquitous ocean of artificial construction—it actually takes some effort these days to find an environmental entity that is purely natural. (And do not be fooled and ask something like, what about the surrounding air? If you are currently situated inside a heated or air-conditioned room, the substance you are breathing is not exactly natural. And do not be further fooled and ask, like the academicians, what about language? Listen to a spoken four-consonant adjective, stare at a sentence typeset upon the page, contemplate a blaring horn at a roundabout, and analyze a smiling emoji—what is natural about any of these things?)

The course of artificial construction mirrors precisely the course of human history. Before the start of recent human history, there was no artificial construction of any kind at all to be found within the environment—humanity's surroundings were entirely natural, as had been the case for millions of years. And when human history did finally begin, it was heralded by an infusion of unprecedented artifacts (Zilhão, 2007). Speculate all you like about language genes and neural reconfigurations, the only tangible evidence pointing to the advent of human history is a list of items pulled mostly from the dirt: fire pits, structured bone tools, ochre pigment kits, shell bead jewelry, figurines, etc. And as human history has progressed, becoming ever more eventful and ever more complex, human artifacts have kept perfect pace, growing ever larger in number and ever greater in intricacy. Today, as human history continues to accelerate at breakneck speed and with unparalleled variety, artificial construction continues to accumulate by leaps and bounds and with unheard-of innovation (Rani & Bhardwaj, 2025). By the type of evidence we can actually hold in our own hands and see with our own eyes, human history and artificial construction are intimately linked. Therefore, a thorough chronicle of artificial construction, covering the development and the influence of items ranging all the way from animal skin clothing to the latest in quantum computing, would make for an informative endeavor, and unlike the histories focused on politics, economics, religion and the like, a history of artificial construction would be applicable and foundational to the entirety of humankind. Only King Louis and his pals were directly influenced by the festivities at Versailles, and only the proletariat suffered firsthand the hardships of the Industrial Revolution, but nearly every human being who has lived during the past many millennia has come under the immediate and constant influence of artificial construction.

There are two core aspects to be highlighted in any account of artificial construction:

1. The physical presence of the artifacts themselves, including their relative permanence and their embodiment of distinctive structural features—symmetry, patterns, repetition, number, form, and so on.
2. The significant and unrelenting influence of these artifacts upon human perception and human behavior.

A human artifact carries information via the embodiment of its underlying structure (Hilpinen, 2018), and is often capable of conveying that information across generations. This is in stark contrast to the intense immediacy of the world of survival and procreation, where almost nothing has lasting influence beyond the here and now, where nearly every piece of information is based upon biology and biological actions, and is therefore generationally ephemeral. It was noted previously that for something like collective learning to be possible at all, there would need to be some supporting and exceptional features already in place, such as a means of generational permanence and a modicum of awareness for space and time. A human artifact fits this bill. Although not necessarily built or arranged to last forever, most forms of artificial construction can easily outlive biology, and thereby establish a means for some generational permanence. And although not always associated with space and time as directly as something like a map or a calendar, most constructed artifacts, via their embodiment of features such as symmetry and repetition, at the very least *hint* at the elements upon which space and time are based. The presence of artificial construction expands the human spatial and temporal context—as is evidenced in overwhelming abundance today—and it was only when artificial construction began to appear within the human landscape that immediacy relinquished its relentless hold upon the species, opening a pathway to continuous and accumulating change.

In consequence, human perception and human behavior were never the same again. Before approximately two hundred thousand years ago, humans perceived only their natural surroundings, because of course there was nothing else to be seen, and human behavior responded accordingly, remaining locked inside the immediate and repetitive activities of survival and procreation, remaining confined to the same evolutionarily determined pursuits, day after day after day. The perceptual and behavioral changes would have been slow and subtle at first, due to the small amount of artificial construction being introduced, but even then the distinction was notable and significant. Fire pits and clothing expanded the range of where humans could live, sparking a massive geographical migration (Gilligan, 2010; Scott et al., 2016). Structured weapons altered what humans could hunt, greatly modifying territorial and dietary routines (Ben-Dor & Barkai, 2023). And ornamental jewelry, bone sculptures, cave paintings and the like, these brought with them a palpable manifestation of number, geometry, representation, etc., foundational steps on the road to using abstract language (Bentz & Dutkiewicz, 2026). And due to their durability, the number and type of human artifacts continued to accumulate within the environment, increasing their influence across the entire population. By the time of the agricultural revolution and its sudden explosion of new implements and contrivances—huts, farming tools, fences, pottery, etc.—human behavior, determined ever more frequently by these burgeoning devices, was already finding itself far removed from the species' purely animal past.

And of course it is not even necessary to rely upon the evidence of earlier ages in order to acknowledge the tremendous impact artificial construction has had upon human perception and human behavior—we can observe that impact all around us today. The number of unnatural ways in which humans now perceive their surrounding world has become legion: spectacles, hearing aids, radio, television, yardsticks, stopwatches, binoculars, infrared cameras, etc. Even something as modernly mundane as riding in a passenger automobile has had enormous influence on human perception, because who before the twentieth century could have regularly experienced a landscape whizzing past at sixty plus miles per hour, who was regularly exposed to so much visual information in such a very short period of time? These new and expanding perceptual influences, along with the constant exposure to a growing deluge of state-of-the-art constructions, these have rendered human behavior today nearly unrecognizable from any of the species' former times. Flying, photocopying, texting, golfing, ordering flip-flops online—remember, the list goes on and on. Even those behaviors that might be deemed ancient and biological in their origin—eating, drinking, mating, birthing, rearing, etc.—these are accomplished these days almost invariably with the transforming accompaniment of an unending assortment of synthetic aids—silverware, plumbing, dating apps, epidurals, diapers, etc. The dynamics underlying how artificial construction altered human behavior at the dawn of human history, those very same dynamics are in evidence all around us today, the only difference being that today's events happen far more often and far more swiftly, so often and so swiftly that we barely have time to notice.

And this perhaps constitutes the ultimate irony regarding artificial construction, that it has now become so intertwined into human experience it is easily taken for granted and often overlooked—like water to a fish, like air to a bird—and what humans today take to be "natural" is simply the ever-present collection of their artificial experiences. Drop a modern human naked and without implement into a remote African jungle, and he or she will almost certainly be at wit's end, even though this is exactly the circumstance for which he or she was evolutionarily built; but drop that same person into the middle of Manhattan with just a credit card and a robe, and life will go on with barely a hiccup, as though having been fashioned for just this occasion. Indeed, to understand just how fundamental artificial construction is to modern human experience and to recent human history, imagine what would happen if all the artificial construction were somehow suddenly removed from the entire planet. Every car, every word, every stove, every dentist chair—all of it, completely gone. And then next, suppress every human behavior that owes its existence to these removed artifacts—no driving, no talking, no cooking, no filling of cavities—not a single fabricated activity to be witnessed anywhere one looks. Ask yourself, what would then remain? The answer to this question is exceedingly simple, it is a scenario that has already been described within this essay, already been experienced by *Homo sapien*s individuals. It is the same scenario that existed approximately two hundred thousand years ago, when humans lived in an entirely biological setting, when humans perceived nothing but their natural surroundings, when humans engaged in the same survival-and-procreative behaviors as did all the other beasts. Artificial construction is the core difference—it is the *historical* difference—between the humans of a purely animal past and the humans that have produced all the unprecedented events that have happened ever since.

