

## Autism, Psychosis, and the “Two Cultures”

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C. P. SNOW RECONSIDERED IN LIGHT OF RECENT THEORIES ABOUT MENTALISTIC COGNITION

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For in order to draw a limit to thinking, we should have to be able to think both sides of this limit.

—Wittgenstein, *Tractatus Logico-Philosophicus*

“Literary intellectuals at one pole—at the other scientists, and as the most representative, physical scientists.” So begins the most cited passage in C. P. Snow’s famous 1959 lecture on “The Two Cultures and the Scientific Revolution.” Snow continues: “Between the two, a gulf of mutual incomprehension—sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding. They have a curious distorted image of each other. Their attitudes are so different that, even on the level of emotion, they can’t find much common ground.”<sup>1</sup> Over the ensuing decades, Snow’s lecture has elicited impassioned commentary from intellectual luminaries such as the literary critic F. R. Leavis and the evolutionary biologist Stephen Jay Gould. The academic culture wars of the eighties and nineties were in many ways a reenactment of this feud. Partisans on each side intoned their shibboleths proudly, like battle cries, until one day this polarization coalesced, farcically and irrevocably, in the form of Alan Sokal’s *Social Text* hoax.<sup>2</sup>

But what if this divide between literary intellectuals and physical scientists were more than just a clash of cultures? What if we got off on the wrong foot by framing the problem in terms of a vague and unquestioned, yet historically contingent concept of “culture”? Biological anthropologists and psychologists have, for some time now, promulgated the view that biology and culture are inextricably intertwined, and that they may in some cases co-evolve.<sup>3</sup> I propose that

we begin to reexamine the bio-psychological dimension of the intellectual divide. If we were to take a randomized sample of healthy adults, we would likely find a *non-random* distribution of cognitive tendencies, particularly in areas that would “tip” an individual one way or the other, toward physics and chemistry or poetry and history. It is also likely that we would find a strong genetic component to these tendencies (and possibly even epigenetic factors such as maternal stress during pregnancy).

The pattern I would suggest as the leading candidate is a spectrum (or continuum) ranging from “mechanistic” to “mentalistic” thinking. Bernard Crespi and Christopher Badcock have proposed this distribution of cognitive tendencies as part of a larger hypothesis on autism and psychosis.<sup>4</sup> It is embedded in their more controversial claim about a process called *genomic imprinting*, which they believe is responsible for the spectrum of cognitive styles in the population. I will comment briefly on the genetic aspect later, but my primary focus is the potential conceptual payoff of this “spectrum,” as well as its place in the debate from which it emerges. The idea of such a distribution of tendencies is more or less intuitive, but we should see it against the backdrop of recent findings on autism and psychosis; these extremes may shed light on cognitive tendencies that also exist among “normal” people.

For those who may be unfamiliar with the subject, I offer a few brief remarks. This set of ideas emerged from the ever-growing body of literature on autism spectrum disorders (ASD), and in particular that branch of research that inquires into “Theory of Mind”—our innate ability to intuit and feel, automatically, the mental states of other people. Autistic people have difficulty apprehending other minds, though they may learn to do so with extensive practice. In such cases, they learn to deduce the thoughts and feelings of others through circuitous, conscious reasoning, but often without the appropriate emotional response. In addition to the obvious clinical importance of autism research, ongoing interest in this topic also stems from the evolutionary implications of such a faculty: the ability to gauge the emotional and intentional states of others would most certainly be adaptive in a hyper-social species, and we would expect to find specialized circuitry designated for this purpose.<sup>5</sup>

