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Labor, People, Culture: A Labor Theory of Human Origins

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This paper presents a consistently materialist theory of human origins which integrates the insights of Marx and Engels with more modern fact and theory from the fossil record, comparative primatology, and the synthetic theory of bio-evolution. According to the labor theory, neither culture, cognition, nor communication is the essential, distinctive attribute of humanity. Rather, these are all derivative of a more basic attribute, social labor. Humanity began when certain pongid populations began to produce their own subsistence and therefore to reproduce themselves as human beings. Through social labor, the earliest humans placed themselves on an evolutionary trajectory that led to the emergence of the "higher" human attributes, including more complex cognitive systems, symbolic communication, magico-religious belief systems, and ethical and aesthetic sensibilities.

> Men became accustomed to explain their actions as arising out of thoughts instead of their needs (which in any case are reflected and perceived in the mind); and so in the course of time there emerged that idealistic world outlook which, especially since the fall of the word of antiquity, has dominated men's minds. It still rules them to such a degree that even the most materialistic natural scientists of the Darwinian school are still unable to form any clear idea of the origin of man, because under this ideological influence they do not recognize the part that has been played therein by labor (Engels, '72:258-259).

The question of human origins is not simply a matter for physical anthropologists and human paleontologists. It is also a central problem for general anthropology, for the questions raised by a consideration of human origins have a very direct relevance not only for more general theories of human social organization and culture but also for contemporary politics (cf. Fried, '73:57-58; Harris, '75:4-5). What is the distinctive feature of humanity that sets us off from the animal kingdom? How did this characteristic arise? What is the significance of this distinction for understanding living sociocultural systems?

The answers to these questions too frequently reflect "that idealistic world outlook" about which Engels complained a century ago, for cultural idealism continues to exert a powerful influence on anthropological thought on human origins as well as living cultural systems (cf. Buettner-Janusch, '57, '66:ix-x, 3-4; Harris, '68; McCown and Kennedy, '72:462; Trigger, '67:167). There is a certain commonsense appeal, particularly for intellectuals, to the view that the human essence lies in our ability to engage in conceptual thought, to reason, or to acquire culture. But the fact that we, as people, subjectively feel this to be true does not mean that it is. Indeed, the purpose of this article is to argue that the so-called "higher faculties" of human beings which we, quite properly, value so greatly are in fact *not* the essential, distinctive feature of humanity but are rather derivative of a more basic, more essential attribute: social production. As Marx and Engels ('47:7) noted over a century ago,

> Men can be distinguished from animals by consciousness, by religion or anything else you like. They themselves begin to distinguish themselves from animals as soon as they begin to produce their means of subsistence ('47:7).

This idea is also found in embryonic form in the German philosopher Herder (1803:152-155, cf. Dobzhansky, '62: 191-192) and the ancient Greek thinker, Anaxagoras (Novack, '73:34). Darwin also noted the importance of tool use in human origins ('36:434), but this materialist lead was not followed up, and anthropological thinking on human origins failed to provide any coherent theory of human origins throughout the nineteenth and early twentieth centuries.

Since about 1950, however, a variety of factors, among which should be included the rejection of the Piltdown forgery (Weiner, '55), the "new physical anthropology" (Washburn, '51), the acceptance of the south African australopithecine material as ancestral to modern humans, the new emphasis on field studies of primates, and the spectacular fossil discoveries in East Africa by the Leakeys and others, have resulted in the emergence of new materialist views of human origins. The most important of these is the tool use theory. As stated by Washburn and Howell,

> It would now appear . . . that the large size of the brain of certain hominids was a relatively late development and that the brain evolved due to new selective pressures *after* bipedalism and consequent upon the use of tools. The tool-using, ground living, hunting way of life created the large human brain rather than a large-brained man discovering new ways of life. The authors believe this conclusion is the most important result of the recent fossil hominid discoveries, and is the one which carries far-reaching implications for the interpretation of human behavior and its origins . . . The important point is that the size of the brain, insofar as it can be measured by cranial capacity, has increased threefold *subsequent* to the use and manufacture of tools ('60:49-50, cf. Washburn, '60).

This, of course, is a return to the materialism of Darwin. It is also a return to the materialism of Marx and Engels, for,

> Tools are the products of labor as well as the instruments of labor . . . Since *Zinjanthropus* made tools according to a set pattern, this signifies that he was engaged in systematic labor activities (Reed, '63:82).