The histories of politics, economics, wars, nations, indigenous peoples, etc., these can indeed be informative, instructive, engaging and usually worthwhile, but they are not *fundamental* histories. They cannot ultimately explain what has happened to the human species over the last two hundred thousand years, and they cannot elucidate what is still happening to the species today, and they do not have direct relevance to the entire population. These other histories exist atop a more basic underlying dynamic structure, one that is almost never acknowledged and one that is too easily overlooked. Such shortsightedness can no longer be tolerated. The migration out of Africa, the coalescing of the Mesopotamian civilization, the Punic wars, the rise of Islam, European colonization, the landing on the moon—none of these events would have been possible without the widespread and accumulating existence of artificial construction, and none of these events are entirely understandable without reference to the nonstop and universal human engagement with synthetic and formal features in the surrounding environment. As will be discussed shortly, artificial construction is not the *cause* of human history, but it is the core element of human change, the fundamental distinction between the humans of today and the humans of a purely animal past. As such, artificial construction undergirds every single moment of human history.

The Inherent Tension

The one deficiency of the previous section is that artificial construction is not the only core element underlying recent human history. It *is* the core element of human change, but there is another fundamental feature that inherently serves to resist and to counteract this change. It is the same fundamental feature that has been there all along, predating artificial construction by literally millions of years. Despite all the environmental upheavals of the last two hundred thousand years, and despite the countless alterations to human perception and human behavior prompted by artificial construction, humans are still biological creatures, they still have biological urges and drives, and they still act as biological beasts. And as we have determined from the characteristics of biology and evolution, animals are not at all predisposed to change. Therefore, in any foundational description of human history—a description capable of characterizing the basic dynamics underlying every consequential event and of possessing direct application to the entire population—there will be three core factors that need to be addressed:

1. humanity's animal nature;
2. the accumulating impact of artificial construction;
3. the inherent tension between the two.

This ongoing tension between humanity's animal nature and the accumulating impact of artificial construction is of course inevitable, because these two influences have differing characteristics, differing backgrounds and differing objectives. Biology tends to be conservative, restrictive, and confined to the here and now, essential components in the service of survival and procreation. Artificial construction is prone to being progressive, emancipative, and spatially and temporally diffuse, the ingredients of profound change and the requisite antidote to evolutionary limitation. The push and pull from these two factors pervades nearly every critical juncture along the human historical path, from local skirmishes over scarce resources to the global cooperation of widespread trade, from the iron-fisted rule of family dynasties to uprisings for universal rights, from the savageness of sexual and territorial conquest to the binding pacts of communities and nations, from the barbarous suppressions of the Inquisition to the daring replies of scientific pioneers. Always a force tending backwards, towards the stability, the certainty, the immediate power of a familiar animal past, and always a force pushing forwards, towards growth, variation, and the anticipated reward of a more promising future.

One of the more fascinating aspects of this inherent tension is that it has been chronologically imbalanced, with one of its constituents going from being completely dominant to being nearly dominated by the other. For the longest period of time, there was of course only humanity's animal nature, and when artificial construction did finally appear within the human environment, its first daunting challenge would have been to retain its minimal foothold. The relative permanence of artificial construction certainly helps in this task, but the quintessentially effective strategy has been for artificial construction to first guise itself as the solution to humanity's basic biological demands. Over the many years, how many innovations have taken hold initially by being seen as beneficial to the species' survival-and-procreative prospects, and how many artifacts have achieved their popularity by appealing first to the species' corporeal needs? Fire, clothing and structured weapons, for instance, would have clearly boosted a population's continuance, and therefore been readily accepted despite the initial strangeness. And the majority of ancient artwork, its structure and technique quite unlike anything witnessed before, managed to make its way into the glad clutches of most ancient humans by being often sexual in representation and purpose (Høgh-Olesen, 2025), an oddly pleasing introduction to geometry and form. (Note, by the way, that this same dynamic can still be observed today, for instance in the rapid adoption of the Internet, a tool designed initially to disseminate scientific and other kinds of academic information, but employed far more frequently by the population at large for the purposes of gossip, scams and pornography (Kim, 2006).)

It was around the time of the agricultural revolution that the opposing poles of this tension began to equalize. Until that moment, humans were still living the lives of hunter-gatherers, and their gradually transforming experiences could still be characterized as being primarily brutish and primitive. But with the development of domestication and with the subsequent budding of civilizations, any bestial portrayal of the human species could no longer be held as mostly true. Humans living in houses. Humans traveling on ships. Humans writing things down. And no longer did every innovation need to justify itself by first appealing to basic biological wants. Monuments, money, music, theater, schools—what immediate bodily need did any of these elaborate constructions fulfill? But make no mistake, humanity's animal nature was still very much on extravagant display. Wars, conquests, slavery, pillage, rape, murder, rebellion, gladiatorial contests, palace intrigue, human sacrifice, animal slaughter, the constant echos and frequent reminders of a once savage and tribal existence. Always steps being taken to go forward; always steps being taken to head back.

But persistently, more steps forward than back—artificial construction began to prevail.

With the coming of the scientific revolution, and still accelerating all the way through the present day, artificial construction has become the increasingly dominant influence in nearly every human endeavor. There are very few places left on the surface of this entire planet that have not been significantly transformed by human hands—in some cases, transformed beyond recognition—and there are very few humans within the extant population whose behaviors are guided more frequently by their inner animal instincts than by the structural features accumulating all around. Yes, there are still wars, still self-serving grabs for limited resources, still jealous squabbles everywhere one looks, and there are still newborn babies being caressed by their mothers. It is accurate to say that humanity's animal nature has not actually gone anywhere at all, it still courses passionately through modern human veins. But it is also accurate to say that humanity's animal nature is no longer an equal match for a much larger and constantly expanding rival. Humankind has been mostly overrun by artificial construction, and to see this, we need only take a good look at our own activities: we drive because there are cars on the street, we shave because there are razors in the cabinet, we read because there are books on the shelf, and we find ourselves engaging in such behaviors for the vast majority of our time. By the evidence of simple observation alone, humans can now be described as less the product of their biology than they are the product of their fabricated surroundings.

