Evolutionary Psychology: Predictively Powerful or Riddled with Just-So Stories?
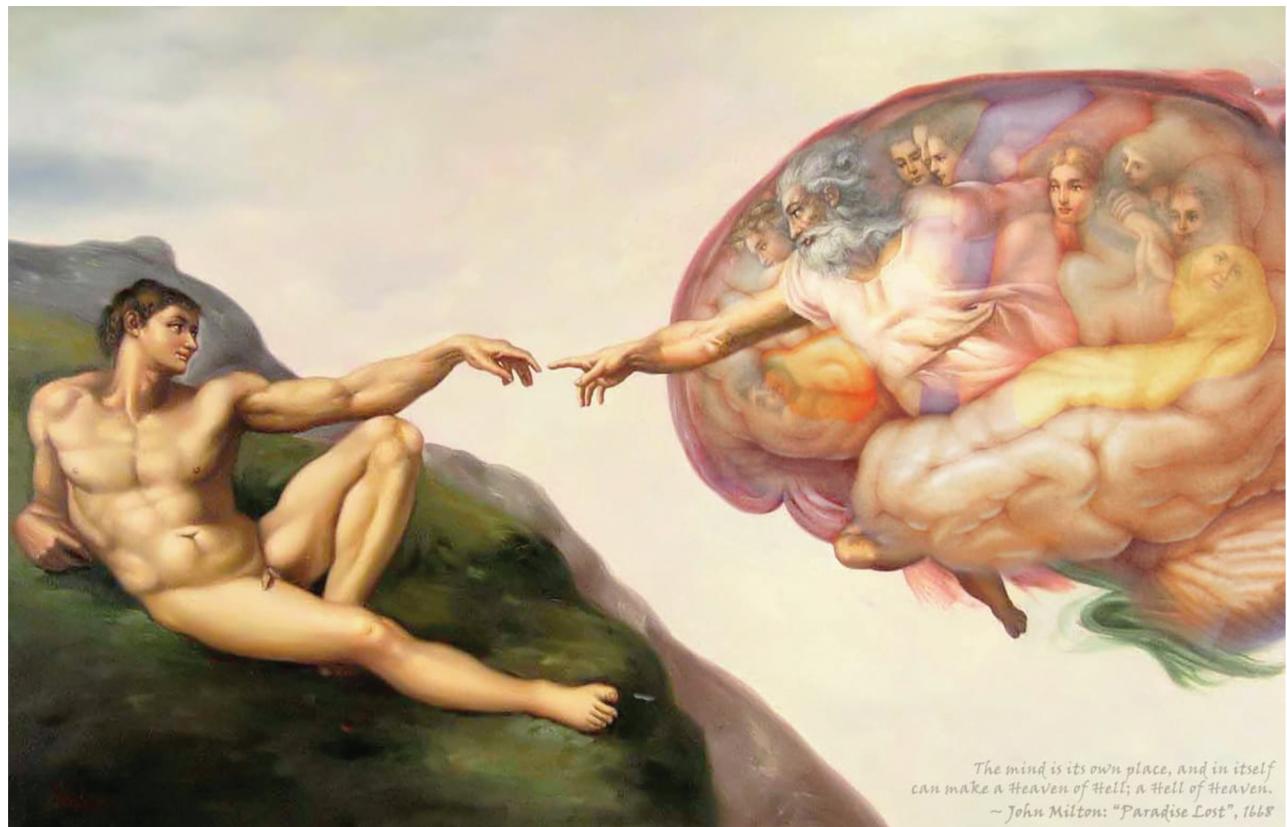
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The mind is its own place, and in itself
can make a Heaven of Hell; a Hell of Heaven.
~ John Milton: "Paradise Lost", 1668

This essay is part of a series on the value of evolutionary approaches to psychology.

Part 1 clears away seven key misconceptions.

Part 2 shows why evolution is necessary for a complete science of the mind

Part 3 (this essay) illustrates how evolutionary thinking leads to new discoveries.

They do not need to be read in order.