The priority of Marx and Engels in this regard, although noted by a few anthropologists (Cook, '73; Faris, '75; Leacock, '72; Ruyle, '76; Trigger, '67), Marxists (Novack, '73; Reed, '63), and others (Gould, '75), has not been generally appreciated by physical anthropologists (but is noted by Holloway, '69:399).

Subsequent to the resurgence of the tool use theory, there have been a number of competing theories proposed, most notably the group cohesiveness theory (Holloway, '67, '68), and the seed eater theory (C. Jolly, '70). Significantly, however, these theories have also been materialist as their authors have attempted to root them in the synthetic theory of evolution. These theories, however, are at best partial ones (as was that of Marx and Engels). The purpose of this paper is to integrate them into a larger theory which will state more systematically the relationship between the human dependence on social labor and the emergence of those attributes which we as humans see as the most basic aspects of our human existence: our ability to reason, to converse, and to set aside our petty egotistic concerns in favor of what we see as larger, more important ends.

THE THERMODYNAMIC BASE OF SOCIETY

In order to understand the origins of humanity from what are essentially nonhuman, ape-like ancestors, one must employ a conceptual framework which is cross-specifically applicable. It is all very well to say, as does the author of a recent textbook, that "culture was invented between two and 2.5 million years ago," but this doesn't get us very far in understanding why it was "invented." The culture concept, as it is usually employed by anthropologists, is species-specific and cannot shed much light on human origins and the relationship of early hominids to pongids. It has been suggested that human sociocultural systems are best understood in ecological perspective (Vayda and Rappaport, '68; Richardson and McEvoy, '76), and I suggest that human evolution is best approached using an ecological framework.

Ecosystems are composed of three kinds of entities, matter, energy, and information, which interact in space and time (Richardson and McEvoy, '76:xi). Looking at these in an autecological framework, matter includes the population of the given species and its biotic and abiotic environment. The environment contains use values, resources, and hazards. Use values are

environmental entities such as water, air, food, and shelter, which possess some quality capable of satisfying some need or want of the members of the population. Resources are environmental entities which are, or are potentially, use values. These are species specific. A live zebra is a resource for a hunting dog, a dead zebra is a use value, capable of satisfying hunger. But a zebra, dead or alive, is neither a resource nor a use value to a lizard. Instead, it may be a hazard, an environmental entity which may pose a threat to the well-being of the members of the population.

The dependence of animal populations on energy has two aspects: first, a continual *intake* of energy is essential to sustain life; second, this energy must be continually *expended* in various kinds of behavior in order to maintain the organism as a functioning entity. Elsewhere, I have argued for the desirability of terminologically separating these two aspects of energetics, and of referring to the first as bioenergy and the second as ethnoenergy (Ruyle, '73b, '76).[1] The bioenergy system of a given animal population is the manner in which it articulates with the energetic structure of the ecosystem it inhabits, in short, its sources of food. The ethnoenergy system of the population is the way in which this energy is expended in various activity, the total behavioral way of life of the population (see fig. 1).

Information is both intrasomatic and extrasomatic. It includes the sense impressions that organisms gather from the environment, the programs for processing these sense impressions and articulating them with behavioral plans, behavioral rules, and communication between individuals. Broadly speaking, we may differentiate between information which is genetically encoded and information which is learned. Learned information may be acquired by *situational* learning of individual organisms, *social* learning, where information is transmitted between individuals usually through imitation, and *symbolic* learning, where this information is carried by symbols (Fried, '67:5-7). Human culture is largely symbolically learned and this serves to distinguish it from the protoculture of nonhuman species, which is based on social learning.

Most commentators see this human capacity for symbolic acquisition, transmission, and manipulation of information to be the unique, distinctive attribute of humanity, which sets us off from the rest of the animal kingdom. This may be, and symbols are certainly important, but I suggest that however important symbolic learning is, it is still derivative, that it follows upon a certain elaboration of the pattern of ethnoenergetic expenditure of our pongid ancestors. To

