# MENTAL MODULES AND ESSENTIALISM: TRAIT VARIATION AND ITS IMPLICATIONS FOR EVOLUTIONARY PSYCHOLOGY

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## ABSTRACT

Jerome Barkow, Leda Cosmides, and John Tooby in their book, The Adapted Mind, espouse a view of evolutionary psychology. They claim that given homo sapiens evolutionary history; psychology is provided with the means to decypher the "mental modules" that underlie and explain the nature of humanity. Their belief is that with our knowledge of anthropology, biology and genetics we can fully understand the common cognitive structures that are present in every human alive today. I argue the opposite, present views of genetics and variation in the philosophy biology demonstrate why this is not possible. I draw from the views of David Hull, Elliot Sober and Marc Ereshefsky to demonstrate why theories dependent on essentialism within species is a project that is bankrupt and should be given up in favour of projects that can actually lead us to an understanding of human cognition.

Since Charles Darwin's famous voyage on the HMS Beagle the theory of evolution has had an increasingly prominent role in the development of a number of fields. Among these is the field of psychology. In the last two decades or so, psychologists have been turning more and more to biological theories of adaptation to draw conclusions about the behavior and cognitive faculties of humans. In the forefront of this movement towards adaptation and evolution as a basis of human mentality are theorists such as Jerome Barkow, Leda Cosmides, and John Tooby. In 1992 these three published a book titled *The Adapted Mind* which set the theoretical tone, so to speak, for psychologists who believe that if one wishes to come to an understanding of why humans are they way they are, all that one needs to do is examine the history of the species *homo sapiens* and identify the adaptive pressures which have shaped its development. Despite the heavily influential nature of the views of Barkow, Cosmides, and Tooby there are some worries about the aptness and veracity of their claims; among these, are arguments against essentialism and the concept of normalcy of traits within species that are found in the philosophy of biology.

In the philosophy of biology there is a long running debate about the nature of species. The predominant views involved in this debate are cluster theory, essentialism, and the historical

approach (Ereshefsky, 2001). For the purposes of this paper, we will only discuss the issues that arise with essentialism; the simple reason being that they are the most informative in regards to the topic at hand. Recently, however, theorists in the philosophy of biology have been moving away from traditional views of essentialism as it was first proposed by scholars such as Aristotle, and which heavily influenced early biologists such as Linnaeus. Many philosophers, such as Hull, Sober, Rosenberg, Williams, and Ereshefsky (Ereshefsky, 2001) believe that given what we have learned about genetics, evolution, and the variation of traits within species the traditional views of essentialism no longer apply to taxonomy, nor does it apply to the understanding of the phenomes of organisms. This rejection of essentialism has major implications for Barkow et al.

According to Barkow, Cosmides and Tooby (1992), the central premise of their theory is that "beneath variable behavior(s) lie universal mechanisms" (Barkow, Cosmides, & Tooby, 1992). They claim that "there is a universal human nature" (Barkow et al, 1992) and that this human nature exists at the level of adapted psychological mechanisms (i.e. mental modules). Claims such as the above immediately give cause for those with worries about the aptness of essentialist theories to perk up their ears. However, before one too hastily rejects the views of Tooby, Cosmides and Barkow1, one must be careful to give the three their due, and be sure of exactly what they are claiming.

The opinions of the three expressed in *The Adapted Mind* can be taken to imply either one of two things. One interpretation of the three's arguments, such as "(there is) a single, universal pan human design" (Barkow et al 1992) is to believe that Tooby, Cosmides and Barkow are attempting to suggest a type identity between the mental modules from one person to another. Another, weaker interpretation is that the three hold the view that everyone has similar mental modules that fall under some sort of normal range. It is not completely clear which of these views the three hold, but in either case there are reasons to doubt that the nature of mental modules could be as they describe. Since it is not evident *prima facie* which of these views the three hold, it would be prudent to explore and consider objections for both.