A common refrain in the social sciences is that evolutionary psychological hypotheses are "just-so stories." Amazingly, no evidence is typically adduced for the claim—the assertion is usually just made *tout court*. The crux of the just-so charge is that evolutionary hypotheses are convenient narratives that researchers spin after the fact to accord with existing observations. Is this true?

Do Evolutionary Approaches Lead to New Predictions? What About New Discoveries?

In reality, the evidence suggests that evolutionary approaches generate large numbers of *new predictions and new discoveries* about the human mind. To substantiate this claim, the findings in this essay were predicted a priori by evolutionary reasoning—in other words, the predictions were made before the studies took place. They therefore cannot be post-hoc stories concocted to fit already-existing data.

Anger

Take anger, for example. [One evolutionary psychological theory suggests that anger evolved as a bargaining tactic to convince other people to treat you better](#). If you sense that somebody doesn't value your welfare enough, you get angry in an (unconscious) attempt to convince them to place more emphasis on your wellbeing. In the language of the theory, you are trying to get them to update their ["welfare tradeoff ratio"](#) toward you—how much they value your welfare relative to theirs—and treat you better in the future.

For our purposes, this theory is interesting because it makes clear a priori predictions about (1) which factors will trigger greater anger among victims of maltreatment, and (2) the way the guilty party will try to appease the victim.

The Contexts that Trigger Anger

When a victim is wronged, which circumstances should produce the greatest anger? According to the theory, it should be the circumstances that most strongly suggest that the guilty party *doesn't value your welfare*. This is most obviously and poignantly the case when the culprit knew exactly whom he was harming, inflicted a large cost on his victim, and barely derived any benefit from his actions. In other words, the theory predicts that victims will be angriest (1) when they were the specific target of the culprit, (2) when they suffered greatly, and (3) when the culprit only benefited slightly.

Note how counterintuitive the last prediction is: victims will be *less* angry when their malefactor benefited *more*! This prediction seems perplexing, but it is predicted by this evolutionary theory of anger. If the guilty party didn't benefit much, that means he was willing to hurt you *for minor benefit to himself*, which means he cares about you even less than if he was willing to hurt you for great benefit to himself. In the parlance of the theory, he has a worse welfare tradeoff ratio toward you. Exactly as predicted, [experiments conducted across six cultures demonstrate that these precise circumstances trigger the greatest anger in victims.](#)

The Nature of the Guilty Party's Apology

The same theory also makes intriguing a priori predictions about the wrongdoer's *apologies*. The theory predicts that culprits will try to defuse victims' anger by claiming that (1) they didn't know they were targeting the victim *specifically* (for example, they knew they were pulling a prank on a group of people, but didn't know who their *specific* victim would be), (2) they thought the victim bore only a small cost, and (3) the benefit they attained was large. As before, this evolutionary theory generated these predictions a priori – [and as before, all three predictions are supported by cross-cultural experiments](#).

Note again how strikingly counterintuitive the last prediction is: when trying to defuse their victims' anger, culprits will assure their victims that they benefited greatly from their wrongdoing! This kind of apology sounds like a joke; it seems to do violence to common sense. But it was [predicted a priori according to a clear evolutionary logic and was subsequently supported by the data](#). And just like the other findings, it was also completely unknown before these experiments were conducted. It is the diametric opposite of a just-so story.

Disgust

It isn't just anger, of course—evolutionary theories offer similar predictive power in other areas of psychology.

Consider the following evolutionary predictions about disgust, all of which were made a priori: 1) people's disgust will be more strongly triggered by objects that pose a greater risk of infection, 2) women will be more disgusted during the first trimester of pregnancy compared to the second and third trimesters, 3) people who grow up in regions of the world with higher levels of infectious disease will be less extraverted, less open to new experiences, and less interested in short-term mating than their counterparts who grow up relatively pathogen-free, 4) cross-cultural differences in pathogen prevalence will predict cross-cultural differences in individualism-collectivism, 5) those with a stronger proclivity for short-term mating will be less easily disgusted, 6) experimentally triggering disgust will reduce interest in short-term mating, 7) people will feel less disgust toward their own offspring and their offspring's bodily waste compared to the offspring of others, and 8) presenting people with the threat of disease will cause a host of psychological and physiological changes that reduce the likelihood of infection, including a) releasing pro-inflammatory cytokines, b) behaviorally withdrawing, c) temporarily becoming less open to new experiences, and d) reducing one's desire to affiliate with people. All of these predictions were generated before the fact on the basis of evolutionary reasoning, and all were subsequently supported by the data.