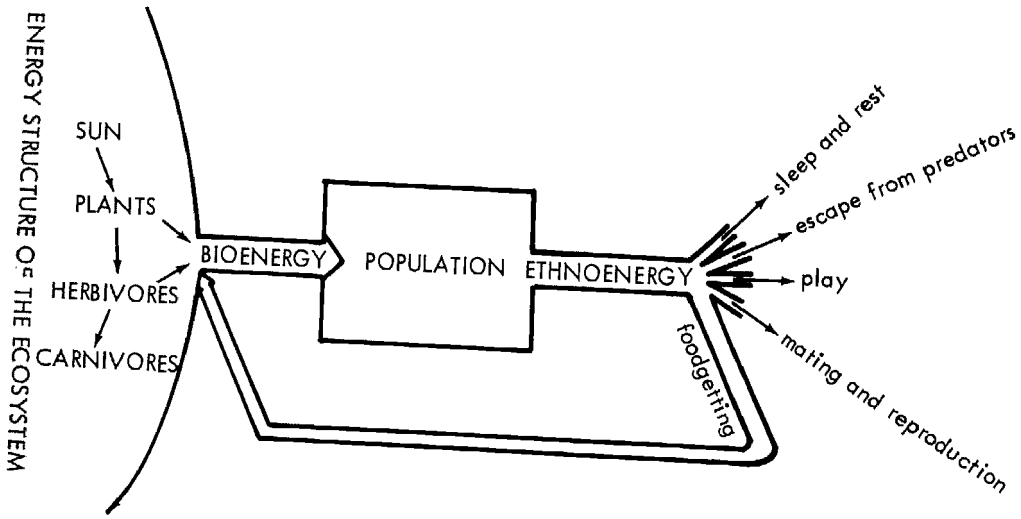


Fig. 1 Bioenergy and ethnoenergy.

understand this, it is necessary to look a bit more closely at the manner in which various animal species expend energy in the pursuit of need satisfaction.

Human populations, like other animal populations, are dependent upon both bioenergetic intake (food) and ethnoenergetic expenditure (behavior). In human populations, there is also a third energy system, the auxiliary energy system in which energy is used in an extrasomatic way by the members of a population, for example the use of fire, draft animals, water and wind power, and fossil fuels and atomic energy. Most studies of the energetics of human populations fail to make any distinctions between these various thermodynamic systems and tend to concentrate on the auxiliary energy system (Adams, '75; Cook, '71; Cottrell, '55; Harris, '75; Jamison and Friedman, '74; Kemp, '71; H. T. Odum, '71; Rappaport, '71b; White, '49, '59, '75). Consequently, they fail to recognize the thermodynamic peculiarity of the human primate. For vital transformations within the ethnoenergetic system have been the underlying forces which have generated the significant advances in the evolutionary career of humanity.

The ethnoenergetic system, or the way in which the bodily energy of the members of a population is expended to satisfy the various species-specific needs of the population, provides essential benefits to the members of the population, and it is possible to calculate or measure both the energy cost and the benefits of particular behavioral patterns. One essential requisite of the ethnoenergy system is to continue harnessing bioenergy, as diagrammed in fig. 1, and one important index of cultural development is the amount of energy that must be devoted to food production in proportion to the yield (cf. Harris, '75:233-255), but this is a post-pleistocene development and hence outside the scope of the present discussion.

Other essential aspects of the ethnoenergetic system include escape from predators, mating and reproduction, care of infants, rest, and sleep. In many, if not most species, sufficient time is left over for various kinds of energy expenditure which do not appear, at first sight at least, to be essential—play, grooming, and so forth.

Animal species vary in the degree to which there is intermingling of the energy expenditures of individual members of the population. In solitary species there may be little or no cooperative expenditure of energy, except in mating behavior. In social species, by contrast, the expenditure of energy by one individual often provides benefits to other members of the population. Examples of this include the predator warning systems of baboons and various species of herd living herbivores, the structured predator defense systems of baboons, grooming behavior of many primates, and mating and infant care. In such cases, the energy expenditures of the members of the population intermingle, and we may speak of ethnoenergetic flows between members of a population. A variety of patterns of energy flows occur among the nonhuman primates. The care of mothers for their offspring is largely a one-way flow. Cooperative defense systems involve a pooling of ethnoenergy that provides benefits to the entire troop. Mutual grooming is a two-way flow.

Social life, then, develops as individual organisms draw upon the energy expenditures of other members of the population. When the benefits obtained by tapping the ethnoenergetic resources of other members of the population outweigh the costs of having one's own ethnoenergy tapped by others, social life emerges and evolves.