There have been those who have cautioned against this trajectory. For instance, Nietzsche's major beef with Western civilization was that it was draining humanity of its animal vitality, suffocating the species' natural energies under a cascade of bureaucracy, commercial interests and moral imperatives, all major constituents of artificial construction (Nietzsche, 2013). And indeed it is now an open question, what with machine learning and other forms of artificial intelligence very much a reality, with robotics, with genetic engineering, with cybernetics and other forms of biological manipulation, and with the prospect of further technologies yet to come, is artificial construction on the verge of replacing biology entirely (See et al., 2025), will artificial construction become the sole survivor of the inherent tension? This is not the time or circumstance to debate and to decide such matters, but at the very least, we must give an overdue recognition to the rapidly encroaching influence artificial construction has had—and continues to have—on human experience and human history. From the beginnings of behavioral modernity, and increasing inexorably all the way through the present day, artificial construction has been reshaping *Homo sapiens* in a manner quite unlike anything that has happened before, changing the species in the most profound of ways and for an unknown purpose, with continuing uncertainty as to whether the ultimate outcome will be for good or for bad.

What Does Intelligence Have to Do With It?

After evolution, intelligence is probably the next most popular reason given to explain humanity's rapid transformation from wild animal to modern citizen. The idea usually expressed is that the human brain, perhaps by becoming larger, perhaps by becoming neurologically rearranged, perhaps by … well, the details do get a bit fuzzy here … but by some sufficient means, the human brain around a couple hundred thousand years ago began cranking out the words, numbers, logic, etc. that put *Homo sapiens* on its current progressive path. Or to sum the matter up in a conspicuously non-specific sentence, we owe our modern activities to the abilities of our superior human brain.

It should come as little surprise that there are a number of problems with this line of thinking, problems that go beyond just its fuzziness. The biggest issue is that such a cerebral transformation is biologically and evolutionarily implausible. Never mind the enormity of the genetic and neural alteration that would need to be involved (Toga & Thompson, 2005)—certainly more enormous than anything that has evolutionarily gone before—just consider the timeline alone. Is it being suggested that a mere two hundred thousand years ago, the human brain did not have the capacity for calculus, chemistry, quantum theory, critical thinking, etc., and then what, it suddenly did, and across the entire population? What kind of evolutionary mechanism works in this way? Or maybe that is not quite the scenario being offered, that instead, the cerebral transformations have occurred more gradually, with the first genetic/neural changes allowing for the ability to control fire and wear clothing, giving the warmer people a massive selective advantage and leading to the sudden extinction of everybody else. Later mutations then gave the human brain the ability to domesticate animals and to build permanent shelter, with those fortunate few receiving such neural upgrades rapidly killing off all their unhoused neighbors. Finally, the most recent transformations have produced neurons capable of performing multi-equation vector analysis, wave-dynamic physics, and Turing machine instruction, meaning of course that the eight billion people still managing to survive on this planet must all be MIT graduates. Or is that not exactly the lesson to be learned from eighth-grade science class (McGraw-Hill Education, 2011)?

There is no plausible biological avenue from the animal-brained humans of two hundred thousand years ago to the supposedly super-brained humans of today. In fact, there is no logical reason at all to assume that the *Homo sapiens* brains of two hundred thousand years ago were different in any significant way from the *Homo sapiens* brains working right now, the earlier lack of calculus, chemistry, quantum theory, critical thinking, etc. notwithstanding. If the humans of today are intelligent—and indeed they are, in a way that no pure animal has ever managed to be—they did not gain that intelligence organically.

The thing is, intelligence *is* a vital concept for achieving a fundamental understanding of recent human history, but only when intelligence is correctly described. There is a different way of looking at intelligence, a way that does not define it as being merely the product of dendrites and axons. Although this alternative view of intelligence certainly runs counter to prevailing opinion (Colom et al., 2010), it does possess several advantages that speak in its favor: this alternative view's characteristics are directly observable via the essential tool for measuring intelligence, the IQ test; this alternative view's timeline cleanly follows the outline of human history; this alternative view remains consistent with the phenomenon known as the Flynn effect; and this alternative view does not require any extraordinary (that is to say, implausible) physical alterations within the human skull over a very short period of time.

The key to this alternative description of intelligence is once again artificial construction. When intelligence is portrayed correctly it can be seen as simply a different aspect of the constructed surroundings in which humans now live. The symmetry, patterns, repetition, number, form, etc. that are embodied within the many fabricated objects of artificial construction, along with the human behavioral responsiveness to these synthetic features, all this constitutes the material and the operations of what is commonly labeled as human intelligence. And furthermore, all this constitutes the performance measured when one sits down to take an IQ exam. Take a good look at what an IQ exam consists of (Wechsler, 1997). There is not a single natural element upon it, not one survival-and-procreative capacity being probed. Every single question on every single intelligence test is composed entirely from the elements of artificial construction—digits, words, puzzles, matrices, geometrical patterns, etc.

When a human takes an IQ exam, what he or she is being measured for is their ability to accurately and productively interact with artificial construction, the very same type of artificial construction the test-taker will encounter nonstop in their everyday world. The concepts of artificial construction and human intelligence are essentially inseparable.

Approximately two hundred thousand years ago, when there was no artificial construction existing anywhere at all within the human environment, there was also no human intelligence. The humans of back then were displaying the same level of intelligence as were all the other animals, an amount that could be fairly labeled as zero. For instance, the humans of back then were not capable of answering—or even comprehending—a single question from a modern intelligence exam, the same that can be said of wild animals today. But the reason for this lack of intelligence was not cerebral. The human brains of that time were essentially the same as the human brains of today, so they certainly had the *capacity* to display intelligence, but the problem was that they had nothing upon which to *employ* that capacity. An ability to golf is meaningless if there are no courses to be played, and an ability to interact with artificial construction is also meaningless if there is no artificial construction around. Intelligence does not materialize without the existence of artificial construction.

When artifacts did begin to appear within the human environment, intelligence began to emerge within the species, and since artifacts are generally available to the entire population, intelligence began to emerge universally (no implausibly widespread genetic mutations or cerebral alterations required). To be sure, in addition to the fundamental role being played by artificial construction, there are neural factors involved with human intelligence—the factors that explain individual intelligence differences. And even in the earliest days of intelligence, these individual differences would have been readily apparent. In the handling of fire, in the crafting and maintenance of structured weapons and tools, in the interpretation of body art, etc., some of the population would have shown themselves as being quite masterful with these newfound artifacts, some would have betrayed themselves as being at a relative loss, and the majority would have revealed abilities falling somewhere in between, the exact same pattern of performance that appears today on modern intelligence exams. This individual capacity is known as general intelligence ability (Gottfredson, 1998), sometimes labeled as *g*, and since general intelligence ability is determined primarily by neural and genetic factors (Deary et al., 2022; Plomin & von Stumm, 2018), it is biologically and evolutionarily logical to assume that the level and distribution of general intelligence ability within the population was the same at the dawn of human history as it is right now. That is to say, general intelligence ability, along with its genetic and neural support, has not significantly changed over the last two hundred thousand years.