Because of the problematic connotations of the word *theory*, many researchers have adopted terms such as *mentalizing* or *mind-reading* to refer to our everyday inferences about other minds. Mentalizing is the immediate and automatic intuition that the person before you has an inner life—emotions, thoughts, and volition—even though the *exact* content of the other’s thoughts and feelings may remain a mystery. It is possible to misinterpret the meaning of another’s body language, but it is exceedingly difficult, if not impossible, to interpret it as signifying *no* state of mind whatsoever. To borrow an example from Lisa Zunshine, we might see tears on a friend’s face and misinterpret them as tears of joy or sadness, but we cannot escape the automatic “inference” that it represents some internal state of affairs; the autistic person, by contrast, has difficulty inferring any emotion or internal state at all.<sup>6</sup> Temple Grandin, the most famous highly functioning person with autism, has given us a poignant account of her difficulties in decoding the outward signs (facial expressions, vocal inflections) of complex social emotions such as jealousy, compassion, annoyance, and so forth.<sup>7</sup>

The developmental psychologist Simon Baron-Cohen provided an early and sustained presentation of the idea that autism is characteristically a deficit in Theory of Mind.<sup>8</sup> More recently, Baron-Cohen has argued that autism may be an instance of the “extreme male brain.”<sup>9</sup> His general hypothesis is that the “male” brain is wired for system building or “systemizing,” while the “female”

brain is wired for empathizing. This does not mean, however, that sex determines brain type: some women are better at systemizing than some men, and some men are better at empathizing than some women. What it does mean is that, *on average*, women receive slightly higher scores on psychological tests for empathy, and men on average receive slightly higher scores on tests for systemizing. (Imagine two overlapping bell curves with staggered peaks. The offset peaks would represent the averages, and the overlapping area would represent the “exceptions.”<sup>10</sup>)

So what are empathizing and systemizing? Empathizing is “the drive to identify another person’s emotions and thoughts, and to respond to them with an appropriate emotional response.” Unlike the cold, non-empathic calculation of the psychopath, true empathizing occurs when we “feel an appropriate emotional reaction” to the emotions of others, and when we try to “connect or resonate with [others] emotionally.”<sup>11</sup> Systemizing, by contrast, is “the drive to analyze, explore, and construct a system. The systemizer intuitively figures out how things work, or extracts the underlying rules that govern the behavior of a system.” The caveat here is that a system need not be a machine, though this is the most obvious example; systems might also include a cup of water, a lake, a piece of music, a company, or a political organization. A system is “anything which is governed by rules specifying input-operation-output relationships.”<sup>12</sup> After presenting evidence for gender differences with respect to empathizing and systemizing, Baron-Cohen goes on to argue that autism is an extreme manifestation of the “male,” systemizing brain, with heightened powers of systemizing and severely diminished powers of empathy.<sup>13</sup>

In recent years, the biologist Bernard Crespi and the sociologist Christopher Badcock have attempted to revise and extend Baron-Cohen’s pioneering work in interesting ways. They suggest that autistic spectrum disorders (ASD) are the diametric opposite of psychotic spectrum disorders (PSD), and that these disorders lie along a broader cognitive spectrum with normality in the middle.<sup>14</sup> Crespi and Badcock revise the conceptual axis around which Baron-Cohen’s thesis turns: in place of the terms *systemizing* and *empathizing*, they suggest *mechanistic* and *mentalist*. On this schema, *an excess of mechanistic cognition and a deficit of mentalism* characterize autism, whereas psychosis exhibits the reverse—*a deficit of mechanistic cognition and an excess of mentalism*. Though Baron-Cohen considers various forms of psychosis as possible candidates for the extreme “female brain,” the category of empathy rules out most of these: psychotic spectrum disorders encompass highly mentalistic traits, but not empathy per se. Thus his treatment of psychosis remains tentative and provisional, and his analysis quickly returns to the more familiar ground of autism.<sup>15</sup> Let us consider, then, the reasons for revising the dichotomy of systemizing and empathizing.

Badcock argues that “mechanistic” is preferable to “systemizing,” because systemizing implies a top-down approach—an awareness of the whole that is often missing in people with ASD. One autistic savant purportedly possesses the lexical vocabulary of sixteen languages, but translates from one to the other word-for-word and “like an automaton,” without any grasp of the whole sentence. Contrast this with the method of more holistic translators such as Sigmund Freud, who would read a passage, close the book, and then consider “how a German writer would have clothed the same thoughts.”<sup>16</sup> The holistic translator, then, is in fact working systematically without being mechanistic. He or she does consider an input, an operation, and an output, but then goes on to ask: What is the *gist* of the whole? How can I best impart the tone, style, and intent of the original? (Local inaccuracies are sometimes justified in the name of holistic fidelity to the spirit of the text.)