Among social species of primates, fairly elaborate behavioral interactions have developed and the individual members of the primate population may be absolutely dependent upon the group for survival and reproduction (A. Jolly, '72; F. L. W. Richardson, '75). But such interactions are largely surface phenomena in that there is little production of use values and little time depth to the interactions. To understand this statement, it is necessary to look more closely at the labor process and social production. Here, there is no better place to begin than *Capital:*

> Labor is, in the first place, a process in which both man and Nature participate, and in which man of his own accord starts, regulates, and controls the material re-actions between himself and Nature. He opposes himself to Nature as one of her own forces, setting in motion arms and legs, head and hands, the natural forces of his own body, in order to appropriate Nature's productions in a form adapted to his own wants. By thus acting on the external world and changing it, he at the same time changes his own nature. He develops his slumbering powers and compels them to act in obedience to his sway. We are not now dealing with those primitive instinctive forms of labour that remind us of the mere animal. An

> immeasurable interval of time separates the state of things in which a man brings his labour-power to market for sale as a commodity, from that state in which human labour was still in its first instinctive stage. We pre-suppose labour in a form that stamps it as exclusively human. A spider conducts operations that resemble those of a weaver, and a bee puts to shame many an architect in the construction of her cells. But what distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality. At the end of every labour-process, we get a result that already existed in the imagination of the labourer at its commencement. He not only effects a change of form in the material on which he works, but he also realizes a purpose of his own that gives the law to his modus operandi, and to which he must subordinate his will. And this subordination is no mere momentary act. Besides the exertion of the bodily organs, the process demands that, during the whole operation, the workman's will be steadily in consonance with his purpose. This means close attention. The less he is attracted by the nature of the work, and the mode in which it is carried on, and the less, therefore, he enjoys it as something which gives play to his bodily and mental powers, the more close his attention is forced to be.
>
> The elementary factors of the labour-process are 1, the personal activity of man, *i.e.*, work itself, 2, the subject of that work, and 3, its instruments (Marx, '65:177-178).

Here, a point of clarification is in order. Marx uses an essentially mentalistic feature to distinguish human labor from the productive activity of bees ("what distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality"). Although this is true in the case of bees (a more modern view would take into account the *cultural* basis of human production as opposed to the *genetic* basis of bee production), it is much less clear in the case of other sorts of mammalian productive activity. Chimpanzee tool making, in fact, also appears to be characterized by foresight and imagination (Kohler, '26; J. Van Lawick-Goodall '71:36-37, 277-280; Poirier, '74:335-337).

If, then, we cannot use Marx's mentalistic characteristic to distinguish human labor from the productive activity of pongids, how do we do so? There are two considerations that are important. First, pongids are not *dependent* upon productive activity; only a small proportion of the total caloric intake of pongids comes from termiting or predation. Secondly, the productive process of humans is much more complex than that of nonhuman mammalian species. It is possible to distinguish between human labor and the protolabor of other mammals in purely behavioral terms. The labor process in human populations is characterized by the following seven features:

1. expenditure of energy
2. transformation of nature
3. tool use
4. spacial separation of production and consumption
5. temporal separation of production and consumption
6. cooperation in production
7. sharing in consumption

Where the production of use values does not exhibit all of these features we may speak of protolabor, which is fairly common among mammals.[2] Of course, not all human production involves all of these characteristics. Some production may be purely individual, some may not involve the use of tools, but such examples are surprisingly uncommon and insignificant.

Significantly, none of these essential features of the labor process is unique to human society, for they are all found in a variety of other species. The important point in this regard is that *all* human populations, from the australopithecines to the present, are absolutely *dependent* upon this fully elaborated labor process—and have been for millions of years. On the other hand, the fully elaborated labor process is not found in *any* non-human mammalian species. Nonhuman mammals exhibit various kinds of protolabor that transform nature into species acceptable form but that are characterized by only some, not all, of the attributes of the human labor process (see Table 1).

Labor and protolabor, then, are forms of ethnoenergy, and the productive process is a thermodynamic process in which environmental resources are transformed into use values through the expenditure of ethnoenergy. The energy used in the production of the use value becomes embodied in the use value, and when the use value is consumed, the ethnoenergy is consumed. Thus, for example, if three hours of labor are spent in collecting edible tubers, the

TABLE 1

Labor and protolabor compared.

	Labor	Protolabor				
	Human labor	Chimpanzee termite collecting	Chimpanzee predation	African hunting dogs	Beaver dam and lodge building	Termite nest building
1. Energy expenditure	X	X	X	X	X	X
2. Transformation of nature	X	X	X	X	X	X
3. Tools	X	X	—	—	—	—
4. Spatial separation of production and consumption	X	—	X	X	—	—
5. Temporal separation of production and consumption	X	—	X	X	X	X
6. Cooperation in production	X	—	X	X	?	X
7. Sharing in consumption	X	—	X	X	X	X

consumption of these tubers involves not only the consumption of several hundred calories of bioenergy, but also the consumption of three hours of labor (ethnoenergy). Further, if the tubers are consumed by someone other than their producer or collector, we may speak of three hours of labor energy flowing from the producer to the consumer. If half of the tubers are consumed by someone other than the producer, we may speak of one and a half hours of labor flowing from producer to consumer. Production, then, implants energy into a deep substratum of use values, where it can be later tapped for consumption.