But human intelligence as a whole clearly *has* changed over the last two hundred thousand years. The humans of two hundred thousand years ago would not have been able to do arithmetic, they would have possessed a vocabulary less extensive and less sophisticated than a modern child's, and they would have recognized only the most basic of patterns presented to them. Today's average human can do algebra, can understand and manipulate tens of thousands of words, and can even manage to navigate a downtown traffic grid. What explains the difference? How do the humans of today display more instances of intelligence before their second cup of coffee than ancient humans did over their entire lifetime? If the difference is not cerebral, then there must be something else driving this enormous and historical growth in human intelligence, and as it happens, that something else is staring us right in the face. The difference in displayed intelligence from ancient humans to the humans of today is the amount and complexity of artificial construction existing within the human environment, an amount and complexity that was practically non-existent two hundred thousand years ago, and is overwhelmingly abundant today.

The above discussion can be captured in an equation:

measurable intelligence = general intelligence ability x artificial construction

Measurable intelligence is the equivalent of the raw score on an intelligence exam, with that exam serving as a proxy for the amount and type of artificial construction a person will routinely encounter within their everyday life. Average measurable intelligence would have been zero at any time before the start of human history, and average measurable intelligence would have been extremely low right after the start of human history, and average measurable intelligence is many orders of magnitude higher today. Unlike general intelligence ability, measurable intelligence increases over time. The form of the equation above reveals that measurable intelligence is actually the combined result of two orthogonal factors: one, *general intelligence ability*, representing biologically driven individual intelligence differences, and two, *artificial construction*, representing the amount and complexity of fabricated features to which the test-taking population is exposed. At any given moment of time, artificial construction will be roughly the same for every member of the population, and thus, any differences in raw scores on intelligence tests—that is, any differences in measurable intelligence—will be due primarily to differences in general intelligence ability. Smart people will get the high scores, indicating their superior dexterity with the artificial construction all around them, including the artificial construction contained on the exam, the not-so-smart people will get lower scores, indicating their reduced capacity for artificial construction, and the majority of the population will fall somewhere in between, performances that will mostly correspond to the relative circumstances and outcomes in these test-takers' everyday lives (Gottfredson, 2002).

But *over* time, artificial construction does not remain constant. As the number and intricacy of artifacts continues to accumulate within the human environment, artificial construction significantly increases. When later generations are assessed for their intelligence, two notable characteristics will be evident. One, the pattern of individual differences will still be the same, that is, there will still be smart people, not-so-smart people, and the majority that fall somewhere in between—the level and distribution of general intelligence ability does not deviate over time. Two, the *overall* level of intelligence will increase across the population, because the individual abilities are now being applied against a growing accumulation of artificial construction; that is to say, measurable intelligence will increase over time, due entirely to the corresponding increase in artificial construction. This increase in measurable intelligence is noticeable across even a small number of generations, and when the interval is as long as two hundred thousand years, the difference becomes stark.

This phenomenon has a name, it is called the *Flynn effect*. The first intelligence tests were invented and administered early in the twentieth century, and as that century progressed, intelligence researchers began to notice that the raw scores on these tests were significantly increasing over time. James Flynn in the 1980s published two influential papers (Flynn, 1984, 1987) that showed this phenomenon was essentially universal across the population, bringing greater attention to the phenomenon and providing an inspiration for its name. The Flynn effect has baffled scientists ever since its discovery, because it does not fit cleanly into their brain-specific theories regarding human intelligence (Rodgers, 2023). Therefore, scientists have taken to labeling the Flynn effect as a temporary aberration, one they hope and believe soon will disappear (Dutton et al., 2016; Pietschnig & Gittler, 2015). But the above analysis reveals that the Flynn effect is anything but temporary, that it has been with humanity ever since the start of human history. And since artificial construction continues to accumulate rapidly within the human environment, there is no reason to expect that the Flynn effect will end anytime soon. Scientists actually have no cause to be baffled by the Flynn effect; what they do have cause to be baffled by are their brain-specific assumptions regarding human intelligence.

The lesson to be taken from this section is that human intelligence is indeed a fundamental component underlying human history, but not if intelligence is being thought of as some biologically miraculous neuron-produced activity. Instead, intelligence is a fundamental component underlying human history because intelligence is essentially inseparable from artificial construction, the core element of human change. The progress of human history, the continuous increase in measurable intelligence—these are essentially two different aspects of the same course of events, and as such, they can shed light upon each other.

As a side note, it is interesting to contemplate some of the other kinds of "intelligences" that are often tossed about within the psychological literature (Gardner, 1987). Social "intelligence." Emotional "intelligence." Bodily-kinesthetic "intelligence." And so on. I put the word *intelligence* inside quotations for these alternative concepts because I prefer to reserve that word for the type of ability being measured via an IQ test, which, as has already been described, queries for relative dexterity with various types of artificial construction. That being said, these other so-called intelligences are not without merit or interest, they represent abilities that are often important in individuals' lives. But these other abilities are not directly connected to artificial construction, they are instead associated to that other fundamental human influence, namely humanity's animal nature. And if there were tests available to measure for social, emotional and bodily-kinesthetic abilities, such tests could have been meaningfully administered to humans well before the start of human history. As pure animals, humans were social creatures, they were emotional creatures, and they made great use of their bodily dynamics—the value of these characteristics would have been critical in those earlier days. And because humans have retained their animal nature through current times, such abilities still play a lingering role in modern human experience. But it also needs to be recognized that these lingering skills have been nearly swamped by the newcomer, that in a world that is being mostly overrun with artificial construction, and in a population the behaviors of which are being determined mostly by an endless array of synthetic interaction, no type of intelligence is more important than the standard kind, the kind that measures expertise with artificial construction.

What Does Autism Have to Do With It?

Although artificial construction serves as a core element in any fundamental description of human history, artificial construction cannot serve as human history's cause. It remains unexplained how and why artificial construction even began, and what is it that allows artificial construction to continue, and why is it that it occurs only within the environment of the human species and not within any other. A preliminary answer to these questions leans on a topic that must at first glance seem to be entirely unrelated, perhaps even outrageously so, but this is only because the topic has been so badly misunderstood. The origin of human history, the driver of human history's transformational course, and the reason for humanity's atypicality is to be found in a more accurate description of the condition known as autism.