Similarly, Badcock suggests that a deficit in mentalism, not empathy, may be the defining feature in ASD. He points out that Temple Grandin appears capable of empathizing quite well with animals, but not with human beings. Based on her work with farm animals, Grandin writes: “I have a sensory empathy for cattle. When they remain calm I feel calm, and when something goes wrong that causes pain, I feel their pain.”<sup>17</sup> Badcock cites other examples of autistics who report something like a subjective experience of empathy, but lack insight into the source of those other emotions. Grandin also writes that she understands only simple emotions such as fear, anger, happiness, and sadness; but when it comes to subtler, complex social emotions, she describes being mystified by the invisible “electricity” or “telepathy” that seems to exist among people.<sup>18</sup> These examples suggest “that it is the *mentalist* aspect of being able to empathize with other human beings that is lacking in autism, not simply empathy as such.”<sup>19</sup>

Consider now the corollary, the idea that psychotic spectrum disorders (PSD) represent an excess of mentalistic cognition. To judge cursorily, the scientific literature is rife with reports relating ASD to instances of extraordinary mechanistic talent and autism-like traits in otherwise highly functioning people (Einstein, Mozart, et al.).<sup>20</sup> But if Crespi and Badcock are right, we must also consider the existence of quasi-psychotic traits in the normal population, and whether such traits would predispose an individual to gravitate to literature, history, religious studies, certain kinds of philosophy, or psychotherapy. The humanistic disciplines have traditionally operated with a mind-

### The Spectrum Hypothesis

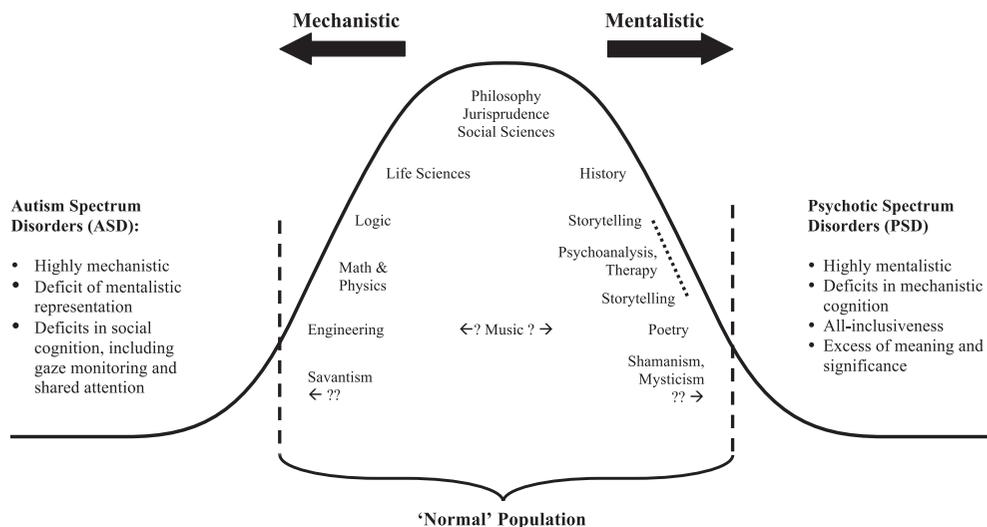


Figure 1. The Spectrum Hypothesis. The spectrum of cognitive tendencies ranging from highly mechanistic to highly mentalistic. The curve represents the hypothesized spectrum between the two extreme disorders, ASD and PSD, with “normal” people lying in between. The academic disciplines within the normal range represent a rough sketch of possible relative positions for the cognitive types required for these domains.