First let us explore the mental modules as type identical across the species *Homo sapiens*. It seems from the three's assertions in *The Adapted Mind*, that they believe that though behavior

1 From this point on for reasons of me being too lazy to repeatedly type out their entire names, Tooby, Cosmides and Barkow will be referred to as "the three"

may vary from one individual to another, the mechanisms behind these behaviors are structurally and functionally identical. They believe that variation of action and response is not a phenomenon due to different cognitive and mental mechanisms within the brains of different individuals, but a result of differing environmental inputs. Such a view is evident in claims of theirs such as:

> (The human mind is not) an externally programmed general-purpose computer lacking in a richly defined evolved structure. Instead, human culture and social behavior is richly variable because it is generated by an incredibly intricate contingent set of functional programs that use and process information that is provided both intentionally and unintentionally by other human beings (Barkow et al 1992).

This view of Tooby, Cosmides, and Barkow can be interpreted to be making claims similar to those of the traditional essentialist. Indeed, the picture that the three provide of mental modules sounds very much akin to what Aristotle might claim about the essences of a natural kind, with the exception that the three hold that mental mechanisms are contingent rather than necessary (Sober, 1992).2 Their talk about the "richly defined evolved structure" (Barkow et al 1992) being triggered or suppressed by "information that is provided both intentionally and unintentionally by other human beings" (Barkow et al 1992), is nearly identical to Aristotle's discussions of the natural states of things versus the interfering forces which influence the manifestation of those states.

It seems that there is reasonable justification to believe that Tooby, Cosmides and Barkow have traditional essentialist leanings, and that they believe that the mental modules of all humans share a common structure and function. However one should not ignore the other possible interpretation of the three's claims about mental modules. Perhaps they are not making the strong claim that mental modules are completely invariable from one person to the next, perhaps they are just claiming that there is a normal set of mental modules that the vast majority of the population possess. Though there is no explicit mention of this alternate view within the literature, it is reasonable to believe that the three may hold this view given the abounding objections against the belief that there exist universal traits that are strictly identical across members of a species.

Now that we have examined what the opinions of Barkow, Cosmides and Tooby are, it seems natural to move to the reasons that they believe that the nature mental modules is as they

2 See Aristotle's *Metaphysics* for a more thorough exploration of this issue.

claim. The three believe that mental modules developed as they have due to the fact that they evolved in prehistoric *Homo sapiens* to deal with the stresses that faced a hunter-gatherer species. In the two million or so years that humans spent as hunter-gatherers, in the three's opinion, our minds adapted trait by trait, mutation by mutation, to meet the pressures that were imposed upon us by the environment until we arrived at the point where we are now at. Based upon this view and the three's interpretation of Mendelian genetics, the three develop a theory of the development of the mental mechanisms that we have, and of why these mechanisms are of a universal pan-human design.

Barkow, Cosmides and Tooby believe that given the complexity of the system of our mental modules, the length of the gene sequences necessary to encode such a system, and the fact that our reproduction involves the joining of two different sets of gametes which must be compatible, we cannot significantly differ in terms of our mental modules. The three believe if by happenstance an individual was born with a set of mental modules that deviated significantly from the normal population, that individual's genotype would differ so much that they would be unable to parent viable offspring. The individual's gametes would be so incompatible that they would not be able to combine with potential mates. The probability of them meeting and mating with another who had the same mutation would be so low that the new module would not continue to survive.3 They make arguments for this case with references to what they believe is the adaptational process that led to the current state of the vertebrate eye.

Barkow, Tooby and Cosmides claim that the eyes of vertebrates are a very complex system, with many adaptations to deal with a plethora of pressures that our environment challenges us with. The three believe that such being the case, the eye is much like the mental modules that they posit. Mental modules, like eyes, adapted over many millennia, one beneficial mutation at a time to arrive at the complex structure that exists today. They also point out that given the common adaptational history the mechanisms found in vertebrates are nearly identical. Among the commonalities across vertebrate species the three list such structural traits as the construction of the retina, the photo-reactive pigments, and so on; they also list the functional commonalities such as the iris' ability to adapt the aperture of the pupil in response to changes in ambient illumination and the stereoscopic coordination of the eyes that is necessary for three dimensional vision (Barkow et al, 1992). They also believe that, given the similarity of traits

3 This view is more clearly expressed on page 78 of *The Adapted Mind*

across species, within species, such as *Homo sapiens*, besides some very minor differences, such as the colour of one's irises, eyes are essentially identical in structure and function. With this conclusion in mind, the three generalize to mental modules, and claim that it is plausible, given the complexity of mental modules, which equals if not exceeds the complexity of eyes, that there is little likelihood that there is any variation in the mechanisms of human mentality.

