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Book Review

The Human Mind Isn't Perfect – Who Knew?¹

A review of Gary Marcus, *Kluge: The Haphazard Construction of the Human Mind*. Houghton Mifflin, New York, 2008, 224 pp., US\$24.00, ISBN 978-0-618-87964-9 (hardcover)

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Gary Marcus is a professor of psychology at New York University and director of the NYU Infant Language Learning Center. In *Kluge*, Marcus tackles the structure of the human mind, focusing on its many quirks and shortcomings. He refers to the mind as a kluge; that is, “a clumsy or inelegant – yet surprisingly effective – solution to a problem” (p. 2). Furthermore, according to Marcus, the mind is comprised of many kluges, each built by natural selection to solve an adaptive problem. Suggested examples of kluges include memory, belief, and decision making, as well as language and pleasure seeking. Throughout the book, Marcus argues that these features of the mind result from evolution by natural selection, and that by examining these features from an evolutionary perspective, we can understand why they are accompanied by so many clumsy quirks. This evolutionary approach makes *Kluge* stand out among several recent books that address the structural and functional quirks of the mind (e.g., Brafman and Brafman, 2008; Fine, 2006; Tavris and Aronson, 2007). Unfortunately, the reader well-versed in modern evolutionary theory will find that this approach is not well executed.

When we read that evolution by natural selection promotes what is best for the species, we become concerned about the author's understanding of modern evolutionary theory, in general, and about the process of natural selection, in particular. These concerns are first triggered in chapter four (Pleasure), when Marcus states, “Pleasure is our guide, (...) and without it, the species wouldn't propagate” (p. 124). A cursory review of the literature would reveal that this description of evolution by natural selection is severely outdated and, indeed, was thoroughly discredited by Williams (1966) nearly a half century ago. And this is not Marcus's most egregious misunderstanding of evolution by natural selection. That title is reserved for Marcus's references to optimality as an outcome of the process of natural selection.

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What is a Perfect Adaptation?

Marcus concludes the first chapter by stating, “Whether kluges outnumber perfections or perfections outnumber kluges, kluges tell us two things that perfections can’t” (p. 16). What are these perfections to which Marcus is referring, and where can we go to inspect them? Earlier in the chapter, Marcus employs the metaphor of evolution by natural selection as climbing a mountain, a concept introduced by Wright (1932) and popularized by Dawkins (1996). This metaphor is useful in understanding how complex adaptations come to exist. For example, the leap from a small batch of light-sensitive cells to a lens, pupil, and retina might seem like trying to climb an impossibly steep mountain, but the process of evolution by natural selection provides a solution, selecting for slight improvements in design over vast periods of time. The peak is reached not by scaling the sheer mountain walls, but by slowly following a gentle slope. However, Marcus adds that, “What is omitted from the usual metaphor is the fact that it is perfectly possible for evolution to get *stuck* on a peak that is *short of the highest conceivable summit*” (p. 10, italics in original). The idea of a design feature being situated at a sub-optimal level is fine. The problem is that Marcus appears to believe that a “highest conceivable summit” exists, and that natural selection is capable of reaching it.

Marcus appears to argue that for most, if not all, problems for which there is an adaptation, there is an optimal solution that bests any conceivable alternative, and that this solution is reachable. This position is difficult to defend. Consider the human eye, for example. It is a beautifully designed adaptation, but as Marcus points out, it is not perfect. The problem is that Marcus seems to think that the process of evolution by natural selection *can* produce “a perfect eye.” What are the features of a perfect eye? The retina could be faced forward in humans to eliminate the blind spot, but why stop there? X-ray vision would be useful, as would be night vision, eyes in the back of our heads, and lasers that shoot out of our eyes to vanquish foes. It is not possible to determine generally what features a “perfect” or “optimal” eye would have, and the same is true for the human mind. Marcus inadvertently makes this very point in his discussion of language. He wonders, “What would it mean for a language to be perfect or optimal?” (p. 114) and alas, he is unable to offer any answers. There are too many possibilities, and no clear definition of what would be required. Furthermore, because adaptations are solutions to problems in particular environments and niches, they are by definition highly context dependent. What may be adaptive for an organism in one environment can turn out to be maladaptive following a change in that environment. Given the nature of adaptations, it does not make sense to refer to them in terms of optimality or perfection.

In the end, it is difficult to determine Marcus’s stance regarding the possibility of perfection in evolutionary design. He spends much of the first chapter seemingly defending this possibility, but he also mentions that, “evolution isn’t about perfection. It’s about (...) obtaining an outcome that is good enough” (p. 11). Indeed, the majority of *Kluge* is spent discussing these “good enough” outcomes in terms of the human mind. Fortunately, Marcus’s opinions are much clearer when describing what other people supposedly believe regarding this issue, particularly evolutionary psychologists.