As discussed above, social life involves the tapping of the energy resources of other members of the population. In human populations, this occurs at two levels: first, a surface level in which the individual draws upon the behavior of other individuals to provide immediate benefits to himself, and second, a deep level, in which an individual consumes use values produced by others and thereby consumes their labor energy (see fig. 2). The first of these levels can be seen in many primate societies, but human beings are the only primate in which the second occurs in any developed form. Indeed, just as Lotka ('22) has suggested that biological evolution may be seen as a struggle to capture bioenergy, so I would argue that human cultural evolution results from the struggle of individuals to maximize their control over ethnoenergy (Ruyle, '73a).

We are now in a position to state in thermodynamic terms the distinction between human populations and populations of nonhuman primates (see fig. 3). Pongid populations are characterized by direct, individual appropriation of environmental use values; superficial energy flows occur between members of the population but these do not extend to the food quest, by and large. Human populations, however, regularly transform environmental objects into culturally acceptable use values, the ensemble of which forms a social product which is distributed among members of the population according to socially established rules. The appropriation of nature is therefore social, and, in addition to the purely superficial flows of energy which characterize pongids, there is a deep flow of ethnoenergy sustaining the members of the population. Thus, the manner in which ethnoenergy is directed toward the satisfaction of human needs serves to distinguish human from pongid populations. This distinctive feature

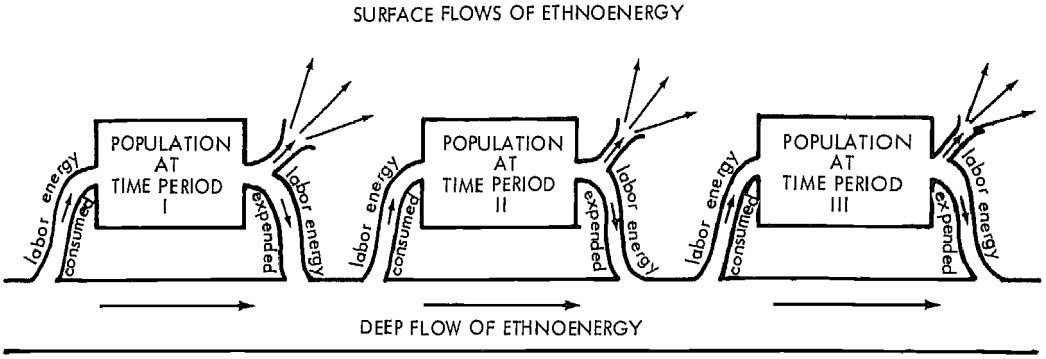


Fig. 2 Surface and deep flows of ethnoenergy.

generates the selective pressures leading to our distinctive morphology, our language, and our abilities to reason and believe in unreason. Before arguing this in depth, however, it may be useful to look more closely at the forms of social labor outside the order Primates.

In his recent integrative work, Wilson ('75:379-382) has noted four "pinnacles" of social evolution, "the colonial invertebrates, the social insects, the nonhuman mammals, and man." It is better, however, to speak of three pinnacles, the colonial invertebrates, the social insects, and mammals, including (or especially) human society. Each of these pinnacles is characterized by the dependence of individual organisms on a deep flow of ethnoenergy within society.

In what Wilson calls the *ne plus ultra* of invertebrate social forms, the jelly fish-like hydrozoans of the order Siphonophora, there are specialized productive organs for capturing and digesting prey and distributing this digested food to other parts of the colony. The social evolution of the Siphonophora has proceeded to the point where they can be distinguished from organisms only with difficulty.