Note that some of these findings could probably have been predicted without evolutionary reasoning. For others, it would have been harder. And for others still, it would have been nearly impossible.

The crucial thing, though, is that at no point in *any* of these examples is an evolutionary explanation being concocted post hoc to accord with existing data. In each case, evolutionary reasoning is being used to generate a novel hypothesis— and this hypothesis is then tested, leading to new findings. In other words, we are not moving from *known observations → convenient post-hoc explanations*—we are moving from *evolutionary reasoning → new a priori predictions* that get tested, leading to → *new discoveries* about previously unknown phenomena.

Notice how starkly the above evidence conflicts with the just-so allegation. The crux of the "just-so" charge is the idea that evolutionary hypotheses are plausible-sounding stories that researchers concoct after the fact to accord with known observations. But the examples in this essay—which are quite standard—show the charge to be woefully misinformed. Evolutionary hypotheses in psychology stick their necks out on the line, making clear a priori predictions that are then tested and either rejected or supported by the evidence.

For these reasons, when the just-so charge is repeatedly leveled against the field, those who are actually familiar with the primary literature get an eerie "bizarro world" sense. They have first-hand evidence of precisely the opposite: evolutionary theory is dazzling in the breadth and precision of the novel predictions it generates about human psychology. Many of us who have studied both traditional and evolutionary approaches to psychology adopted the latter in our research *precisely* because of their enhanced predictive power.

The most adamant members of the just-so chorus will not be dissuaded, and will sometimes try a different variant of the argument: evolutionary psychological hypotheses must be just-so stories because it is impossible to differentiate an adaptation (something that evolved because it serves a biological function) from a byproduct (a mere side effect of an adaptation). This argument suffers from two serious errors.

First, although all inferences and conclusions in science must always remain tentative and open to revision, there *are* evidentiary criteria for telling adaptations apart from byproducts. You can read about them here, here, here, here, here, and here.

Second, this argument rests on the misconception that all evolutionary research centers on deciding *what is and what isn't an adaptation*. In reality, this is not how it works; much research in evolutionary psychology is instead about *using evolutionary thinking to generate new a priori predictions and make new discoveries about the mind*, as this essay has shown. The emphasis in such a priori, theory-driven research is on (1) asking new questions, (2) generating new predictions, and (3) making new discoveries—not on making a definitive statement about whether or not something is an adaptation. Many of the studies linked in this essay do exactly that: they use evolutionary reasoning to generate new

predictions, and then they test those predictions and make new discoveries about how the mind works, sometimes supporting and sometimes refuting the original hypotheses. But they often *don't* purport to conclusively answer the question "is it an adaptation or a byproduct?" In some cases, they don't even ask the question at all.

Error Management Theory

A final example of the predictive power of evolutionary thinking comes from Error Management Theory, a theory about the evolution of cognitive biases. Error Management Theory suggests that in decision-making scenarios, you can make two possible kinds of error: a Type I error (a false positive) or a Type II error (a false negative). If one error is more costly than the other, and this cost asymmetry recurs over evolutionary time, then the species in question will evolve neurocognitive mechanisms that are *adaptively biased* toward the safer error. In other words, animal brains operate according to a similar logic as humanly engineered smoke alarms: they are built to be biased toward the less costly error because this minimizes the likelihood of the more catastrophic error.

This simple evolutionary theory leads to new discoveries in areas such as social cognition, visual and auditory perception, and immune function. For example, the theory predicts that when people look down at the ground from a high vantage point such as a steep hill, they will systematically *overperceive* their distance to the ground, because this is safer than *under*perceiving the distance to the ground, which could lead to a lack of caution and a lethal fall. This prediction is verified by the data—as is the supplementary prediction that this height estimation bias will be attenuated when people are looking *up* to a precipice from *below* (because it is not as dangerous when you are at the bottom), as well as the remarkably precise a priori prediction that the height overestimation bias will apply to environmental verticality, but not retinal verticality (because only *environmental* verticality is related to falling risk). We owe our knowledge of these fascinating discoveries to the evolutionary reasoning that led to these predictions—predictions that didn't exist before researchers thought to approach the problem from an explicitly evolutionary perspective.

