



(REVIEW ARTICLE)



## A review of Dr Wrangham's book, '*the Goodness Paradox . . .*', and insights into the evolution of human language, aesthetics, and free will

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### Abstract

Dr Richard Wrangham's book and YouTubes are helping to explain our evolved psychology as primarily occurring in African hunter-gatherer bands before the end of the last ice age. This perspective is supported by the exquisite cave paintings and tool artifacts from this ancient time. The most important evidence about our origins, however, comes from recent anthropological studies of current bands that represent the earlier age. Results showed that 5-psychosocial-behaviors produced both the environment and the natural selection for our psychology. These are: 1) language, coalitional activities and egalitarianism organization, 2) problems of bullies for egalitarianism, 3) management of the problems by gossip, ostracism and executions, 4) those targeted by the management had shorter lives and fewer children demonstrating strong natural selection, 5) reduced targeting occurred for those showing high-quality activities or high status, which increased the complexity of the selection to include all of our psychological abilities. The evolved psychological abilities include those highlighted by Dr Wrangham: emotions, intelligence, conscience and personality, as well as those with only supporting evidence: developmental and social learning, theory of mind, language, aesthetics, and free will. Further support for the importance of the 5-psychosocial-behaviors is provided by evidence from the domestication syndrome, natural selection pressure, and a positive feedback model. In addition, these perspectives can explain issues such as why 50% of our thoughts and behaviors comes from our environment and development as demonstrated in identical twin studies, and why we experience life with agency and free will. Dr Wrangham's work is producing a new explanation of our nature that can help us all to understand why we are the way we are.

**Keywords:** Evolution; Hunter-gatherers; Natural selection; Execution hypothesis; Psychology; Sociology; anthropology

### 1. Introduction: Aesthetics in hunter-gather bands before the end of the last ice age

It is widely agreed that our psychology evolved in African hunter-gatherer bands (HGB) before the end of the last ice age. Figure 1 shows a cave painting during this time from Lascaux France and following intercontinental migrations. A central stationary horse is made with patterned orange paint. The head of the horse appears to blend into the background. Upon further inspection, however, the background becomes a second large animal. The lower area is composed of galloping beasts, which contrasts dramatically with the two larger subjects. This art demonstrates advanced aesthetic abilities, and Picasso said that these cave paintings are the most beautiful art works ever created! His remarks support the consensus that our psychology had evolved before the start of the agricultural age, 12,000 years ago. The focus of Dr Wrangham's work is explaining how and why we developed these abilities so long ago.

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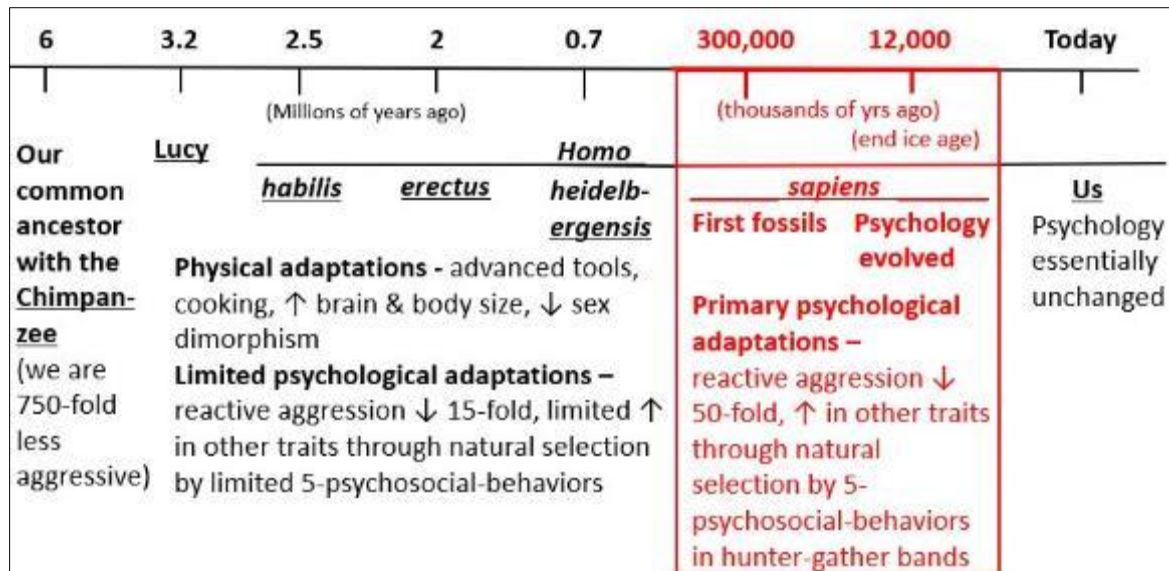
Paleolithic Cave Art Europe©Wikimedia

