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tors of variables. Finally, his supporting arguments or rationales are poorly conceived and tenuous at best.

We do not contend that van den Berghe's thesis is invalid. We do contend, however, that in the way his ideas are presented, they defy a cogent interpretation and a means of validation.

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## THROWING THE BEAST BACK OUT: A CLOSER LOOK AT VAN DEN BERGHE'S "BEAST"

### (COMMENT ON VAN DEN BERGHE, ASR DECEMBER, 1974)

Although a biological model of human behavior is a refreshing change from the usual cultural paradigm, van den Berghe's provocative and witty argument for the causes of human aggression and group structure is open to serious question. For despite numerous citations of literature on primates and humans, he has managed to overlook much of the relevant literature on human evolution. And, while at first it may appear as if he has succeeded in "bringing beasts back in," a closer look reveals that he has captured the wrong ones.

In his search for the "root of human aggression," van den Berghe outlines the following scenario: at some unspecified time, man-like creatures left the forest and banded together for survival on the African savannah. Unlike many other creatures on the savannah, however, these man-like "beasts" possessed no "biological weapons" for hunting prey or for defense. As a result of this unfortunate circumstance, the ancestors of man were at first forced to secure their sustenance through scavenging the leftovers of other predators.

Eventually, at some point in prehistory, incipient hierarchies among members of prehuman groups evolved to meet "both defensive and offensive functions." Because these beasts possessed more intelligence than those around them and because their incipient hierarchal organization afforded some degree of protection, their numbers grew rather rapidly. Such population pressure caused competition for limited resources, with the result that intra- and inter-group aggression began to disrupt these early hominid groupings. In order to meet this crisis, two mechanisms had survival value: (1) increased hierarchy and (2) territoriality. These adaptations effectively suppressed aggression and created social stability, but they also did more: under the right conditions, they functioned to provoke challenge which, according to van den Berghe, represented a major force behind social change.

Thus, hierarchy and territoriality have been fundamental to the biological evolution of humans. And, while these biological predispositions did not reach their maximum expression until the Neolithic, where horticultural requirements for sedentary living gave them even more selective advantage, hierarchy and territoriality are, in van den Berghe's view at least, partially due to biogenetic causes. And hence, it is this fact which helps account for the universality of hierarchy, territoriality and aggression in human patterns of social organization. In evaluating the plausibility of this scenario, three sources of data on hominid evolution are available: (1) archeological evidence on the demography of early hominids; (2) ethnographic studies of present day hunting and gathering societies; (3) field studies of primates. By drawing upon relevant data from these three sources, the four major variables accounting for human aggression in van den Berghe's model can be examined: (a) population pressure, (b) resource competition, (c) hierarchy and (d) territoriality. If the weights van den Berghe assigns to these variables during early hominid evolution are not supported by the data, then we have sound reason for "throwing the beast back out."

### *What Population Pressure?*

In van den Berghe's model, it is population pressure from surplus numbers of individuals in a group, as well as surplus numbers in a defined area, which first caused competition for resources. As when a sufficiently dense population initially began to put pressure on natural resources is not revealed in van den Berghe's model, and because he has so conveniently collapsed 20 million years of hominid evolution (geologically a time period which includes part of the Miocene and all of the Pliocene and Pleistocene), it is difficult to examine his hypothesis. All that can be ascertained from his model is that hominid *intelligence* at some time during hominid evolution caused, in mysteriously unspecified ways, hominid groups to become more prolific.[1]

Fortunately, less illusive sources of information are available. For example, most estimates of hominid populations during the last million years of the Pleistocene place the world's hominid population at 8 to 10 million (Washburn, 1968a; Coale, 1974). Even if we assume that great portions of land area were uninhabitable—a questionable assumption for much of early hominid history—and even if we double the estimates, it is hard to visualize intense population pressures. Equally significant are data suggesting that the world population of hominids during the Pleistocene was quite stable, growing at only a very slow rate (Isaac, 1968). While in the short run, particularly in highly favorable climates with ample food supplies, some populations may have grown rapidly, climatic changes, especially during periods of glaciation, most likely dramatically reduced food supplies and, hence, the population. During these periods of food shortages, reductions in the population were probably accomplished by abortion, withholding food from the aged and, probably most important of all, infanticide (Birdsell, 1968). Thus, in the long run, very little real growth in the hominid population was evident, for as Coale notes (1974:17): "Whatever the size of the initial human population, the rate of growth during man's first 990,000 years (about 99 percent of his history) was exceedingly small . . . the annual rate of increase during this first long interval was

[1] What makes this even more mystifying is the lack of evidence for early hominids being significantly more intelligent than chimpanzees. Some few fossil specimens do possess cranial capacities larger than present-day apes (e.g., KNM-ER-1470, the recent find by Richard Leakey), but most are only slightly larger than the apes. Increased brain size was a relatively late development in human evolution. Moreover, given the necessary high mobility of early hominids and the associated pattern of carrying infants for long distances (Lee, 1972), increased intelligence might be expected to lead to a realization of the problem of excess population and to the development of infanticide or other cultural forms of population control.

only about 15 additional persons per million of population." Not until the terminal Pleistocene, when stable sources of food energy were found with the domestication of plants and animals, is it believed that the human population began to increase significantly (Washburn, 1968b).