It seems, after some consideration, that the evidence that Tooby, Cosmides and Barkow point to as rational to draw the conclusion that mental modules are universal, is oversimplified if not leading to completely fallacious inferences. One might be concerned if the three are really saying what they seem to be saying, given their knowledge of issues within the field of biology and genetics. It would seem more reasonable for the three not to make as strong and difficult to defend claim as: eyes, and therefore mental modules, due to their evolutionary histories, must be structurally and functionally identical and make a weaker more defensible claim, such as there is a normal set of traits which nearly all of the population possess. However it the arguments for universality are clearly stated as arguments for universality in the section titled: "What Adaptations Look Like" in *The Adapted Mind* (Barkow et al, 1992). It should be noted though, that even if the three were making the weaker claim, there would still be reason that such a claim should be doubted, which will be discussed later on in this paper.

Now that we have gone over the claims that Barkow, Cosmides, and Tooby, and the rationale behind their views, it seems to be a natural time to discuss some reasons why their views should be called into question. First let us examine their example of the vertebrate eye. They believe that a complex system such as the eye demonstrates to us why we should believe that mental modules should be of "universal pan human design" (Barkow et al, 1992). However if such an example does anything, it informs us of why we should believe that there is a substantial amount of variance within any population for any adequately complex set of traits.

The three believe that optical organelle are nearly identical across the human species, but this simply is not so. An example of this would be color blindness. One in five males and a somewhat lower number of females are afflicted with some level of inability to discriminate at least some of the colours that the "average" person can. Protanopia, deuternopia and tritanopia are fairly common within the population, they are conditions affecting the structures involved in vision, and moreover they are the result of genetic defects (Carlson, 1998). Not only is color blindness caused by genetic variation, it is a genetic variation which leads to the manifestation of

a maladaptive trait, or set of traits. Yet these traits are not extinguished as one would assume, given the three's claims about genetics, they survive and pass on from one generation to the next.

In addition to the worries about the analogy between the vertebrate eye and mental modules that Tooby, Cosmides and Barkow makes, there are theoretical reasons within the philosophy of biology to doubt views that posit universal invariant traits. Some of these arguments can be found in the third chapter of *The Poverty of the Linnaean Hierarchy* by Marc Ereshefsky (2001). In this chapter Ereshefsky makes a claim that has very important implications for those who take the three's view to indicate that mental modules are universal and invariant. Ereshefsky, in his discussion about essentialism, notices that speciation is a slow gradual process. There are no clean cut lines when one species becomes another, rather evolution and speciation is a vague blurry process. Speciation is much like a balding man, there is no specific instant when the man goes from having a head of hair to being bald. The process, like the process of species delineation is gradual and has no clear boundaries. This being the case, at any given time there should be members within any population that carries some genetic material that differs from the rest of the population, whether this material is able to "spread" and become common within the population is a matter of how the phenetic expression of the gene affects its carriers ability to survive, but the case still stands such genetic variations are found in any population of sufficient size.

Even Barkow, Tooby, and Cosmides make similar claims as those of Ereshefsky in their discussion of the vertebrate eye. They claim that our eyes evolved slowly and gradually trait by trait to deal with the adaptive pressures which faced our ancestors. It seems reasonable to assume then that they would also believe that our ancestors had variation within their populations, otherwise where would the traits come from to be selected for? So why is it that they hold that there is no significant variation within our population? Is it that they believe that they believe that somehow the process of evolution has stopped, and we are no longer evolving? This might seem like an unreasonable claim, and it is, but it would have to be the claim that is being made if one were indeed to believe that there could be no substantial amount of variation within a complex set of traits.