Attacking an Evolutionary Straw Man

Although Marcus seems to believe that perfection is identifiable and achievable as a product of natural selection, the majority of *Kluge* addresses the imperfections produced by this process. Marcus argues that most scholars interested in the human mind do not appropriately

consider its imperfections, stating that, “Nobody would doubt [imperfections] when it comes to the body, but somehow, when it comes to the mind, many people draw the line” (p. 6). Marcus accuses evolutionary psychologists of drawing this line. This misguided and misinformed critique of evolutionary psychology is where *Kluge* is weakest, attacking a position that no evolutionary psychologist would defend. Marcus begins by stating that, “The notion of optimality is (...) a recurrent theme in the increasingly popular field of evolutionary psychology” (p. 7). He then describes how evolutionary psychologists, when confronted with an apparent quirk of the human mind, attempt to explain how it is not really a quirk at all, but instead reveals adaptive design.

For example, Marcus describes a study by Haselton and Buss (2000) proposing that men overestimate the sexual receptivity of potential partners because it has been, on average, a successful mating strategy over evolutionary time. Marcus puts words into the researchers’ mouths, describing this as, “a highly efficient strategy shaped by natural selection” (p. 8), and he concludes by stating, “Underpinning such examples is a bold premise: that optimization is the inevitable outcome of evolution” (p. 9). In reality, Haselton and Buss (2000) conclude that “This insight may alter the interpretation of known cognitive errors and may lead to the discovery of new cognitive errors” (p. 90). They are clearly acknowledging that cognitive errors exist, and are using evolutionary theory to explain why. This is the same strategy Marcus uses throughout *Kluge*, and yet he believes that the evolutionary psychological agenda contradicts his.

Marcus’s misunderstanding of evolutionary psychology is also showcased by his reference to Tooby and Cosmides, whom he refers to as “the cofounders of the field” (p. 7). Marcus (p. 7) uses the following quote from Tooby and Cosmides (1995) to support his argument that evolutionary psychologists view the mind as optimally designed:

[B]ecause natural selection is a hill-climbing process that tends to choose the best of the variant designs that actually appear, and because of the immense numbers of alternatives that appear over the vast expanse of evolutionary time, natural selection tends to cause the accumulation of *superlatively well engineered* [italics added by Marcus] functional designs. (p. 1193)

First of all, “superlatively well engineered” design is not equivalent to optimal or perfect design. For example, computer hard disk drives are superlatively well engineered, being used to store roughly 90% of all new information produced by humans around the world (Pinheiro, Weber, and Barroso, 2007), and yet the nominal lifetime of the average hard drive is just five years (Schroeder and Gibson, 2007). This form of memory is much more reliable and efficient than human memory, but these benefits come with the cost of a significantly shorter average lifespan compared to the human brain. There is always a tradeoff between the costs and benefits of a design, even a superlatively well engineered design. The human mind is superlatively well engineered, and yet it is far from perfect. There is no contradiction here.

Secondly, although Marcus emphasizes Tooby and Cosmides’s description of adaptations as superlatively well designed, he ignores the earlier part of their quote, which describes adaptations as “the best of the variant designs *that actually appear* [italics added]” (p. 1193). This statement implies that, for any adaptation, there are better designs that were never stumbled upon by natural selection. This is one of the fundamental premises of *Kluge*, and it also happens to be a fundamental premise of evolutionary science in general and of evolutionary psychology in particular.

Where do Kluges Come From?

It should be noted that throughout *Kluge*, Marcus does a wonderful job of describing the many imperfections that accompany various mental processes. These imperfections are depicted through the use of memorable anecdotes and supported with reference to numerous empirical studies. However, the focus of *Kluge* is to explain why these imperfections exist and where they come from. Time and again, Marcus uses the same type of explanation that he criticizes evolutionary psychologists for making, by referring to the adaptive qualities of these kluges.

Marcus considers memory to be one of the best examples of a mental kluge. He provides numerous anecdotes and empirical studies that describe the fallibility of memory. Readers who are unfamiliar with this research will gain an enhanced understanding of how untrustworthy our memories can be. Marcus argues that the imperfections of memory arise primarily from the fact that it is a contextually based system, which just happens to be the type of system that natural selection stumbled upon. However, he explains why this system was selected by stating that “For our ancestors, who lived almost entirely in the here and now (...), quick access to contextually relevant memories of recent events or frequently occurring ones helped navigate the challenges of seeking food or avoiding danger” (p. 37). In other words, behind our quirky memory system lies adaptive design.