**Figure 1** Cave painting from Lascaux France that was produced by hunter-gatherer bands before the end of the last glacial period. The art demonstrates great aesthetic abilities, which is important evidence that all of our psychological abilities had evolved by this time (see text)

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## 2. Dr Richard Wrangham's insights into our evolutionary history

Dr. Richard Wrangham's book, "The Goodness Paradox . . .", and YouTube "Hunter-Gatherers, Homo duplex . . .", present the latest evidence about our evolutionary history [1,2, one of the current authors has previously reviewed this work (3,4); however, new aspects are being presented here]. This explanation starts with a timeline (**Figure 2**). On the left is our common ancestor with the chimpanzee from 6 million years ago. Dr Wrangham argues that the ancestor and today's chimpanzees have very similar levels of reactive (anger) aggression and they both lived/live in the same habitat of tropical rain forests. He measured the level of aggression in today's chimpanzees and our cultures by the number of times individuals hit each other. He concluded that we are approximately 750-times less aggressive than chimpanzees and the common ancestor, and the decrease occurred in our ancestral line. Next in the figure is our four ancestors: Lucy (*Australopithecus afarensis*), *Homo habilis*, *H. erectus*, and *H. heidelbergensis*. These species evolved between 3.2 and 0.7 million years ago as they moved from tropical forests to wooded and savanna habitats and adapted to the new environments. Advanced tool making and cooking evolved during this time. Physical adaptations included a doubling of body size and a tripling of brain size. Sexual dimorphism, a measure of difference in size between males and females, was also reduced. Limited psychological adaptations during this time included decreased reactive aggression and greater cooperation as demonstrated by butchering, cooking, and decreased sexual dimorphism. Further insight into our decreased aggression comes from the bonobo (not shown in **Figure 2**). This species shared a common ancestor with chimpanzees at 2 million years ago. The bonobo adapted to a new habitat and changed from a chimpanzee alpha-male dominance group to a female dominance group. Surprisingly, this large change in dominance only reduced the bonobo's reactive aggression (number of times male bonobos hit other males) by 50%, to 375 times more aggressive than us. Based on the above evidence, we estimated a 15-fold decrease in reactive aggression during the time of our four hominin ancestors. Dr Wrangham suggests that this decrease could have been caused by natural selection from limited 5- psychosocial-behaviors (explained below). There were other limited psychological advancements during this time that are being attributed to the same natural selection processes.



**Figure 2** Our origins during 6 million years of evolution. On the left, we share a common ancestor with today’s chimpanzees. Next, our four hominin ancestors and their adaptations in the physical and psychological areas are described. As highlighted in the red box, 300,000 years ago is when our first fossils were found and 12,000 years ago is the end of the last ice age, which brackets the time of our primary psychological evolution. This occurred in HGB through natural selection through 5-psychosocial-behaviors (see text). Today is shown on the right, and indicates that our psychology continues essentially unchanged from the end of the last ice age.