Artificial construction is distinguished by its underlying structural features, the pronounced embodiment of such concepts as symmetry, patterns, repetition, number, form, etc. Nature as well contains many instances of these structural concepts, for instance in the regularities of celestial motion and in the gravity-induced shapes of plants and trees. Nonetheless, the biological world has never appeared to take any notice of these underlying structural features. So compulsory are the demands of survival and procreation that biological perception never gets much beyond immediate need. From an organism's sensory field, the only elements that tend to stand out and get attention are instances of food and water, objects of potential danger, possible sexual targets, and so on, and any extraneous scrutiny given to such items as patterns and symmetries will be in most instances evolutionarily unproductive and therefore weeded out. This is why animal existence is so repetitive across every species—every organism is perceiving the exact same class of objects from its surrounding environment, and is behaving correspondingly in nearly the exact same way. Biological perception is tightly restricted—there is no leeway for such things as symmetry, patterns, repetition, number, form, etc.

Prominent within the class of biological perceptual targets are conspecifics, the other members of one's own species. Almost every organism possesses a strong perceptual bias for its population brethren and their various activities (Lickliter, 1991; Nunes et al., 2020). Lions perceive mostly other lions, honeybees perceive mostly other honeybees, etc. There is a clear evolutionary reason for this type of perceptual bias, for if an organism did not have a natural tendency to focus upon and to give rapt attention to the other members of its own species—that is, if conspecifics were just some part of the nondescript sensory background—then how likely would it be to stumble upon a sexual mate, how could offspring be tracked and cared for, what would foster pack hunting and what might support group defense? A perceptual bias for conspecifics is an essential factor in the survival-and-procreative prospects of nearly every animal species, and is especially apparent in those species that are depicted as being social, including our own.

The reason for my emphasis on conspecific perception is because it is precisely with reference to this notion that autism can be correctly described. Most human individuals (roughly ninety-eight to ninety-nine percent of the population) have a normal experience with conspecific perception, an experience that is readily apparent from the earliest years of life. Non-autistic children give preferred attention to human faces, human voices, human touch, human smells, and non-autistic children are drawn to following human activities and mimicking human behavior (Mottron & Gagnon, 2023). This conspecific bias helps ground the non-autistic child's sensory world, providing the necessary guidance in determining which items in the sensory field need to be brought to the perceptual foreground, and which items can be safely ignored. This sensory grounding in turn provides the basis for further developmental progress, with the child following various forms of human lead into more complex encounters with a broader human environment. This is the *typical* form of sensory and perceptual development, determined in large degree by conspecific bias, and it is as old as biology itself. But because it is as old as biology itself, it is also quite constrictive. Before the start of human history, when humans were still pure animals, typical sensory and perceptual development would have guided human individuals into a typical animal existence—eating and drinking, fighting and fleeing, mating and rearing, day after day after day, with no extra room for symmetry, patterns, repetition, number, form, etc.

Autism is most accurately and fundamentally described as a significant lack of conspecific perception, a clear non-bias for the members of one's own species, a condition experienced today by perhaps a little more than one percent of the human population (Mottron et al., 2025). The first indication that a child is likely to be autistic is his or her diminished attention for and interaction with the human features in the surrounding environment. Non-responsiveness to human voices. Odd sensitivity to human touch. Lack of joint attentive and other shared activities. Whereas the non-autistic child reacts with readiness and glee to nearby humans and their various endeavors, the autistic child appears to be mostly unaware of everything human around them.

The consequences of a significant lack of conspecific perception are profound. The most basic consequence is that the typical path of sensory and perceptual development is now closed. Since conspecific humans and their associated features do not emerge predominantly from an autistic child's sensory field, his or her sensory world will first be experienced as something more akin to an unorganized sensory chaos. That is to say, there will be a significant lack of sensory grounding. No impressions will easily stand out, no sensations will fade naturally into the perceptual background, every sensory element will retain essentially equal sensory footing, with the result often being a mix of assorted sensory difficulties—hypersensitivity, hyposensitivity, synesthesia (Hazen et al., 2014; Kern et al., 2006). If an autistic child gets stuck in this circumstance, his or her developmental prospects will almost certainly be grim, and sadly, there are such cases. But fortunately, there is also an out from this circumstance, and most autistic children, at least to some degree, will take advantage of it, with far-reaching and atypical ramifications for the entire species.

There are two distinct ways to break a sensory chaos. The first way is the time-honored biological way, headlined by conspecific perception, whereby an organism gives perceptual bias to the survival-and-procreative features within its sensory field, including a perceptual bias for the other members of its own species. This approach has a clear evolutionary advantage, but it also comes at a cost, for it restricts an organism's perceptions and behaviors to only those items and activities that have immediate survival-and-procreative consequence, leaving the organism nearly oblivious to everything else. The second way to break a sensory chaos is to focus on the environment's inherent underlying structure, giving preferred attention to those surrounding features that can serve to break the background noise. Concepts such as symmetry, patterns, repetition, number, form, etc., they all have one characteristic in common, they are antithetical to randomness and chaos, they are the contrast to background noise. And any organism that takes this second path to breaking its sensory chaos will find itself with access to a structural world that has gone almost entirely unnoticed by the biological kingdom for nearly four billion years.

An autistic child, cut off from the typical and biological way of overcoming his or her sensory chaos, will do the next best thing, honing in on those inherent structural features that can be found in the surrounding environment. The evidence for this approach can be found in the many atypical activities of autistic children: staring at ceiling fans, repetitive humming, flicking light switches, lining up toys, watching the same video over and over, etc., activities that can be characterized by the prominent attention being given to underlying structural features (Jacques et al., 2018). These so-called repetitive behaviors and interests are not disorders—in fact, just the opposite—and they are not something that needs to be cured. They are instead the necessary attempts to bring organization and grounding to an autistic child's sensory world, and to the extent these attempts are successful, they break the child's sensory chaos and open a door to further developmental progress—not *typical* developmental progress, but progress nonetheless, progress based not primarily upon the conspecific humans around them, but instead upon symmetry, patterns, repetition, number, form, etc.

There is a straightforward corollary that arises from this description of autism: human history, marked by its increasing reliance upon environmental structure and form, began when autism gained a significant foothold within the population, providing the necessary and sufficient means for the development of artificial construction.

Something had to begin the process, and the long unproductive reach of biological time shows that typical perceptions and behaviors are not adequate to the task, that something thoroughly atypical is needed instead. And the natural autistic tendency to focus upon the structural features in the surrounding environment is the key to opening new perceptual and behavioral doors. We do not have enough data to describe in detail how this might have played out in the earliest days, but we can assume that the autistic individuals within the human population would have been taking particular notice of the structural features provided by nature—the symmetries of mountains and trees, the regularities of celestial paths, the repetitiveness of meteorological seasons, and so on—and would have been attempting to recreate these features in various guises, the same way we witness autistic children today repurposing toys and other objects in unusually creative and structural ways. Here would have been the origin of the very first artifacts, and although some of these artifacts would have been quickly forgotten and discarded, others would have proven to be quite useful, and not just to autistic individuals. The non-autistic members of the population, naturally inclined to take notice of other humans and of what other humans do, would have found themselves curious about the odd behaviors and unusual constructions they were witnessing. And to the degree that these new behaviors and new constructions served survival-and-procreative purposes, the non-autistic members of the population would have been more than glad to adopt these behaviors and constructions for themselves, by copying, by promulgating, by improving. Thus would have begun a productive symbiotic relationship between the autistic and non-autistic members of the human population, a relationship that has spawned a continuous increase in the amount of structure being introduced into the human environment, thereby fueling artificial construction and the events of human history.