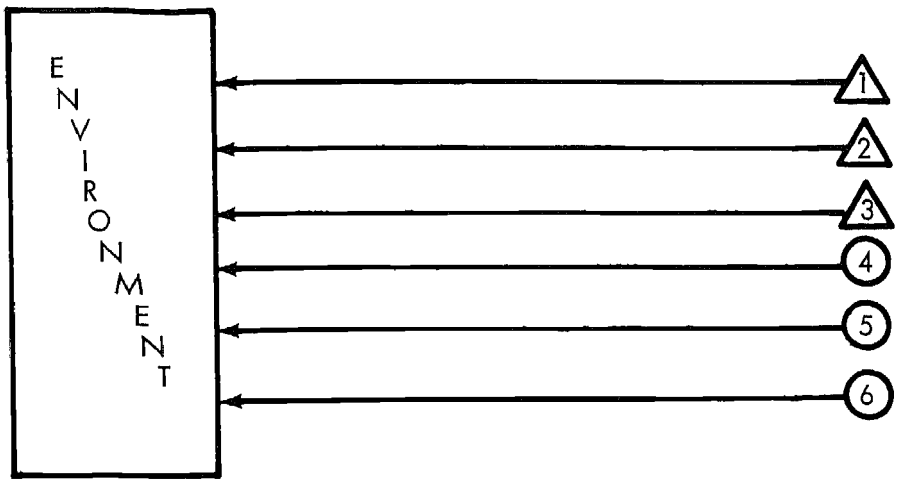
Similarly, the social insects are characterized by the social production of use values in the form of nests and food. The dependence of individual organisms on this system of social production is complete. Individual ants and bees consume only a small part of what they produce, and produce only a small part of what they consume. There is a continual flow of productive ethnoenergy, embodied in use values, between members of the population.

There is thus a thermodynamic similarity between societies of humans and societies of colonial invertebrates and social insects. This similarity lies in the dependence of individual organisms on the deep flow of ethnoenergy embodied in use values—digested food for Siphonophora, shelter and food among social insects, and shelter, food, weapons, tools, and other articles among humans even at the technologically most rudimentary, hunting and gathering level.

Both of these nonhuman pinnacles of social evolution utilize purely genetic information systems. Further, the individual organisms composing such societies are neurologically simple (a bee brain has about 250 cells, a human brain several million).

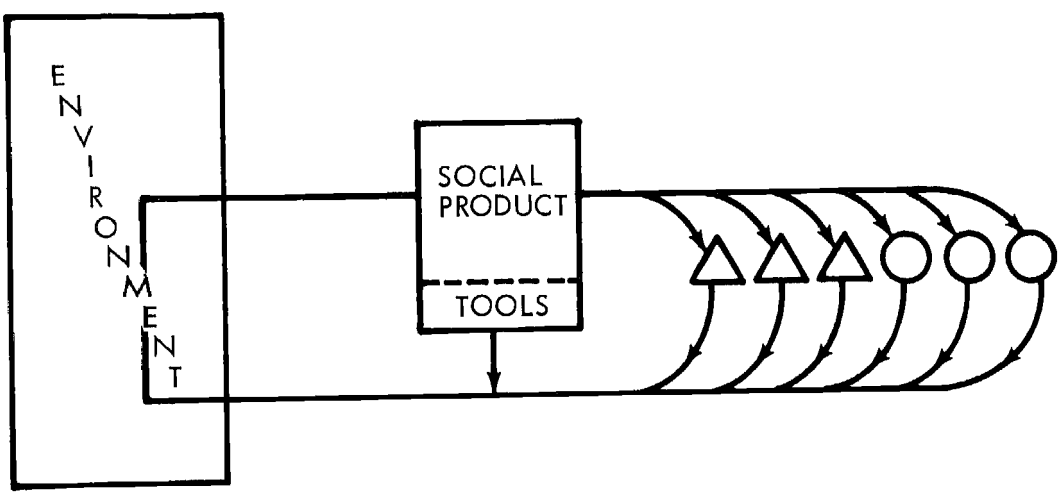
Aside from the basic mammalian dependence upon milk ("The key to the sociobiology of mammals is milk" [Wilson, '75:456]), mammalian social life by and large does not involve any deep ethnoenergetic flows. The most highly evolved forms of mammalian social life, by fairly common consent, occur in the order Primates, such as the African apes and baboons. Social life among the primates is associated with a very high degree of neurological complexity, and increased brain size, which permits a dependence on social learning, behavioral flexibility, and complex social interaction. Only very occasionally does such interaction include social production among the nonhuman primates.

There are, however, deep flows of ethnoenergy occurring among the social carnivores, most notably African hunting dogs. Individual dogs, like individual ants and individual human



PONGID PATTERN

(direct, individual appropriation of environmental use-values)



HUMAN PATTERN

(social production of culturally acceptable use-values through expenditure of labor energy)

Fig. 3 Ethnoenergetic flow in pongid and human populations.

beings, are dependent upon a system of social production and a deep flow of ethnoenergy. The social evolution of hunting dogs, however, is limited by their morphology. Their hunting tools are biological ones, and they lack the arboreal evolutionary heritage which provides primates with visual acuity, hand-eye coordination, and increased intelligence. When these highly evolved primate characteristics are combined with a system of social production similar in many respects to the group hunting carnivores, the result is the emergence of human systems of social production.