*What Resource Scarcity and How Much Competition?*

In van den Berghe's model, competition for resources intensifies when population growth burdens finite resources. Most studies of natural resources during the Pleistocene, however, do not sustain van den Berghe's hypothesis of burdened resources. Rather, just the opposite appears to be the case for, as Deevey (1968:249) points out, the Pleistocene experienced a steady-state population which used resources at "well below the carrying capacity of the environment." Moreover, in contradiction to van den Berghe's claim that even a small surplus population would deplete an area's resources, hominid groups were never confined to a finite land resource base. As migratory hunting and gathering groups, early hominids would simply move on to new resource areas; and since their world-wide numbers were so few, it is unlikely that there was any great difficulty in finding new sources of food. In fact, the migratory movements of early hominid groups probably contributed to the successful ecological adaptations of the human species. For not only did hominid migration enable populations to expand by enlarging the resource base, but as Davis (1974:53) notes: "Migration also stimulated sociocultural evolution both by making environmental adjustments necessary and by diffusing innovations. Finally, since migration also involved interbreeding, it caused man, in spite of his worldwide dispersion and his adaptation to diverse environments, to remain a single species."

As van den Berghe argues, resource scarcity can become a matter of definition, especially among highly intelligent hominids. And hence, he hypothesizes that a *surplus* of resources can create as intense competition and aggression as resource scarcity. To illustrate this process, van den Berghe offers the curious example of chimpanzees who refused to share surplus food, preferring instead to hoard it by becoming dominant and aggressive. This example would suggest that hierarchy and aggression are not an inherent part of primates' biological makeup but instead derive from an interaction with the environment, for indeed van den Berghe recognizes that chimps are "neither territorial nor strongly hierarchical." Following Kummer (1971), the chimps' deviant behavior was clearly an "adaptive modification" to a *particular* environment. And, as Kummer argues (1971), when the behavior of a species differs from others of the same group and the same gene pool, then the behavior is cultural rather than genetic. Thus, if chimpanzees can modify their behavior to a particular environment, it can also be assumed that van den Berghe's "highly intelligent *Homo sapiens*" can also modify his behavior. To be sure, as van den Berghe points out, the primates are not "humans stopped dead in their evolutionary tracks," but chimpanzees are man's closest relatives and recent studies of the serum albumin of man and chimps suggest that "man and apes shared a common ancestor (only) 5 million years ago" (Sarich and Wilson, 1967).

Thus, there was not sufficient resource scarcity to generate the consistent competition which could cause a shift in the human gene pool toward heightened aggression. And it can be questioned if surplus resources caused sufficiently consistent competition to cause such a shift; and in fact, van den Berghe's own data on chimpanzees would support the opposite contention: aggression is a psychological and cultural adaptation to surplus resources—an adaptation which does not require a biological basis to organize chimp behavior, and inferentially, patterns of human organization.

*Hierarchy*

Van den Berghe assumes, at least implicitly, that early hominids left the forest without weapons and without a group structure and that, once on the savannah, organized hierarchies had selective value for defense and for controlling intra-group aggression. Since all primates reveal patterns of group organization (Hamburg, 1972), it is not likely that early hominids wandered out onto the savannah without some degree of group organization. Actually, these early hominids probably revealed little agression for it was the more "aggressive" chimpanzee which, in all likelihood, forced less agressive hominid groups out of the retracting forests. Thus, early, and certainly not very aggressive hominids probably had viable patterns of social organization as they settled on the savannah, patterns which did not need hierarchy to control almost non-existent aggression.

Once on the savannah, did these hominid groups develop strong tendencies toward ag-

gressiveness and hierarchy? The data from the few remaining hunting and gathering societies clearly indicate that aggression and hierarchy are not prominent (Lee and DeVore, 1968; Bicchieri, 1972). Since these societies are probably the closest approximations of any extinct human group and since, as noted by Turnbull (1968:341), they contain "very gentle people," the lack of aggresslon and hierarchy in hunters and gatherers makes van den Berghe's scenario of early man highly questionable. Furthermore, when intra-group conflict does occur among present day hunters and gatherers, group fission as opposed to hierarchy appears to be the most prevalent adaptation (Lee and DeVore, 1968; Bicchiere, 1972). Hierarchy, then, does not appear to have been a necessary pattern of adaptation for those rare instances of aggression among otherwise rather benign hunting and gathering people.