That symbiotic relationship continues unabated through the present day. The twenty-first century provides an intriguing laboratory for the observation of autistic and non-autistic influences upon the human species. Non-autistic individuals still receive their developmental start primarily through conspecific bias and through interpersonal connection, but in an environment now nearly dominated by artificial construction, non-autistic individuals quickly find that their human companions are leading them ever more frequently into a never-ending relationship with symmetry, patterns, repetition, number, form, etc. That is to say, non-autistic individuals quickly discover what it is like to experience an autistic style of perception, and although this style of perception will not be natural in the biological sense, it will soon become "natural" in a different sense, the sense of being constantly there. Therefore, as adults, non-autistic individuals reflect a provocative blend of two very different sources of influence, the non-autistically themed impact of humanity's animal nature and the autistically themed impact of artificial construction. The push-pull within each individual from these two sources of influence mirrors the push-pull driving the course of events for the entire human species.

At the same time, most autistic individuals today experience these same two influences, especially as adults, having arrived at them through a slower and inverse course of development. Unfortunately, autistic individuals must also suffer through a third kind of influence, one that is proving to be quite detrimental. The recognition of autism beginning in the mid-twentieth century can be described in some ways as an unfortunate event. Before then, those autistic individuals achieving a degree of developmental progress, despite their quirkiness and their relative lack of the standard social graces, blended in reasonably well with the rest of the population, their unusual perceptions and behaviors still contributing in ways both big and small to the ongoing accumulation of artificial construction (think for instance of both the atypical personalities and the fundamental innovations behind such names as Newton, Einstein, Darwin, Cantor, Turing, etc. (James, 2003; Snyder, 2004)). But with the overt recognition of autism came also a terrible misunderstanding, the widespread and unevidenced belief that autism is a dire medical condition, one in need of both treatment and cure. More than a half century's worth of research and effort along these lines has proven to be utterly fruitless (Brignell et al., 2018; Myers et al., 2020; Parellada et al., 2023; Sandbank et al., 2020; Whitehouse et al., 2021), but nonetheless, too many autistic children today are being routinely subjected to a stunning array of stifling interventions, everything from stupefying drugs to mindless ABA, all inhibitors to natural autistic development.

Listen, autistic individuals who are in need of extra care should receive extra care, but no autistic individual deserves anything less than full dignity and a correct understanding. Autistic individuals are not sick, they are not disordered, they are not non-autistic individuals trying to get out. Autistic individuals simply are who they are, organisms without a strong perceptual bias for the conspecific humans around them. This does leave them evolutionarily vulnerable and it does force them into an alternative and slower course of development, but it has also helped them create a stunning new environment in which these disadvantages mostly disappear. Without the significant presence of autism within the human population, *Homo sapiens* would still be a pure animal species, would still be oblivious to the environment's underlying structure, would still be bereft of artificial construction, and would still not possess a single ounce of intelligence. To the extent that humanity enjoys the benefits of its modern circumstances, humanity needs to accept the following fact: autistic individuals are not in need of treatment and cure, they are instead in need of appreciation.

One question that remains unanswered is, why the human species? Why not for instance Asian badgers? There is nothing about a lack of conspecific perceptual bias that is necessarily human, it is reasonable to expect that autistic organisms must appear also from time to time within other species. But it is also clear that autism is evolutionarily disadvantaged, that its characteristics are contradictory to survival-and-procreative prospects, especially under the often brutal conditions of the natural world. It can be hypothesized that over the hundreds of millions of years of previous biological existence, autism never gained a significant foothold within any other species, not significant enough to catalyze the initiation of artificial construction. Therefore, the real question to be asked is, what is it about *Homo sapiens* that has allowed autism to reach a meaningful and sustainable presence within the population? Admittedly, the picture is rather murky here, but one possibility to consider is that the gestational peculiarities of the human species provided special impetus to give extra care to its newborns, including its autistic newborns, thereby allowing an autistic foothold to be gained. Due to their transition to bipedalism and the resulting narrowing of the female birth canal, humans are born quite early relative to their full gestational needs, and human infants are quite helpless in their first year or two of life (Mitteroecker & Fischer, 2023). This, combined with the fact that humans are born usually just one at a time, means that a great deal of investment is made in each individual before maturity is gained, providing increased motivation to see that investment through. Most animal species produce far more offspring than are needed to sustain their population numbers, with little care being given to help the evolutionarily weaker, including any autistic offspring. The human species on the other hand cannot afford to be so profligate with its next generation, with the result being an unusually protective harboring of *all* its infants, including those of an autistic bent. We can witness this extra care still being expressed today, with time and effort being doled out as needed for nearly every human child, including those not following a typical developmental course.

That extra time and effort has paid dividends. By supporting a significant presence of autistic individuals within its population, the human species has gained a new perspective upon its surrounding world—a structural perspective—and by taking advantage of the artificial construction this new perspective brings, the species has broken the perceptual and behavioral chains long imposed by biology and evolution.

Conclusion

The history of the human species over the last two hundred thousand years has been an extraordinary occurrence, quite unlike anything witnessed before upon the planet Earth, and it remains an open question whether similar events can take place in other corners of the universe and what that might ultimately mean.

To continue their history and to carve their destiny successfully, humans will need to better understand themselves, and this effort will require greater awareness of the fundamental forces that have been driving human change. The explanations for human history offered to date have not been nearly adequate—they suffer from biological implausibility and from not being germane to the problem at hand, leaving too many essential details unspecified. The alternative description of human history that has been offered within this essay will no doubt sound strange to the early twenty-first century ear—it is after all an atypical solution meant to fit an atypical phenomenon. But this solution does attempt to get at the heart of the matter, and it does specify the key roles played by artificial construction, intelligence and autism, and it does not rely upon any biological magic.

Having an accurate and deep understanding of human history is important, if for no other reason than this: given the rapidly accelerating pace of historical events, given the rapidly accelerating accumulation of artificial construction, and given the rapidly accelerating advancement of human intelligence, the climax of human history is surely upon us soon.

References

Baker, D. (2014). Standing on the shoulders of giants: Collective learning as a key concept in Big History. In L. Grinin, D. Baker, E. Quaedackers, & A. Korotayev (Eds.), *Teaching and researching Big History: Exploring a new scholarly field* (pp. 41-64). Uchitel Publishing House.