set about meaning and significance that is entirely absent in the physical sciences. If I am right, the preponderance of this mind-set in the humanities is more than simply a matter of academic culture or tradition. The graph below is a provisional attempt to integrate the notion of a cognitive spectrum with C. P. Snow's two cultures. In broad, sketch-like strokes, I have noted where certain intellectual types might fall in between the two extremes.<sup>21</sup>

Before proceeding, let us return to the genetic component of Crespi and Badcock's work. Genomic imprinting refers to the tug-of-war between paternal and maternal genes in the developing embryo and fetus. For some traits, such as size, paternal genes can be expressed and maternal genes silenced, or vice versa.<sup>22</sup> Badcock and Crespi argue that imprinting may also be responsible for where we end up along the mechanistic-mentalistic cognitive spectrum. If paternal genes are expressed, autistic tendencies manifest in the child; if maternal genes are expressed, psychotic traits prevail.<sup>23</sup> This does not eliminate the role of other factors, such as epigenetics and environment; moreover, the authors admit that it is controversial "to propose a single, overriding explanation for such a huge range of mental conditions."<sup>24</sup> However, if they are right, the model of "imprinted" cognitive types could represent a compelling alternative to Baron-Cohen's more standard view of "male" and "female" brains. Specifically, Crespi and Badcock's model could help to explain how and why so many women possess "male brain" traits and mechanistic tendencies, and vice versa.

But my own interest lies in the cognitive traits themselves. We can begin to explore the implications of this cognitive spectrum now, long before any consensus appears on the issue of genomic imprinting and gendered brains. Some of the traits that are typical of ASD, which includes Asperger's syndrome and Kanner autism, are: egocentrism and reduced empathy (including the qualifications noted earlier), a deficit in gaze monitoring and shared attention, and language problems, such as repetitive, "mechanical" speech. Another feature, sometimes called "weak central coherence," is the inability to relate details to a larger whole or continuous narrative; according to one hypothesis, this may be the result of under-connectivity among different regions of the brain.<sup>25</sup> *Hypo-mentalism*, or a glaring deficit in mentalistic cognition, appears to be the common denominator of these traits. According to Badcock, researchers have begun to see a small but statistically significant link between autism and engineering; for example, a significant number of children with autism or Asperger's syndrome have fathers who are engineers. In another study, students in sciences and technology scored higher than their peers in the humanities on an Autism-Spectrum Quotient (AQ) Test.<sup>26</sup>

When we compare the aforementioned abbreviated list of traits to corresponding traits in psychotic spectrum disorders, we begin to see the diametric opposition. Psychotic spectrum disorders include manic depression or bipolar disorder, major depression, and schizophrenia. In stark contrast to the autistic traits discussed above, PSD patients show an increased awareness of gazes and attention, experience hallucinations and delusions, and are prone to risky social behavior. And in contrast to the hypo-mentalism of ASD, PSD is characterized by *hyper-mentalism*: an overdeveloped sense for the thoughts, feelings, and intentions of other people, and the tendency to project these qualities onto inanimate objects as well. In addition, psychotics seem to have an excess of what severe autistics notably lack: a strong sense of self and an exaggerated sense of one's own centrality in the landscape of surrounding events. The tendency toward megalomania is certainly evident in the most famous and intensely studied case of paranoid schizophrenia, the case of Daniel Paul Schreber (1842–1911). In

a disturbing and now well-known passage, Schreber writes: “[E]verything that happens is in reference to me. . . . Since God entered into nerve-contact with me exclusively, I became in a way for God the only human being, or simply the human being around whom everything turns, to whom everything that happens must be related, and who therefore must also relate all things to himself.”<sup>27</sup>