Thus, the difference between apes and humans can be stated in thermodynamic terms. In pongid and human populations there are surface flows of energy between individuals, but only human populations are dependent upon a deep flow of energy. This deep flow is generated by a system of social production. Similar deep flows occur in highly social species in other orders, colonial invertebrates, social insects, and social carnivores. The evolution of human sociality, like social evolution in these other species, is rooted in this thermodynamic elaboration. The difference is that human evolution began from an already highly social primate base, with extreme neurological complexity, visual acuity, manual dexterity, and a high degree of hand-eye coordination. The result is that human systems of social production are far more elaborate than anything occurring in other species. The distinctive features of human beings developed as adaptations to these elaborate systems of social production. We turn, then, to a discussion of these adaptations.

LABOR AND MORPHOLOGY

The distinctive morphological features of the human primate include, first, those related to bipedalism, including the structure of the foot, the pelvic girdle, the spinal column, and the manner of attachment of the skull to the spinal column; second, the structure of the hand; third, dentition; fourth, the structure and size of the brain; and fifth, the relative hairlessness of human beings. It is generally accepted that tool use and group hunting provided the key selective pressures leading to each of these morphological features and once it is understood that these are aspects of social labor, it follows simply enough that human morphology is itself a product of labor, produced in adaptation to social production. It may be well, however, to review some of these interrelationships.

The Hand and Bipedalism

The relationship between bipedalism and freeing the hand for tool use was recognized by both Darwin and Engels:

> Man could not have attained his present dominant position in the world without the use of his hands, which are so admirably adapted to act in obedience to his will. Sir C. Bell insists that "the hand supplies all instruments, and by its correspondence with the intellect gives him universal dominion." But the hands and arms could hardly have become perfect enough to have manufactured weapons, or to have hurled stones and spears with a true aim, as long as they were habitually used for locomotion and for supporting the whole weight of the body, or, as before remarked, so long as they were especially fitted for climbing trees . . . From these causes alone it would have been an advantage to man to become a biped; but for many actions it is indispensable that the arms and whole upper part of the body should be free; and he must for this end stand firmly on his feet. To gain this great advantage, the feet have been rendered flat; and the great toe has been peculiarly modified, though this entailed the almost complete loss of its power of prehension. It accords with the principle of the division of physiological labour, prevailing throughout the animal kingdom, that as the hands became perfected for prehension, the feet should have become perfected for support and locomotion . . . If it be an advantage to man to stand firmly on his feet and to have his hands and arms free, of which, from his pre-eminent success in the battle of life, there can be no doubt, then I can see no reason why it should not have been advantageous to the progenitors of man to have become more and more erect or bipedal. They would thus have been better able to defend themselves with stones or clubs, to attack their prey, or otherwise to obtain food. The best built individuals would in the long run have succeeded best, and have survived in large numbers (Darwin, '36:434).

> Climbing assigns different functions to the hands and the feet, and when their mode of life involved locomotion on level ground, these apes gradually got out of the habit of using their hands (in walking) and adopted a more and more erect posture. This was *the decisive step in the transition from ape to man* . . . It stands to reason that if erect gait among our hairy ancestors became first the rule and then, in time, a necessity, other diverse functions must, in the meantime, have devolved upon the hands . . . but the decisive step had been taken, *the hand had become free* and could henceforth attain ever greater dexterity . . . Thus the hand is not only the organ of labor, *it is the product of labor* (Engels, '72:251-252, emphasis in original).

It should be stressed that bipedalism is an adaptation to labor, and not an independent adaptation which simply happens to free the hands for tool use and production. "If evolution operates by selection, rather than by foresight, tool using must have appeared first. Only then could the intrinsically inefficient, bipedal mode of locomotion be favored in selection" (Hayes and Hayes, '55:115, citing *pro* Bartholomew and Birdsell, '53:482, and *contra* Washburn, '50; cf. also Oakley, '57:207-208). Although this point is often ignored, it remains valid and no convincing alternative has been suggested.

Dentition

The distinctive dental apparatus of humans, as opposed to pongids, includes first of all a parabolic shaped dental arcade, as opposed to the U-shaped arcade of pongids, and a reduction in the size of the canines. The former point appears to be related to the adoption of a graminiverous diet, which is not directly related to the adoption of social production, although it probably occurred about the same time. The latter point, the reduction of the relative size of the canines, has been related to the use of tools and weapons. Darwin argued over a century ago that

> The early male forefathers of man were . . . probably furnished with great canine teeth; but as they gradually acquired the habit of using stones, clubs, and other weapons for fighting with their enemies or rivals they would use their jaws and teeth less and less. In this case the jaws, together with the teeth, would become reduced in size ('36:435).