Ben-Dor, M. & Barkai, R. (2023). The Evolution of Paleolithic Hunting Weapons: A Response to Declining Prey Size. *Quaternary. 6*. 46. https://doi.org/10.3390/quat6030046

Bentz, C., & Dutkiewicz, E. (2026). Humans 40,000 y ago developed a system of conventional signs. *Proceedings of the National Academy of Sciences of the United States of America*, *123*(9), e2520385123. https://doi.org/10.1073/pnas.2520385123

Bingham, P.M. (2000), Human evolution and human history: A complete theory. Evol. Anthropol., 9: 248-257. https://doi.org/10.1002/1520-6505(2000)9:6<248::AID-EVAN1003>3.0.CO;2-X

Blackmore, S. (2001). Evolution and memes: The human brain as a selective imitation device. *Cybernetics & Systems, 32*(1-2), 225–255. https://doi.org/10.1080/019697201300001867

Brignell, A., Chenausky, K. V., Song, H., Zhu, J., Suo, C., & Morgan, A. T. (2018). Communication interventions for autism spectrum disorder in minimally verbal children. *The Cochrane database of systematic reviews*, *11*(11), CD012324. https://doi.org/10.1002/14651858.CD012324.pub2

Brodie, R. (1996). *Virus of the mind: The new science of the meme*. Integral Press.

Christian, D. (2018). *Origin story: a big history of everything.* First edition. New York, Little, Brown and Company.

Christian, D. (2023). The Trajectory of Human History. Historical Social Research / Historische Sozialforschung, 48(1 (183)), 62–83. https://doi.org/10.12759/hsr.48.2023.04

Colom, R., Karama, S., Jung, R. E., & Haier, R. J. (2010). Human intelligence and brain networks. *Dialogues in clinical neuroscience*, *12*(4), 489–501. https://doi.org/10.31887/DCNS.2010.12.4/rcolom

Deary, I. J., Cox, S. R., & Hill, W. D. (2022). Genetic variation, brain, and intelligence differences. *Molecular psychiatry*, *27*(1), 335–353. https://doi.org/10.1038/s41380-021-01027-y

DeSalle, R., Lepski, G., Arévalo, A., Bobo, D., LaVergne, N., Miyagawa, S., & Tattersall, I. (2026). Natural selection and language genes in humans. *Scientific Reports*. https://doi.org/10.1038/s41598-026-39032-2

Diamond, J. (1997). *Guns, germs, and steel: The fates of human societies*. W.W. Norton & Company.

Dutton, E., van der Linden, D., & Lynn, R. (2016). The negative Flynn Effect: A systematic literature review. *Intelligence, 59,* 163–169. https://doi.org/10.1016/j.intell.2016.10.002

Finkel, M., & Lamm, E. (2025). Cultural evolution beyond the individual: What human collective knowledge adds to high fidelity copying. *Biology & Philosophy*, *40*(3), Article 15. https://doi.org/10.1007/s10539-025-09982-4

Flynn, J. R. (1984). The mean IQ of Americans: Massive gains 1932 to 1978. *Psychological Bulletin, 95*(1), 29–51. https://doi.org/10.1037/0033-2909.95.1.29

Flynn, J. R. (1987). Massive IQ gains in 14 nations: What IQ tests really measure. *Psychological Bulletin, 101*(2), 171–191. https://doi.org/10.1037/0033-2909.101.2.171

Gardner, H. (1987). The Theory of Multiple Intelligences. *Annals of Dyslexia*, *37,* 19–35. http://www.jstor.org/stable/23769277

Gee, H. (2021). *A (very) short history of life on earth: 4.6 billion years in 12 pivotal moments*. St. Martin's Press.

Gilligan, I. (2010). The Prehistoric Development of Clothing: Archaeological Implications of a Thermal Model. *Journal of Archaeological Method and Theory*, *17*(1), 15-80. https://www.jstor.org/stable/25653129

Gottfredson, L. S. (1998). The general intelligence factor. *Scientific American Presents, 9*, 24-29.

Gottfredson, L. S. (2002). *g*: Highly general and highly practical. In R. J. Sternberg & E. L. Grigorenko (Eds.), *The general factor of intelligence: How general is it?* (pp. 331–380). Lawrence Erlbaum Associates Publishers.

Gravel-Miguel, C., & Coward, F. (2024). Palaeolithic Social Networks and Behavioural Modernity. In T. Brughmans, B. Mills, J. Munson, & M. Peeples (Eds.), *The Oxford Handbook of Archaeological Network*

Research (pp. 433–458). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198854265.013.23

Harari, Y. N. (2015). *Sapiens: A brief history of humankind*. HarperCollins.

Hazen, E. P., Stornelli, J. L., O'Rourke, J. A., Koesterer, K., & McDougle, C. J. (2014). Sensory symptoms in autism spectrum disorders. *Harvard review of psychiatry*, *22*(2), 112–124. https://doi.org/10.1097/01.HRP.0000445143.08773.58

Hilpinen, R. (2018). Artifact. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Spring 2018 ed.). https://plato.stanford.edu/archives/spr2018/entries/artifact/

Hofman, M. A. (2014). Evolution of the human brain: when bigger is better. *Frontiers in Neuroanatomy*, *8*, 15. https://doi.org/10.3389/fnana.2014.00015

Horgan, J. (1996). *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age*. Addison-Wesley.

Høgh-Olesen, H. (2025). The venus figurines of the upper paleolithic as sexual power objects: The first fetishing of the female body in human imaginative culture. *Evolutionary Behavioral Sciences, 19*(1), 14–27. https://doi.org/10.1037/ebs0000341

Jacques, C., Courchesne, V., Meilleur, A.-A. S., Mineau, S., Ferguson, S., Cousineau, D., Labbe, A., Dawson, M., & Mottron, L. (2018). What interests young autistic children? An exploratory study of object exploration and repetitive behavior. *PLoS ONE, 13*(12), Article e0209251. https://doi.org/10.1371/journal.pone.0209251

James I. (2003). Singular scientists. *Journal of the Royal Society of Medicine*, *96*(1), 36–39. https://doi.org/10.1177/014107680309600112

Kaiser, D. (2020). Why students have turned away from history. The James G. Martin Center for Academic Renewal, June 10, 2020. https://www.jamesgmartin.center/2020/06/why-students-have-turned-away-from-history/

Kern, J. K., Trivedi, M. H., Garver, C. R., Grannemann, B. D., Andrews, A. A., Savla, J. S., Johnson, D. G., Mehta, J. A., & Schroeder, J. L. (2006). The pattern of sensory processing abnormalities in autism. *Autism : the international journal of research and practice*, *10*(5), 480–494. https://doi.org/10.1177/1362361306066564

Kim, W. (2006). Trends in the uses of the Internet — 2006. *Journal of Object Technology*, *5*(2), 55-69. https://www.jot.fm/issues/issue_2006_03/column6

Klein, R. (2002). *The Dawn of Human Culture*. New York: Wiley.