Perhaps the most interesting comparison—particularly for the purposes of thinking about Snow’s two cultures—is that between weak and strong internal coherence. In contrast to the near absence of central coherence in ASD, the hyper-mentalistic of psychosis exhibits a preponderant drive toward integration, a preoccupation with the whole or the “big picture” into which all local details are subsumed. In other words, psychosis strongly tends toward top-down, holistic processing over autism’s bottom-up, detail-oriented processing.<sup>28</sup> This tendency is likely an attribute of mentalism, rather than simply an absence of mechanistic thought; moreover, the trait might be hyper-developed at the expense of mechanistic cognition. Neurological research suggests that, again in contrast to autism’s under-connectivity, psychosis is characterized by “hyper-connectivity of some aspects of cognition, especially for thought processes involving language.”<sup>29</sup> This produces an over-inclusiveness of thought and sentiment, a kind of “metastasis” of interconnectedness in which everything is laden with significance. Badcock reports some telling remarks by schizophrenics: “Every single thing *means* something”; and “I have a sense that everything is vivid and important”; or “The walk of a stranger could be a ‘sign’ to me which I must interpret.”<sup>30</sup> The drive toward meaning and significance is exaggerated in psychosis, but its correlate among normal people would include folk psychological theories and tendencies to interpret the meaning of random events (e.g., “It was a sign that I ran into him/her the other day”).

Hyper-connectivity in linguistic thought processes may be expressed as a drive to narrate, particularly the events of one’s own life. For those of us who fall toward the mentalistic end of the cognitive spectrum, the stability of one’s self is facilitated by self-narration and autobiography. This tendency might range from casual but habitual narrative reports to full-blown, detailed self-storying—the manifestation of a Proustian imperative to recover the past. It is possible that this tendency is more than merely self-indulgent narcissism, that some people (more than others) require the act of narrativizing their experiences, particularly painful ones. The psychologist James Pennebaker has documented certain measurable health benefits, including improved mental and immune function, associated with the practice of keeping a diary: “Constructing stories facilitates a sense of resolution, which results in less rumination and eventually allows disturbing experiences to subside gradually from conscious thought. Painful events that are not structured into a narrative format may contribute to the continued experience of negative thoughts and feelings.”<sup>31</sup> Similarly, Jerome Bruner devotes a chapter of *Making Stories* to the virtues of self-narration. Bruner, however, goes a step further by suggesting that there is no “intuitively obvious and essential self” waiting to be portrayed in words. “Rather, we constantly construct and reconstruct our selves to meet the needs of the situations we encounter. . . . Telling oneself about oneself is like making up a story about who and what we are, what’s happened, and why we’re doing what we’re doing.”<sup>32</sup>

But wait—not so fast! The notion that the self is subject to infinite refashioning will strike many as the same old “postmodern rubbish.” Whether Bruner’s claim is false or not, I want to draw attention to a more fundamental question. If the idea of a cognitive spectrum is correct, we would

expect to see certain kinds of people gravitate toward the idea of literary self-storying, while others will be repulsed by it. We would expect that an autobiographical consciousness would be more important for people on the mentalistic end of the spectrum. The philosopher Galen Strawson, echoing the rhetoric of C. P. Snow, writes the following in his review of Bruner's book:

There is a deep divide in our species. On one side, the narrators: those who are indeed intensely narrative, self-storying, Homeric in their sense of life and self, whether they look to the past or the future. On the other side, the non-narrators: those who live life in a fundamentally non-storytelling fashion, who may have little sense of, or interest in, their own history, nor any wish to give their life a certain narrative shape. In between lies the great continuum of mixed cases.<sup>33</sup>

Though I have no empirical data, it would be surprising if Strawson's "deep divide" and "great continuum" did *not* map well onto the cognitive spectrum we have been considering. I will, however, venture an empirical prediction here—one in keeping with our hypothesis. If self-storying is quantifiably beneficial to some people, as Pennebaker suggests, *then we would expect those benefits to be noticeably higher in people who exhibit greater mentalistic tendencies, and significantly less or negligible in people who exhibit cognitively mechanistic tendencies.*