The red box in the figure highlights the period of our primary psychological evolution, between 300,000 years ago, our first identified fossils, and 12,000 years ago, the end of the last glacial period [1,2,5]. During this time all humans were living in hunter-gatherer bands (HGB) and were conducting subsistence and migratory living. Language evolved during this time. We estimated the level of reactive aggression at 300,000 years ago to be 50 (750/15) times greater than the aggression at the end of the ice age. Dr Wrangham attributes this extreme decrease in aggression and changes to our other psychological traits to natural selection from 5-psychosocial-behaviors (explained below). Finally, at the far right of the figure, it is stated that our psychological traits have remained relatively unchanged since the end of the last ice age.

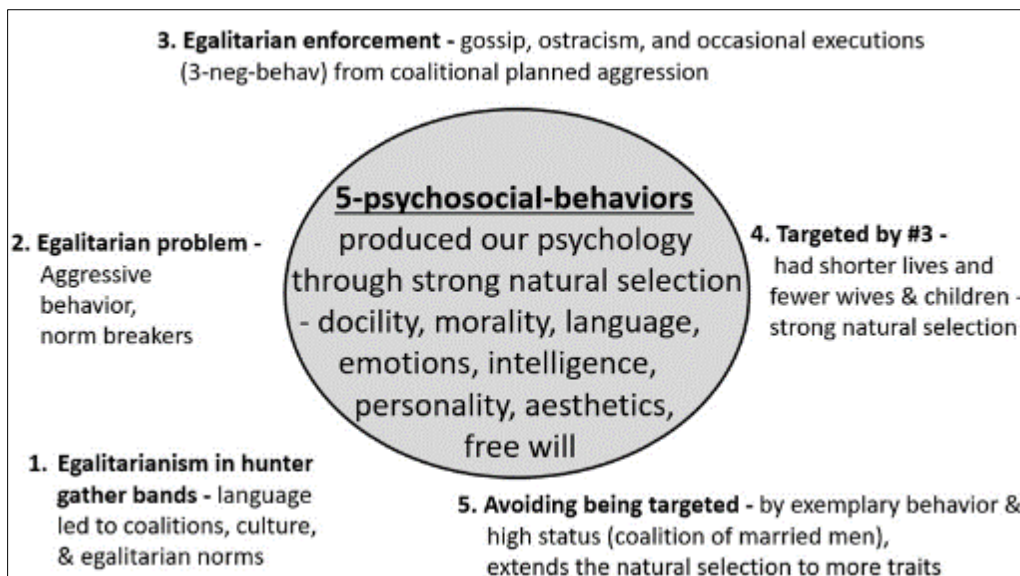
### 3. The 5-psychosocial-behaviors in our psychological evolution

The time of our primary psychological evolution, 300,000 to 12,000 years ago, has been difficult to study because it was so long ago and only a few fossils and artifacts are available. The breakthrough occurred, however, when it was determined that a few HGB have lived in isolation since the end of the ice age and continue to make the same artifacts. The anthropologists studied these HGBs in Africa, New Guinea, and Brazil, and the natural selection processes that resulted in our psychology were identified.

As expected, they found that people in the current HGBs had language abilities equivalent to ours. They conducted subsistence and migratory living. The bands were composed of 5 to 15 families. There was sexual division of labor consisting of men hunting, and women caring for children, gathering tubers and other foods, and cooking the evening meal. Polygamy was practiced, but most males were singly married. Animist thinking was used to explain much of their existence, and to enforce community norms. Famine, disease, and war were risks that were endured. They were organized around egalitarian values, and they had an active social life with group singing often occurring during the day and evening. Finally, the cultures were described as very happy. Wrangham’s writings are primarily about the natural selection occurring in the bands, which is defined as differential survival and reproduction that is associated with fitness in their environment. Surprisingly, none of the above HGB activities were found to have natural selection effects on psychology.