Klein, R. G. (2009). *The human career: Human biological and cultural origins*. University of Chicago Press.

Kurzban, R. (2010). *Why everyone (else) is a hypocrite: Evolution and the modular mind*. Princeton University Press.

Lickliter, R. (1991). Context and animal behavior: II. The role of conspecifics in species-typical perceptual development. *Ecological Psychology, 3*(1), 11–23. https://doi.org/10.1207/s15326969eco0301_1

McGraw-Hill Education. (2011). Glencoe integrated iScience, Course 3, Grade 8, student edition. McGraw-Hill.

Mitteroecker, P., & Fischer, B. (2023). Evolution of the human birth canal. *American Journal of Obstetrics and Gynecology*, *230*(3S), S841-S855. https://doi.org/10.1016/j.ajog.2022.09.010

Mottron, L., & Gagnon, D. (2023). Prototypical autism: New diagnostic criteria and asymmetrical bifurcation model. *Acta psychologica*, *237*, 103938. https://doi.org/10.1016/j.actpsy.2023.103938

Mottron, L., Lavigne-Champagne, A., Bernhardt, B., Dumas, G., Jacquemont, S., & Gagnon, D. (2025). Asymmetric developmental bifurcations in polarized environments: a new class of human variants, which may include autism. *Molecular Psychiatry*, 30, 6155–6164. https://doi.org/10.1038/s41380-025-03275-8

Muttarak, R. & Wilde, J. (eds.) (2022). *The World at 8 Billion*. New York: Population Council.

Myers, S. M., Challman, T. D., Bernier, R., Bourgeron, T., Chung, W. K., Constantino, J. N., Eichler, E. E., Jacquemont, S., Miller, D. T., Mitchell, K. J., Zoghbi, H. Y., Martin, C. L., & Ledbetter, D. H. (2020). Insufficient Evidence for "Autism-Specific" Genes. *American journal of human genetics*, *106*(5), 587–595. https://doi.org/10.1016/j.ajhg.2020.04.004

Nietzsche, F. (2013). *On the genealogy of morals* (R. C. Holub, Ed.; M. A. Scarpitti, Trans.). Penguin Classics.

Nunes, A. R., Carreira, L., Anbalagan, S., Blechman, J., Levkowitz, G., & Oliveira, R. F. (2020). Perceptual mechanisms of social affiliation in zebrafish. *Scientific reports*, *10*(1), 3642. https://doi.org/10.1038/s41598-020-60154-8

Parellada, M., Andreu-Bernabeu, Á., Burdeus, M., San José Cáceres, A., Urbiola, E., Carpenter, L. L., Kraguljac, N. V., McDonald, W. M., Nemeroff, C. B., Rodriguez, C. I., Widge, A. S., State, M. W., & Sanders, S. J. (2023). In Search of Biomarkers to Guide Interventions in Autism Spectrum Disorder: A Systematic Review. *The American journal of psychiatry*, *180*(1), 23–40. https://doi.org/10.1176/appi.ajp.21100992

Pietschnig, J., & Gittler, G. (2015). A reversal of the Flynn effect for spatial perception in German-speaking countries: Evidence from a cross-temporal IRT-based meta-analysis (1977–2014). *Intelligence, 53,* 145–153. https://doi.org/10.1016/j.intell.2015.10.004

Pinker, S. (1994). *The language instinct: How the mind creates language*. William Morrow & Co.

Plomin, R., & von Stumm, S. (2018). The new genetics of intelligence. *Nature reviews. Genetics*, *19*(3), 148–159. https://doi.org/10.1038/nrg.2017.104

Rani, P., & Bhardwaj, R. (2025). The Future of Innovation: How emerging technologies are shaping tomorrow. *International Journal of Applied and Behavioral Sciences*, 2(1), 181–186. https://doi.org/10.70388/ijabs250117

Ratra, B., & Vogeley, M. S. (2008). The beginning and evolution of the universe. *Publications of the Astronomical Society of the Pacific, 120*(865), 235–265. https://doi.org/10.1086/529495

Richerson, P. J., & Boyd, R. (2005). *Not by genes alone: How culture transformed human evolution*. The University of Chicago Press.

Rodgers, J. (2023). Eleven articles and 27 authors pay tribute to James Flynn: A summary and critique of special issue articles on the Flynn effect. *Intelligence, 101*. https://doi.org/10.1016/j.intell.2023.101794

Rohde, K. (Ed.). (2013). *The Balance of Nature and Human Impact*. Cambridge: Cambridge University Press.

Sandbank, M., Bottema-Beutel, K., Crowley, S., Cassidy, M., Dunham, K., Feldman, J. I., Crank, J., Albarran, S. A., Raj, S., Mahbub, P., & Woynaroski, T. G. (2020). Project AIM: Autism intervention meta-analysis for studies of young children. *Psychological bulletin*, *146*(1), 1–29. https://doi.org/10.1037/bul0000215

Scott, A. C., Chaloner, W. G., Belcher, C. M., & Roos, C. I. (2016). The interaction of fire and mankind: Introduction. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, *371*(1696), 20150162. https://doi.org/10.1098/rstb.2015.0162

See, J. E., Gilpin-McMinn, J., Dorton, S. L., Cooke, N. J., Lee, J. D., Lau, N., & Li, R. (2025). Are humans still necessary? Expanding the discussion. *Ergonomics*, 1–16. https://doi.org/10.1080/00140139.2025.2496949

Snyder, A. (2004). Autistic genius?. *Nature 428*, 470–471. https://doi.org/10.1038/428470a

Sterelny K. (2011). From hominins to humans: how sapiens became behaviourally modern. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 366*(1566), 809–822. https://doi.org/10.1098/rstb.2010.0301

Toga, A. W., & Thompson, P. M. (2005). Genetics of brain structure and intelligence. *Annual review of neuroscience*, *28*, 1–23. https://doi.org/10.1146/annurev.neuro.28.061604.135655

Wechsler, D. (1997). *WAIS-III administration and scoring manual*. The Psychological Corporation, San Antonio, TX.

Wells, H. G. (1920). *The outline of history: Being a plain history of life and mankind*. The Macmillan Company.

Whitehouse, A., Varcin, K., Waddington, H., Sulek, R., Bent, C., Ashburner, J., Eapen, V., Goodall, E., Hudry, K., Roberts, J., Silove, N., Trembath, D. (2021). Interventions for children on the autism spectrum: A synthesis of research evidence. Autism CRC, Brisbane. http://hdl.handle.net/10072/422341

Zilhão, J. (2007). The emergence of ornaments and art: An archaeological perspective on the origins of “behavioral modernity”. *Journal of Archaeological Research, 15*(1), 1–54. https://doi.org/10.1007/s10814-006-9008-1