Why does the divide exist at all, and what is mentalism from an evolutionary point of view? Paul Bloom has convincingly argued that we are "born dualists."<sup>34</sup> Dualism is the view that there exists something other than physical matter—a psyche, a soul, a free will, or some ethereal "mind-stuff" beyond the purely physical. Though few modern neuroscientists and psychologists still adhere to this version of philosophical dualism, it appears that humans are naturally equipped with dualistic instincts. Experiments have shown that even young infants begin to distinguish automatically between the behavior of inanimate objects and the behavior of humans, long before linguistic competence.<sup>35</sup> As adults (under normal circumstances), we cannot help but automatically and intuitively attribute the qualities of intention, emotion, and "inner life" to others and to ourselves. Perhaps to a person with severe autism, another person seems no more alive than a wooden doll; and perhaps to a schizophrenic, the wooden doll seems just as willful and observant as a living person! This diametric opposition of the two disorders suggests an evolved, specialized set of neural circuits governing these functions. In other words, our instinctive dualism is most likely an evolutionary adaptation—one that grants us a type of intelligence suited to hyper-sociality. But rather than endowing us with some other calculus of cooperation and competition, like the dancing of bees or the airborne pheromones of insects, natural selection outfitted our minds with a hair-trigger for detecting souls. And it is a mechanism that can go haywire in either direction, toward emptiness or wild excess.

A mild psychosis lies at the heart of the humanities, or in any discipline whose primary purpose is the search for "Meaning" in the grand, fuzzy sense of the word. (Conversely, a mild autism may lie at the "heart" of the physical sciences.) Doubtless, there are historians who think quite mechanistically, just as there are some surprisingly poetic physicists! But on average, I suspect that the humanist mentalizes more spontaneously and with greater ease, while the physical scientist mechanizes more naturally. As a trained literary theorist and devotee of continental philosophy, I will

admit to a shock of recognition upon studying the list of psychotic traits. It is no coincidence that literary criticism and Freudian dream analysis were allies for so long: there are no irrelevant details, either in dreams or in poems. Everything means. The primacy of *internal* coherence over external validity is reminiscent of Hegel's dismissal of historical facts that stubbornly refused to fit into the grand sweep of his historical dialectic: *Desto schlimmer für die Tatsachen!* ("That much worse for the facts!") Similarly, in Foucault's work, an impersonal "discourse" appears to watch us, molding and shaping us, manifesting its insidious power in the very words we bandy about unwittingly.

Even beyond the narrow turf of literary theory, the work of most humanists remains highly contextual and narrative. Whereas the scientist strives to excise context and isolate the widget, like irascible Occam with his razor, the humanist forages outward for ever greater, concentric networks of human meaning. A visitor from the Land of the Mechanists who lived among us for a time on our Island of the Mentalists might feel much as Temple Grandin did—that we were communicating through some kind of "telepathy" or strange, hidden electricity. The anthropologist (and former Shakespearean) Daniel Nettle has broached some of these issues in his eloquent work on creativity and madness. Nettle gives us a "fifty percent rule" for the channeling of mentalistic energy into productive, healthy lives: "Only fifty percent of people with psychotic genotypes become psychotic. . . . Fifty percent of the time, a given person might die a madman, but the other fifty, he might live a poet."<sup>36</sup> I would add: Or a cultural historian, or a novelist, or a professor of humanities, or a psychotherapist, or a priest—or, once upon a time, a shaman.

If we could travel back in time, across our evolutionary history, would we find the same distribution of genes that cause us to prefer mechanistic or mentalistic thinking, or that predispose an individual to autism or psychosis? We probably can't know this for sure, but we might venture to say, with a few qualifications, that the cultures of pre-industrial societies slightly favored mentalism, and that the cultures of industrial societies are slowly beginning to favor mechanistic thinking. If this trend exists, it is an incipient one whose outcome is far from determined. Wander a few steps outside the ivory tower and take stock of the gamut of New Age spiritualisms and resurgent fundamentalisms; these social phenomena attest to the powerful legacy of mentalism. Mentalism and dualism, with all their implausible excesses, are likely here to stay. As evolutionary psychologists are fond of saying, of the roughly 150,000 years that modern humans have roamed the earth, we have spent nearly 99 percent of that time as hunter-gatherers, whose survival depended on cooperation and group coordination. But the history of our sociality is older than that. Evolutionary neuroscientists have mapped long-term changes in the brains of our primate ancestors. When compared with the great apes, the divergent branch of hominids and australopithecines (our ancestry) exhibit an expansion in the right anterior regions of the cortex—the areas that regulate self-awareness and awareness of one's own actions in social contexts.<sup>37</sup>