Strong natural selection for our psychology in the HGB was found to be caused by 5-psychosocial-behaviors (**Figure 3**) [1,2]. **3.1.** Egalitarianism was the first behavior and occurred with the onset of language and coalitional activities, which depend on language. Egalitarianism appears to be the universal governing process in the HGB. **3.2.** Threats to the egalitarian way of life, were the next activities, and were observed as high reactive aggression (bullies) behaviors, or

norm breakers. These problems were introduced above by the estimated 50-fold higher reactive aggression for the first *H. sapiens*, 300,000 years ago. **3.3.** Describes the behaviors that enforced egalitarianism. Coalitional planned aggression, which depended on language abilities, was central to enforcement. This is a second type of aggression and is more deliberative than reactive aggression. The coalitional aggression was observed as three negative behaviors (3-neg-behav): negative gossip, ostracism, and, in some cases, executions. Those targeted by the 3-neg-behav were usually interfering with the egalitarian way of life. If gossip was insufficient to change the offender, then ostracism was used. Finally, executions occurred in extreme cases. These killings were usually supported by animist arguments where shamans targeted an individual as a sorcerer. Shamans were of high status and sorcerers were seen as trouble makers. The identified sorcerer would be executed at a later date, almost always by ambush. **3.4.** Is the strong natural selection produced by the 3-neg-behav. Those targeted by the 3-neg-behav had dramatically shorter lives and fewer children. For example, being targeted with gossip and ostracism might result in exclusion from the evening meal, which was a risk for starvation. Executions in the bands averaged one every three to four years, and it was argued that that this selection effect alone was sufficient to account for the approximately 50-fold decrease in reactive aggressive traits that occurred during this time. **3.5** [1,5]. The members of the bands were aware of the potential adverse consequences of the 3-neg-behav, and they tried to avoid being targeted. For example, if a hunter brought game back to the band to be distributed, the risks of being targeted was so great that they usually had others do the distribution. In general, the behaviors to avoid being targeted included being humble, exemplar activities, and obtaining high status. Status, for example, was obtained by shamans and a group of married men who formed a dominate coalition. This group was responsible for setting egalitarian norms and making decisions such as when to migrate. Behaviors for avoiding being targeted increased the complexity of the natural selection such that all of our psychological traits became involved in the natural selection processes. **3-Center.** This section describes the evolution of all of our psychological traits from the 5-psychosocial-behaviors.



**Figure 3** The 5 psychosocial behaviors are shown that occurred in the HGB between 300,000 and 12,000 years (1,2,3,4,5). Center, the five behaviors produced the strong NSP for our many psychological traits, a few of which are shown

#### 4. Further support for the 5-psychosocial-behaviors

Dr Wrangham provided further support for the importance of the 5-psychosocial-behaviors.

*First,* A domestication syndrome is seen widely in nature and it is associated with decreased reactive aggression and decreased bone size. The fossil records from our species before the end of the last ice age demonstrated smaller bones, which is important evidence for our decreased aggression.

*Second,* he states that our psychological abilities have not changed significantly since the end of the last ice age (illustrated in Figure 2). The evidence during this time includes: 1) the short time, 12,000 years, 2) hierarchical values that do not produce NSP for psychological traits, 3) the great variety of agrarian and modern cultures limit the possibility of NSP.

Third, he is providing a new understanding of the environment in HGB for NSP. The evolutionary environment for all other animals is characterized as predator-prey relationships. In contrast, these relationships are not important in our recent evolution. The 5-psychosocial-behaviors produced both the environment and the natural selection for our advanced psychological abilities.