This type of explanation can be found again when Marcus focuses on the capacity to hold explicit beliefs, and the quirks associated with this capacity. One particular quirk is “the human tendency to believe that what is familiar is good” (p. 48), and he offers the following explanation for its existence: “Preference for the familiar may well have been adaptive for our ancestors, (...) creatures with a taste for the well known may have had more offspring than creatures with too extreme a predilection for novelty” (p. 49). Similarly, when Marcus describes the process of decision making, one quirk that he focuses on is the irrational tendency to make decisions that favor the present at the expense of the future. He explains this by referring to the greater uncertainty for survival in ancestral times, arguing that “as a result, over hundreds of millions of years, evolution selected strongly for creatures that lived largely in the moment” (p. 84). These explanations are entirely consistent with the evolutionary psychological approach that Marcus criticizes. A key departure from this approach, however, is that Marcus does not provide empirical evidence to assess his hypotheses.

In addition to positing various selection pressures to explain kluges, Marcus makes several references to two competing mental processes: the “deliberative system” and the “ancestral reflexive system.” He summarizes these by stating that, “as a rough guide, our thinking can be divided into two streams, one that is fast, automatic, and largely unconscious [reflexive], and another that is slow, deliberate, and judicious [deliberative]” (p. 51). Marcus argues that although each of these systems is good at what it is designed to do, problems can occur when the two are in conflict. For example, when describing the klugey aspects of pleasure seeking, his primary explanation is that:

[T]he neural hardware that governs pleasure is, like much of the rest of the human mind, split in two: some of our pleasure (...) derives from the deliberative system, but (...) most pleasure springs from the ancestral reflexive system, which (...) is rather shortsighted, and the weighting between the two systems still favors the ancestral. (p. 128).

Marcus acknowledges that this is meant as a rough guide; it is therefore not surprising that he does not provide supporting empirical evidence. The existence of these two systems and the possible conflict between them are hypotheses worth testing, although both are probably oversimplifications. With what we now know about the modularity of the mind (e.g., Tooby and

Cosmides, 2005), it is likely that within each of these “systems” lies several distinct cognitive adaptations, with some of these in conflict with one another when activated at the same time.

Kluges Exist, So What Can We Do About It?

In chapter one, Marcus offers that “kluges can give us clues into how we can improve ourselves” (p. 17). In the final chapter, he attempts to use such clues to provide tips on how to avoid some cognitive errors. He offers 13 suggestions, all of which are useful, although it is unclear how some of them relate to the rest of the book. For example, Marcus reminds us to “whenever possible, consider alternative hypotheses” (p. 165) and to “always remember that correlation does not entail causation” (p. 166). These are certainly useful and should not be dismissed, but one could generate them without reference to the theory or research described in *Kluge*.

Most of Marcus’s tips relate to the conflict between his proposed deliberative and reflexive systems. For example, he advises us to not make important decisions when we are tired or distracted, because in those situations we are more likely to rely on our short-sighted reflexive system. In the end, it feels like Marcus was trying too hard to describe these tips in a way that could apply to the ideas presented throughout the book, and the result is a list that feels tacked on and misplaced.

Comparing Apples to Apples

In summary, *Kluge* is a well-written description of cognitive adaptations and the imperfections that accompany them. Marcus’s fundamental premise that the many flaws apparent in the human mind are the result of the blind process of natural selection also translates into a strong and successful attack against creationism. Indeed, Marcus opens *Kluge* by acknowledging that his list of mental quirks, as well as other physiological flaws discussed in chapter one, would not exist “If mankind were the product of some intelligent, compassionate designer” (p. 1).

Unfortunately, Marcus’s misunderstandings and misrepresentations of evolutionary theory, in general, and of evolutionary psychology, in particular, turn what might have been a welcome addition to modern evolutionary literature into a very frustrating read. He argues that adaptations and kluges are fundamentally different types of designs, but in fact, “Adaptations are not optimally designed mechanisms. They are better described as jerry-rigged, meliorative solutions to adaptive problems constructed out of the available materials at hand, constrained in their quality and design by a variety of historical and current forces” (Buss, Haselton, Shackelford, Bleske, and Wakefield, 1998, p. 539). In other words, every adaptation is best described as a kluge to some degree, and cognitive adaptations are no exception. Marcus is successful at describing the mind as a kluge, but he is not telling us anything that we did not already know.

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