If I am right, large systems of meaning—both religious and secular—are outgrowths of the myriad mentalistic adaptations that emerged with human social life. We are ineluctably prone to seeing design, purpose, and agency, the qualities that make an object or event seem meaningful to us. As we have seen, this tendency can go awry in ontogeny, and for genetic reasons that we don't yet fully understand. But in addition, we also amplify the effects of these instincts *culturally* when we congregate to form communities of interpretation, which in turn mature into traditions replete

with their canons of experimentation, exegesis, orthodoxy, and insurrection.<sup>38</sup> If autism and psychosis represent distortions of otherwise natural instincts, isn't it possible that modern institutions similarly, though to a lesser degree, segregate and amplify those instincts? What C. P. Snow was describing was not a conflict between two recently invented subcultures, but a conflict of two ancient scripts—the one that shows us “how to do things with things” and the one that shows us “how to do things with people.” When Kant, late in life, published his *Conflict of the Faculties*, he was thinking about the extent to which university faculties should mirror the faculties of Reason. How surprised would he have been to hear that these “faculties” might, when stripped down to the core, turn out to be instincts far older and more animal than anything he could have imagined?

## NOTES

1. Snow, *The Two Cultures*, 4.

2. In 1996, the physicist Alan Sokal published an article entitled “Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity” in the journal *Social Text*. He then revealed that the article was a parody, a spoof designed to satirize the “obscure and pretentious language” and “nonsense and sloppy thinking” found in postmodern literary theory (see Sokal, “A Physicist Experiments,” 63). The ensuing polemics left the two camps—scientists and postmodern theorists—more polarized and entrenched than ever. Sokal later wrote that it was not his intent to discredit all social philosophies of science, but the damage had been done.

3. A common example of a co-evolutionary process is the emergence of lactose tolerance. After the rise of agriculture, humans could harvest calorie-rich milk at relatively low cost. The simple mutation by which the enzyme lactase continues to be produced into adulthood would be highly adaptive. Thus we would expect a rise in the frequency of this mutation after agriculture, though it is obviously not universal. The process is co-evolutionary because (1) our genetic endowment enables the cultural dispersion of knowledge and practices such as the domestication of animals; (2) a cultural practice had a retroactive effect on the genome.

4. Crespi and Badcock, “Diametrical.”

5. In the late 1970s, researchers asked whether our closest living relatives, chimpanzees, have a Theory of Mind. Though there is far from a consensus on this issue, some in the field seem to think that they do. See, for example, Call and Tomasello, “Chimpanzees,” and Premack and Woodruff, “Chimpanzee Theory of Mind.”

6. Zunshine, *Why We Read Fiction*, 13ff.

7. Grandin, *Thinking in Pictures*, 92ff., 106–07.

8. Baron-Cohen, *Mindblindness*.

9. Baron-Cohen, *The Essential Difference*.

10. See, for example, the graph of curves representing male and female scores in empathizing in Baron-Cohen, *The Essential Difference*, 57, figure 5. Baron-Cohen also points out the danger of ascribing all differences to biology. “To do so would be to commit the opposite error to that seen in the 1960s when it was frequently assumed that all sex differences reflected socialization.” On the politics of studying sex differences, see Baron-Cohen, *The Essential Difference*, 10–12.

11. Baron-Cohen, *The Essential Difference*, 2.

12. Baron-Cohen, *The Essential Difference*, 3, 61.

13. As Baron-Cohen notes, Hans Asperger first suggested the idea in 1944, but the untranslated statement went largely unnoticed for fifty years. Baron-Cohen, *The Essential Difference*, 149.