### 5. High natural selection pressure produced by the 5-psychosocial-behaviors

Further support for the importance of the 5-behaviors comes from analysis of natural selection pressures (NSP). This is defined as adaptive change per million years, which is a rate. Different mammalian adaptations can be compared based on their NSP because they come from a similar gene-pool and will have similar resistance to gene changes. As shown in **Table 1A**, our NSP for decreased reactive aggression is measured as an approximate 50-fold decrease that occurred in 300,000 years amounting to 165-fold change/million years. **1B** shows the approximate NSP for the increased length of the giraffe's neck and the elephant's trunk. The giraffe's neck increased by approximately 4-fold from a rather large ungulate, *Canthumeryx*, and through several intermediate species to become the current African giraffe, which occurred over approximately 15 million years [6]. The elephant's trunk increased approximately 3-fold, from a rather large ungulate, *Paleomastodon*, and through several intermediate species to become the current African elephant, which occurred over approximately 35 million years [7]. An average NSP for these two species is also shown. **1C** is the ratio of 1A to 1B-ave NSP and the high product (825) demonstrates the dramatic NSP produced by the 5-psychosocial-behaviors. As explained above, this NSP is being extended beyond the reduction in reactive aggression to encompass all of our psychological abilities.

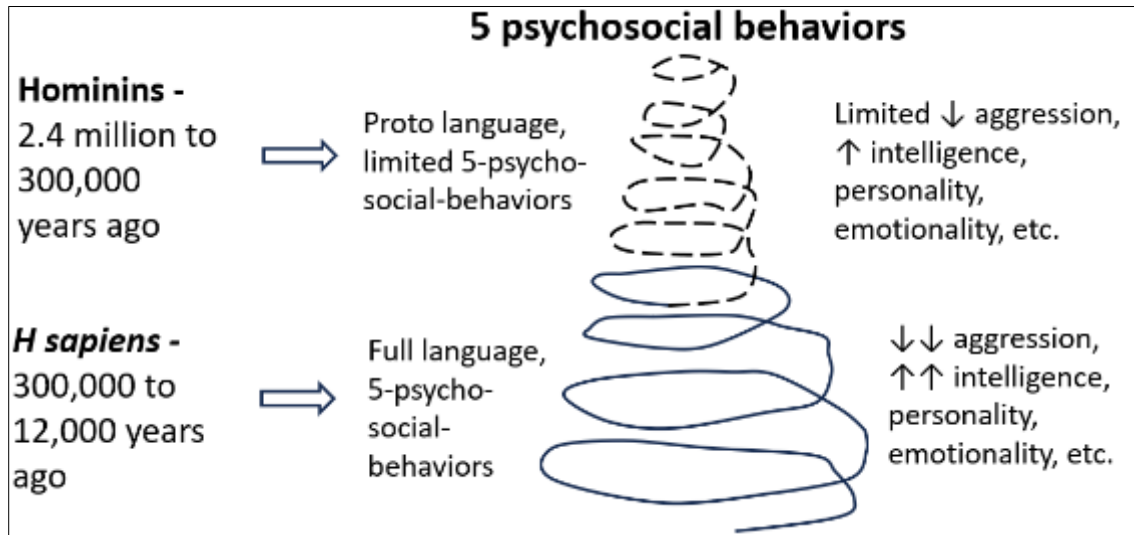
**Table 1** The NSP for our decreased reactive aggression in HGB relative to adaptations in other mammals. A. Our NSP for decreased aggression occurring between 300,000 and 12,000 years ago. B. The NSP for increased length of the giraffe's neck and the elephant's trunk from earlier species. An average for the two animals is also shown. C. Ratio of NSP, A/B-ave, and the high value highlights the strong NSP for our decreased aggression by the 5-psychosocial-behaviors (see text) (Mil, Millions)

<u>Species</u>	<u>Adaptation</u>	<u>Fold change</u>	<u>Mil of years</u>	<u>Selection pressure (Fold-change/Mil yrs)</u>
<b>A. NSP for <i>H sapiens</i></b>				
us	↓ aggression	50	0.3	165
<b>B. NSP for other mammals</b>				
giraffe	↑ neck length	4	15	0.3
elephant	↑ trunk length	<u>3</u>	<u>35</u>	<u>0.1</u>
	average	6	8	0.2
<b>C. Ratio NSP</b>				
A/B-ave (165/0.2) = 825 (greater NSP for our decreased reactive aggression)				