The next view that we will examine as a counter to those of Barkow, Cosmides and Tooby is that of Elliott Sober, as are found in his paper "Evolution, Population, and Essentialism" (Sober, 1992). Sober's comments on the problems of theoretical assumptions

about there being a set of traits being normal for a populations are perhaps the most difficult for the three evolutionary psychologists to deal with. In "Evolution, Population, and Essentialism" Sober discusses why he believes "typologist" thinking is mistaken when applied to fields such as biology. Instead he supports a view of "population thinking." While Sober's view are not strictly ant-essentialist in a global sense, he makes the claim that it would be an error to assume that there is a normal or natural type for any trait, and that variation in the expression of the trait is due to interfering outside forces. He believes instead that for any aspect of a population there is a bell curve of variation, and that there is no single place in the curve which should be assigned primacy and considered the norm (Sober, 1992). There may be some spot on the curve under which the majority of the population falls, but even if some individual happens to fall outside one standard deviation from the mean, or some other arbitrarily chosen cut-off, that individual should not be considered somehow unnatural or abnormal.

In terms of genetics Sober points out while "according to natural state model(s) (such as Barkow, Tooby and Cosmides') there is a single genotype or restricted class of genotypes, which count as the natural states of the population or species," (Sober, 1992) in actuality "statistical profiles of genotypic variance within a population enshrine no such difference. Genotypes differ from each other in frequency; but unusual genotypes are not in any literal sense to be understood as deviations from type" (Sober, 1992). In addition to this he makes it clear, that this is a useful and necessary property for a species to have.

Without an adequate amount of variation of genetic material within a population, that population would soon become extinct due to a lack of adaptability, for there is no trait that is "fittest for all environments" nor is there a certain "genotype being the natural state of a species in terms of maximal fitness" (Sober, 1992). Such being the case it would be reasonable to make the assertion that it is quite possible that individuals within the species *Homo sapiens* could carry different genetic material for the expression of different mental modules. Moreover, it seems quite likely that there is at least some portion of the population who does in actuality bear these genes, and due to the expression of these genes, live out their lives with different mental modules than those of others.

Sober makes another argument which is quite troubling for the views of Tooby, Cosmides and Barkow. He points out that even in individuals sharing common genotypes, they may very well express them in very different ways due to differing environmental conditions; so

that even with a common genotype individuals can have very different phenotypic features. He uses an example referring to the differing height of genetically identical cornstalks grown in different soil conditions, but to be more on topic, I will use the example of fetal alcohol syndrome (FAS).

Fetal alcohol syndrome is characterized by several "abnormalities" such as mental retardation, retarded growth, attention problems, learning difficulties, small head circumference, shortened eyelids, a flattened jaw line, and a poorly developed philtrum and thin upper lip (Nietzel et al, 1998). These "abnormalities" are not the result of genetic variation, but rather are the result of *in utero* conditions. Those born with FAS do not have the condition because they differ genetically from those without FAS, but because their mothers consumed large4 amounts of alcohol during pregnancy. Again, as he did with genotypes, Sober strengthens his claim by pointing out that one should not consider any specific set of environmental conditions to be normal or the fittest for a species, nor should one have the belief that for any genotype there is a single phenotype that is the normal expression of it (Sober, 1992). He claims that any interaction between genotype and environment that occurs to cause the expression of some trait is as "natural" as any other since all these interactions happen in nature (Sober, 1992). Also since all these interactions happen in nature, the claim that certain interactions were unnatural or abnormal would simply reflect our biases and have no place in a proper empirical undertaking.

With consideration of the views of Marc Ereshefsky and Elliott Sober, one cannot help but to question the aptness and veracity of the claims of Tooby, Cosmides and Barkow. If the process of evolution is to continue, there must be constant mutations and variations in any given genome to provide the traits for selection. If human mental structures and functions were as rigidly defined and static as evolutionary psychologists claim, then the species *Homo sapiens* would be in dire straits indeed. For, as Sober pointed out, there is no single set of traits which is the fittest for all environments, there are always a changing dynamic set of pressures driving any organism to adapt. If one were to consider evolution as the driving force shaping the human mind, one must keep the fluid nature of populations in mind. Evolutionary psychology is a start towards an understanding of how our species history has shaped the humans now living in the world, but it is not the end all and be all. Barkow, Tooby and Cosmides views are on the right

4 Studies have shown that as few as two drinks per day during the midcourse of pregnancy can lead to an average drop of 7 IQ points in the child (Nietzel et al, 1998).

track, but without more consideration to what we have learned about genetic variation within populations, it fails to get the job done.

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