14. Crespi and Badcock, “Diametrical,” 241.

15. Baron-Cohen, *The Essential Difference*, 171–86.

16. Badcock, *The Imprinted Brain*, 41. Here, Badcock has cited a passage from Ernest Jones' biography of Freud, *The Life and Work of Sigmund Freud* (1953).

17. Grandin, *Thinking in Pictures*, 94. Also cited in Badcock, *The Imprinted Brain*, 60.

18. Grandin, *Thinking in Pictures*, 91–93.

19. Badcock, *The Imprinted Brain*, 61. Emphasis added.

20. Badcock, *The Imprinted Brain*, 26. See also James, *Asperger's and High Achievement*, and Fitzgerald, *Autism and Creativity*.

21. It would be possible to represent these traits in two dimensions instead of the one-dimensional curve I have proposed. Mentalistic and mechanistic cognition would be the axes in this “two-factor model,” and individuals would likely cluster where the axes represent high mentalistic / low mechanistic cognition and vice versa. Individuals who rated highly (or lowly) on both scales, mechanistic and mentalistic, are probably rare and would appear as outliers.

Doubtlessly, the two traits can be measured separately, and their functions are mostly located in disparate regions of the brain. However, by representing the two factors on a single curve, I am hypothesizing a soft interdependence of the two traits. While exceptions are possible and noteworthy, the hypothesis is that high ability in one trait incurs a cost to the other. The empirical question for neuroscience is whether the development of neural connections among brain regions (not isolated regions) bears out this tendency.

22. This is the case with IGF2, the gene that codes for an insulin-like growth factor in the fetus, and it is believed that imprinting affects a few hundred of our 20,000 genes. See Badcock and Crespi, “Battle,” 1054.

23. Crespi and Badcock, “Diametrical,” 242; Badcock and Crespi, “Battle,” 1054.

24. Badcock and Crespi, “Battle,” 1054.

25. Badcock, *The Imprinted Brain*, 47–48.

26. Badcock, *The Imprinted Brain*, 36.

27. Schreber, *Memoirs*, 233. Schreber was a German judge who experienced his first psychotic break at age forty-two. He spent the remainder of his life in and out of mental institutions. From 1900 to 1902, he wrote his now famous memoir, *Denkwürdigkeiten eines Nervenkranken*, upon which Freud later based his analysis.

28. Badcock, *The Imprinted Brain*, 100.

29. Badcock, *The Imprinted Brain*, 104.

30. Badcock, *The Imprinted Brain*, 108.

31. Pennebaker and Seagal, “Forming a Story,” 1243. See also Baikie and Wilhelm, “Expressive Writing.” Participants wrote for fifteen to twenty minutes, in three to five sessions over consecutive days, about emotionally traumatic experiences. In a longer-term follow-up, Baikie and Wilhelm document benefits such as fewer stress-related visits to the doctor, decreased blood pressure, fewer days in the hospital, and improved mood and affect. Full text available at: <http://apt.rcpsych.org/content/11/5/338.full>.

32. Bruner, *Making Stories*, 64. See also Wilson, “Evolutionary Social Constructivism,” 30–31.

33. Galen Strawson, book review of Bruner's *Making Stories*, in *The Guardian*, January 10, 2004. Available online at: [www.guardian.co.uk/books/2004/jan/10/society.philosophy](http://www.guardian.co.uk/books/2004/jan/10/society.philosophy). See also Strawson, “Against Narrativity.”

34. Bloom, *Descartes' Baby*.

35. Bloom, *Descartes' Baby*, 14–19.

36. Daniel Nettle, *Strong Imagination*, 214.

37. Geary, “General Fluid Intelligence,” 22–25.

38. My idea of “amplification” here is akin to—perhaps even a loose amalgam of—what anthropologists refer to as “cumulative cultural evolution” (Richerson and Boyd) and the “ratcheting effect” of cultural transmission (Call and Tomasello). I am hinting at the possibility of gene-culture co-evolution for cognitive traits, but at present, that notion is probably still a leap of imagination. See Richerson and Boyd, *Not by Genes Alone*.

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