### 6. The 5-psychosocial-behaviors as a positive-feedback model

To better understand our psychological evolution, a positive feedback model can illustrate the processes (**Figure 4**). The onset of language and the 5-psychosocial-behaviors in the HGB would result in decreasing reactive aggression along with increases in other psychological traits. This is illustrated in with language and the 5-behaviors on the left of the spiral and our psychological abilities on the right of the spiral. The positive feedback means that the processes are working in concert to evolve over time. As shown at the farthest left in the figure, the upper half of the model is for our hominin species before 300,000 years ago. This time is represented by the dashed line because there is limited evidence from this ancient period. Proto-languages and proto-5-behaviors are proposed along with limited evolution of our psychological abilities. Starting with our species at 300,000 years ago, in the bottom half of the figure, a solid line is used because there is extensive supporting evidence. Full languages and the 5-psychosocial-behaviors are proposed along

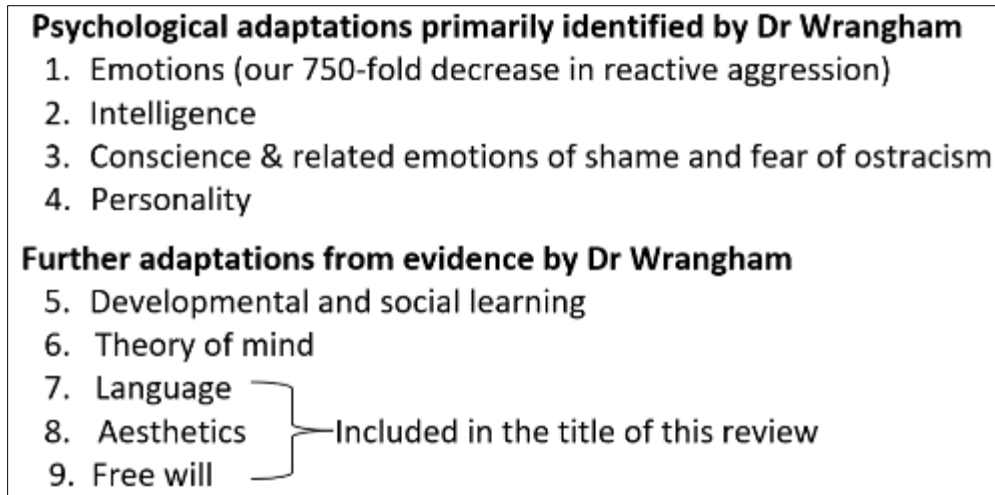
with the evolution of all of our psychological abilities. The increasing diameter of the spiral represents positive feedback for increasing psychological abilities in concert with increases in the 5-behaviors. The widest circles are at the bottom of the spiral indicating the evolution of our full complement of psychological abilities by the end of the last glacial period.



**Figure 4** A positive-feedback model is shown for our psychological evolution with language and the 5-psychosocial-behaviors on the left and decreased aggression along with increases in other psychological abilities on the right. Evolving traits are indicated by the increasing diameter of the spiral over time. For the period before 300,000 years ago, a dashed line is used to represent limited supporting evidence. From 300,000 to 12,000 years ago a solid line is used because there is extensive supporting evidence