*Territoriality and Aggression*

Van den Berghe hypothesizes that competition for resources, whether scarce or abundant, provokes inter-group aggression. Territoriality thus comes to have a selective advantage among hominids living on the savannah, and hence, it presumably became coded into human genes. In looking at the available ethnographic data on hunters and gatherers, however, little evidence of territoriality has been recorded (Lee and DeVore, 1968; Bicchiere, 1972). There are two reasons for this apparent lack of territoriality: (1) little surplus exists, since the economy of a hunting and gathering people revolves around securing a daily food supply from a fluctuating and variable food source—primarily wild plants and animals. Under these conditions, fission and fusion appear to have evolved as the principal mechanism for organizing group activities around fluctuating supplies of resources. If food is abundant, individuals fuse into a group, but if food is scarce, fission of the group is necessary. Thus, territoriality for a free-flowing and highly mobile population would be maladaptive for group survival, since the group itself is not a stable unit. (2) Since plant resources are seasonal and wild animals are migratory, groups must move constantly in order to take advantage of changing food sources. To have fixed territories would have decreased early hominid adaptation to the environment. Thus, while under certain conditions, territoriality may have proved adaptive, the available evidence on hunting and gathering societies does not reveal a pattern sufficiently widespread to have shifted the human gene pool toward territoriality. Furthermore, evidence on primate territoriality is becoming increasingly ambiguous with the accumulation of field studies. In fact, there is some evidence that territoriality is environmental adaptation and is therefore not as clearly a part, as was once thought, of the biological heritage of non-human primates. For example, Jay (1965) reports that Rhesus monkeys living in small restricted areas actively defend and fight for territorial rights. Yet, in the forest nearby, another group of Rhesus monkeys living in a large home range exhibit no territoriality at all. Such findings support the conclusion that, even among non-human primates, territoriality is environmentally determined rather than genetically inherited. And as Washburn notes (1968b:245) ". . . if a species of subhuman primate(s) can vary so greatly in territorial behavior, we may certainly expect a wide variation in man."

By briefly examining the evidence on the variables in van den Berge's model, then, it would seem that the human "beast" lies not so much in its somatic structure but in cultural adaptations to the Neolithic period. For indeed, only when humans discovered domestication of animals and the cultivation of plants about 10,000 years ago were the conditions of van den Berghe's model met. With the Neolithic, it is possible to visualize: (a) a rapidly growing population; (b) fights over economic surplus; (c) differences in power; (d) agricultural territories. It is thus with the Neolithic that humans began to evolve cultural and institutional arrangements to suppress conflict over resources. Territoriality and hierarchy appear to have been nearly universal cultural adaptations among increasingly sedentary peoples.

It is conceivable, however, that the high degree of aggression in modern humans has some genetic basis. Even if this were so, it need not imply that early hominids were genetically aggressive. *Assuming* that Neolithic conditions selected for aggression and *assuming* that the requisite genetic variability was present (or even that new mutations occurred), strong selection could rapidly raise gene frequencies in the last 10,000 years to their present levels (e.g., Livingstone, 1974). In fact, if aggression is due to testosterone levels, a change in regulatory genes controlling the production of this hormone could accomplish the increase. At best, then, van den Berghe's model applies only to the Neolithic and certainly not to the Pleistocene and the early hominid ancestors of modern man.

In summary, van den Berghe wishes to reintroduce the beast (presumably, animal studies) into the study of human society but, as he clearly demonstrates, man is unique among animals in combining high aggression, territoriality and hierarchy (in contrast to all our close phylogenetic relatives). He argues for human intelligence as the underlying cause of this combination of *biological* factors, and yet notes in his introduction that it is precisely an organism's complexity and intelligence which promotes learned behavior. No one would argue that human behavior is not at least *partially* biologically determined and many would agree that ecological and biological factors are important in understanding group structure. But considerations of parsimony might caution us against ill-defined "biogrammars" of territory and hierarchy which have little foundation in primate studies and require difficult to imagine genetic mechanisms. A gene for threat or violence against a *con-specific* (his operationalism of human aggression), for example, raises interesting problems.

More sinister is the intellectual "beast" introduced for consideration in van den Berghe's closing paragraph, for do we really want to bring eugenics back in?

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## REPLY TO FLEISING AND LABOVITZ, AND TURNER, TURNER AND FIX

The flood of comments which my article continues to evoke and the great diversity of the criticisms shows at least two things: I may have been wrong on a number of points, but the issues I raised are not trivial; and the evidence needed to settle most of these issues conclusively is not available yet. There are basically two ways to react to such a situation. One is a prudent retreat from conceptual formulations. To say that "one cannot gen-