The logic of Error Management Theory also predicts that heterosexual women will exhibit an on-average "commitment skepticism bias." The idea is that, on average, *over*estimating a suitor's commitment intent was more costly for our hominin female

ancestors than *under*estimating it—so the theory predicts that modern women will exhibit an on-average bias toward erring on the side of *under*estimating potential mates' commitment intent. This a priori prediction is confirmed by the data—as is the supplementary prediction that postmenopausal women will not exhibit the bias. More data are needed to test this prediction in different cultures and to figure out which contexts upregulate and downregulate the bias (or annul or reverse it), but initial findings seem promising so far.

Next, Error Management logic predicts that we will exhibit an *auditory looming bias*. Specifically, the theory suggests that we will perceive approaching sounds to be closer than they actually are, and to be arriving more quickly than they actually are. This is because the safer error is to be prepared for an oncoming danger too early rather than too late. Indeed, studies show that humans do exhibit this auditory looming bias—as do monkeys.

Studies also confirm that, as predicted, we perceive approaching sounds as both starting and stopping closer than equidistant receding sounds.

The same theory also predicts that people will perceive approaching sounds to be moving more rapidly than receding sounds, *even if the two are actually moving at the same speed*. This prediction is also borne out by the data.

This theory also leads to a new prediction about sex differences in the auditory looming bias, as well as an additional prediction about what happens when you present people with the sounds of different kinds of infant vocalizations (laughing vs. crying), both of which are borne out by the data.

Finally, less physically fit individuals need longer to escape an oncoming threat, so they have a more pronounced auditory looming bias than fitter individuals—exactly as predicted by the theory.

By now the reader has doubtless noticed that many of these findings are counterintuitive, and not the kind of result you could predict using common sense. Some, maybe even most, would have remained undiscovered were it not for the evolutionary reasoning that generated the hypotheses in the first place. And even if somehow that statement is incorrect, what is completely unambiguous is this: these hypotheses were generated a priori and then led to new discoveries about

how the mind works. They decidedly did *not* involve working backward from existing data to convenient stories.

Frequently, the emphasis in evolutionary psychology is not on observing an already-known phenomenon and then working backward, creating a story about how it might be adaptive. Instead, [the emphasis is often on the opposite](#): using a priori evolutionary reasoning to suggest the existence of new, previously undiscovered phenomena—and then going out and testing for the existence of those phenomena. This process (1) leads to new discoveries, and (2) does not involve working backward from data to story. It is therefore the exact opposite of just-so storytelling.

Importantly, the examples in this essay represent only a small fraction of the total; they don't even begin to approach the number and breadth of novel evolutionary predictions about psychology subsequently borne out by the data.

The List is Long and Continues to Grow

Detractors often demand to see "one example" of a situation in which evolutionary thinking generated an a priori prediction that led to a new discovery about the human mind. By my count, this essay has so far presented 26 or 27 such examples.

In truth, there is nothing special about the three theories I picked (anger, disgust, and error management theory) and the discoveries they've produced. Others would have done an equally good job of illustrating the remarkable predictive power of evolutionary thinking in the social sciences.

For example, we could have discussed how evolutionary thinking leads to new predictions about [pride](#), [shame](#), [hunger](#), [gratitude](#), [jealousy](#), [political preferences in leaders](#), [universality in mate preferences](#), [cultural differences in mating strategies](#), [reputation](#), [punitive sentiment toward criminals](#), [volunteering for charity](#), [support for economic redistribution](#), [moralizing people who opt out of public goods](#), [the "erasure" of race](#), [our ability to solve mathematical problems that are framed in terms of frequency versus probability](#), [what kinds of conditions improve our statistical inferences](#), our [ability to detect violators of social contracts](#), [whom newborn babies are said to resemble](#), [what psychological features might accompany illness](#), and [theoretically predicted cultural variation in the extent to which people value physical attractiveness](#)—to name a few.