## 7. Understanding our psychology from the perspective of the 5-psychosocial-behaviors

The high NSP and feedback processes associated with the 5-psychosocial-behaviours are being used to explain all of our psychological traits [1-5]. The first four traits shown in **Figure 5** are emotions, intelligence, conscience, and personality. These traits were extensively discussed by Dr Wrangham [1,2]. For our emotions, the decreased reactive aggression was a direct result of the natural selection from the 5-behaviors. We experience this decrease today in our highly cooperative and tolerant nature. Other emotions including fear, disgust, sadness, trust and surprise can also be explained by the same evolutionary processes. Next, our advanced intelligence also comes from the strong NSP being discussed. Our intelligence and language abilities are a direct result of the mortal dangers of saying the wrong thing in the HGB. Other animals are very limited in these areas because they did not evolve in the environment of the 5-psychosocial-behaviours. Conscience is the next trait, and this adaptation includes strong emotions in the areas of embarrassment, shame, guilt, and fear of exclusion. As stated by Dr Wrangham, our conscience thoughts and emotions are best understood as evolving from the mortal dangers for individuals who conducted contrarian behaviors in the HGB. Our abilities in this area are highlighted by comparisons to chimpanzees. These animals are described as psychopathic with no conscience or moral emotions. Remember their high levels of reactive aggression, described above, and they show no remorse from such violence. Our personality traits are also being explained. We express a wide range of traits in this area, which can be expected from the natural selection processes being described. In contrast, the highly stereotyped behaviour of chimpanzees mean that they have limited personality characteristics.



**Figure 5** Our psychology is characterized by nine evolved traits. The first four traits were extensively discussed by Dr Wrangham. Further, he provided important evidence for the remaining five traits (see text)

The remaining five traits were not actively discussed by Dr Wrangham [1,2]; however, he provided considerable evidence about their evolution (**Figure 5**). Our individual development and social learning are important for our maturation and the cultures we produce. In contrast, chimpanzees demonstrate little social learning or cultural development. Theory-of-mind is the next trait, which is defined in terms of social awareness and the capacity to understand what others might be thinking about us. On a 5-point scale, we obtain 5, whereas chimpanzees and other mammals struggle to obtain even level 1 [8]. Our extensive abilities for theory-of-mind are understood from the current explanations. The last three traits: language, aesthetics, and free will, are included in the title of this review. Our advanced language abilities are obvious traits that distinguish us from other animals. Language allows us to have conceptual thinking related to words and thoughts. The origin of language is important for the evolution of coalitional planned aggression, a fundamental activity to maintain the egalitarian culture of HGB. As part of the positive feedback introduced above (**Figure 4**) greater language abilities were being selected for during planned coalitional aggression and the other psychosocial-behaviors. There were mortal dangers for any contrarian activities in the HGB, and greater language abilities were an important part of avoiding being targeted. The next trait, aesthetics, was introduced above with the cave art (**Figure 1**). Aesthetics was also seen in the HGB with high-quality storytelling and music. These behaviors increased individual status and reduced the likelihood of being targeted by the 3-neg-behav. Thus, our aesthetic abilities evolved from the strong NSP and positive feedback processes being presented (**Figures 2-4**). Finally, free will is the capacity to recognize/generate multiple choices, analyze their consequences, and then elect to pursue one choice. We demonstrate a high level of free will. These abilities were essential to avoid the mortal dangers of contrarian behaviors. Human biases have been advanced as a limit to our free will. Dr Wrangham, however, explains our biases as evolving from the 5-psychosocial-behaviors with limited impact on our free will. An important characteristic of free will is our ability to be morally responsible. In contrast, chimpanzees have behaviors that are stereotyped and compulsive. They demonstrate no moral reasoning, which means that that they have negligible free will.

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## 8. Other perspectives

Other perspectives regarding the evolution of our psychology are widespread.

*First*, a common argument is that we don't know what happened in the HGB before the end of the last ice age. Along this line, a different natural selection process is used to explain each of our 9 psychological traits (**Figure 5**). These widely help opinion are clearly false as explained above.

*Second*, identical twin studies demonstrate that only half of our motivations, intelligence, and personality come from genes and evolution [9]. The other half comes from our environment, which includes development, home life, learning, and culture. Thus, these dual processes produced our propensity for behaviors including self-talk, worry, reasoning and moral thinking. This is not a problem, however, for the 5-psychosocial-behaviors being used to explain our psychological evolution. These 5-behaviors had selection pressures for environmental and development factors. In particular, these factors would have been important for survival per the mortal danger concern.

*Third*, we do not experience life from the perspective of our genes, motivations or environment; we think and behave with agency and free will. One has to keep in mind, however, that our abilities for agency and free will are best understood from the perspective of the 5-psychosocial-behaviors. Agency and free will would have been needed to avoid the mortal dangers in the HGB.

*Fourth*, this review is the first to use the terminology, '5-psychosocial-behaviors' to describe the evolutionary processes producing our psychology. Dr Wrangham used the terminology, the 'execution hypotheses', and the 'Wrangham and Boehm model' for the same purpose; however, we think that our wording is more comprehensive. Also, in our prior two reviews of Dr Wrangham's book we used the terminology, '3-negative-behaviors' to clarify that it is not just executions in the HGB that were producing the high NSP for our psychological traits but also the effects of negative gossip and ostracism [2,3].

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## 9. Discussion

Dr. Wrangham provides new insights into the evolution of our psychology [1,2]. Early evolution of our psychological abilities is shown in the cave art from before the end of the last glacial period (Figure 1). Our natural history is different from the chimpanzee because our hominin ancestors moved into wooded and savanna habitats and eventually lived in HGB with NSP from 5-psychosocial-behaviors (**Figure 2**). These behaviors in the HGB include egalitarianism, threats to egalitarianism, managing the threats with the 3-neg-behav of negative gossip, ostracism, and executions, the strong natural selection for our psychology from being targeted by the 3-neg-behaviors, and the extension of the natural selection to all of our psychological traits by the individuals trying to avoid being targeted with high-quality behaviors and obtaining high status (**Figure 3**). The anthropology studies have established that the 5-psychosocial-behaviors produced both the environment and the natural selection for our psychological evolution. These claims are supported by the high value of the NSP comparison (825) for our decreased reactive aggression compared to other common mammalian adaptations (**Table 1**). The positive feedback model of our psychological evolution (**Figure 4**) illustrates how these many psychosocial processes work to produce our psychology. The evolution of our nine psychological abilities (**Figure 5**) resulting from the 5-behaviors is providing a new foundation for the field of psychology. These explanations can help us know why we get 50% of our behavior from our natural history and 50% from our environment and development, why we experience life with agency and free will, and why we have such advanced abilities in the areas of language, aesthetics and free will. Thus, Dr Wrangham's work is foremost in explaining why we are the way we are!

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## 10. Conclusion

Evolution of our psychological abilities is demonstrated by the cave art from the hunter-gatherer bands from before the end of the last glacial period. Dr Wrangham reports on the anthropological studies from these ancient cultures, which found that 5-psychosocial-behaviors produced both the environment and natural selection for our psychological abilities. The 5-behaviors are:

- Egalitarianism,
- Behavioral threats to egalitarianism,
- Managing the threats with 3-negative-behaviors of gossip, ostracism, and executions,
- The strong natural selection for our psychology from being targeted by the '3-neg-behav',
- The effects of trying to avoid being targeted with high-quality behaviors and by obtaining high status, which extended the natural selection to all of our psychological abilities.

He explains how these 5-behaviors produced the evolution of our emotions, intelligence, conscience, and personality. In addition, he provides evidence for explaining our developmental and cultural abilities, theory-of-mind, language, aesthetics, and free will. The additional evidence for these claims includes:

- Comparisons with the chimpanzee who we share a common ancestor with from 6 million years ago,
- Developments in our four hominin ancestors that suggest early selection from a proto-5-psychosocial-behaviors,
- Historical analysis from the domestication syndrome,
- High natural selection pressure for our decreased reactive aggression compared to the pressure for other mammalian adaptations with further evidence that extends the selection to all of our psychological traits,
- A positive feedback model for the 5-psychosocial-behaviors.



- A prediction that identical twin studies demonstrate that 50% of our thoughts and behaviors come from our genes and evolution and 50% comes from our development and environment,
- A prediction that we experience life with from the perspective of agency and free will,

Thus, Dr Wrangham's work is foremost in explaining the origins of human nature.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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