In each of the above cases, researchers used evolutionary thinking to generate and test new predictions about the human mind, which then led to new discoveries. Quite the opposite of being riddled with just-so stories and after-the-fact concoctions, a reasonable familiarity with the literature shows that evolutionary approaches actually offer a fluent, prolific generativity of a priori predictions that is unusual for psychology.

We might reasonably want to ask *why* evolutionary approaches to psychology are so successful with respect to predictive power. A brief and incomplete accounting suggests that it is partly because evolutionary thinking reduces the search space by [insisting on consilience with biology](), thereby ruling out hypotheses that violate the basic principles of evolutionary theory; partly because evolutionary theory has been worked out in sufficient detail that deriving predictions from the theory is easier than it is from less well-specified theories; and partly because evolutionary approaches offer researchers useful [conceptual-methodological tools such as "task analysis"](), which is [well suited for generating novel predictions about human psychology]() and behavior. The question probably merits a dedicated discussion elsewhere.

It is worth pointing out that it is always possible to cherry pick one's examples. Somebody interested in attacking the field can pick the weakest exemplars, and somebody interested in showcasing its successes can pick the strongest ones. Given this impasse, there are two meaningful ways to proceed. The first is that we can evaluate the *average quality* of studies in the field. The problem with this approach is that most casual observers, intelligent laypeople, and social scientists haven't read a couple of hundred articles in evolutionary psychology in order to make an informed decision about average quality, and they often haven't read a couple of hundred articles in each of social psychology, developmental psychology, and personality psychology in order to make reasonable comparisons either. What remains that *can* be addressed in an essay like this, by readers who are not necessarily immersed in the various branches of psychology, is an *in-principle* assessment: does evolutionary psychology have an inherent problem with just-so stories by virtue of being evolutionary? This essay has marshaled dozens of examples to show that, at the very least, evolutionary psychology is not inherently prone to just-so stories—and in fact generates a plethora of new a priori predictions that subsequently turn into new discoveries about how the mind works.

Claims to the contrary are typically asserted without supporting evidence and are believed to be "obviously" or necessarily true, usually without argument.

For a somewhat different analysis that focuses not on specific examples, but instead on *why* people persist in making this mistake, see misconception #7 in [this](#) essay.

Conclusion

Evolutionary psychology is imperfect and incomplete—it is a young science, still in its early years. There is certainly room for improvement. And like many sciences, it has been undergoing refinements and growing in precision and nuance over time—a welcome trend that we can expect to continue. Unfortunately, however, a big chunk of the current resistance to the field is not based on a knowledgeable assessment of its shortcomings, but rather on misunderstandings. And it will not surprise you to hear that criticisms predicated on misconceptions often miss the mark.

The central argument of this essay has been that evolutionary approaches lead to an impressive number of new discoveries about the human mind, belying the popular but misinformed view that they are plagued by just-so stories. Most people agree that making new discoveries is one of the most important tasks of science—and perhaps even the central one. By this metric, evolutionary psychology is already a clear success story.

But the story has other facets as well. Beyond midwifing new discoveries, evolutionary approaches to psychology have many of the other well-known scientific virtues that accompany a robust theoretical paradigm: they explain existing findings that would be perplexing without the light of evolution, point to new questions that we hadn't previously thought to ask, integrate disparate existing findings into a coherent theoretical framework, [build conceptual bridges between the social and biological sciences](#), and lead to practical applications in fields such as education, medicine, and mental health. Future essays will focus on these additional contributions.

Postscript

If you're interested in further reading on the just-so story idea, you may wish to check out [this short encyclopedia entry](#) by preeminent animal behaviorist John Alcock, [this influential paper](#) on the promises and limitations of evolutionary psychology, [this essay](#) about misconceptions surrounding evolutionary psychology (especially misconceptions #6 and #7), [this article](#) on how to study adaptations and exaptations in psychology, [this chapter](#) on adaptations and byproducts in psychology, and [this paper](#) on how to apply evolutionary principles to psychological research in a rigorous manner—including how to avoid just-so storytelling.