Although there has been considerable controversy on the reasons for canine reduction in hominid evolution (Brace, '63; Holloway, '67; Jolly, '70; Kinzey, '71; Washburn, '68; Washburn and Ciochon, '76), the relationship posited by Darwin has stood the test of time well, provided we recognize that (1) our pongid ancestor did not necessarily have *giant* canines, and (2) tool use was not necessarily the *only* behavioral factor creating selective pressures favoring canine reduction. As Washburn argues, "it seems quite evident that the function of the large canine and all the associated anatomy is an adaptation for fighting—within the troop, between troops, and against animals of other species" ('68:99), and regardless of whether our prehuman ancestors began with large canines or not, it seems equally evident that they would have developed large canines if these functions had not been taken over by weapons and tools.

Restructuring and Enlargement of the Brain

The human brain is unique not only in its relative size, but also in its structure and functioning. As Darwin pointed out,

> No one, I presume, doubts that the large proportion which the size of man's brain bears to his body, compared to the same proportion in the gorilla or orang, is closely connected with his higher mental powers ('36:436; cf. Van Valen, '74).

Although the relative contribution of brain size and structure is not clear, there is no serious doubt that both contribute to the uniquely human mental capabilities of foresight, problem solving, memory, and conceptual thought. Although there are of course rudimentary forms of such abilities appearing among apes, especially in captivity, the pongid life style is not such as to create very powerful selective pressures favoring their development. Such selective pressures can only come from a dependence on social productive forces as these forces themselves become

increasingly complex. Along with the development of social production comes increasing development of human powers of communication, both providing, as Engels noted a century ago, the selective pressures favoring increasing mental abilities and therefore the restructuring and enlargement of the brain:

> First comes labor, after it, and then side by side with it, articulate speech—these were the two most essential stimuli under the influence of which the brain of the ape gradually changed into that of man ('72:255).

Most modern theorists prefer to stress language rather than labor, but as we shall argue below, language developed as an adjunct to production, not vice versa. It is clear, however, that evolutionary changes in the size and structure of the brain have always been an important aspect of human evolution (Holloway, '72, '74, '75; Washburn and Moore, '74:173-174).

Hairlessness

Although a variety of reasons have been proposed for human hairlessness, the most compelling is the suggestion that it is an adaptation facilitating heat loss during daytime hunting in the tropics, again an aspect of social production (Brace, '67:75, but also see Hutchinson, '63 and Newman, '70).

LABOR, SOCIETY AND "ALTRUISM"

The incorporation of social labor into the life process of early hominids created a whole series of systemic changes which radically altered the selective pressures operating on the human psyche and molded it to its present form. Through a dependence on social production,

> . . . human society overcame or subordinated such primate propensities as selfishness, indiscriminate sexuality, dominance and brute competition. It substituted kinship and cooperation for conflict, morality over might. In its earliest days it accomplished the greatest reform in history, the overthrow of human primate nature, and thereby secured the evolutionary future of the species (Sahlins, '60:86).

It should be stressed, however, that the human revolution did not somehow suppress a more basic animal nature which is bestial, selfish, and sexually indiscriminate and which is still lurking in the darker reaches of our psyches (see Geertz, '74 for a criticism of the "layer theory" of human nature). Instead, prehuman primate nature (which was probably not as brutal as Sahlin's imagery would suggest [cf. Martin and Voorhies, '75:174]) was transformed into human nature, which in its very essence is sociocultural, requiring the individual to be concerned with ethical and moral rules as well as the feelings and opinions of others. Human nature, in other words, is incomplete, and requires interaction with a cultural tradition to fulfill itself (cf. Geertz, '74). As Marx noted, "the human essence is no abstraction inherent in each individual. In its reality it is the ensemble of the social relations" (in Selsam and Martel, '63:317).

The pongid base from which humanity evolved was already a highly social one, with a dependence on social learning and complex social interaction and interdependence in child rearing, play, and protection from predators, and mutual grooming. But the food quest among nonhuman primates remains largely an individual matter, marked by competition rather than cooperation. With the transition to social production, human beings became dependent upon social relations in a more complete way, and cooperation extended to the food quest as well as child care and predator protection. This more complete dependence upon society altered the selective pressures operating on the gene pool of the productive population and favored those individuals who were best able to operate within, and thereby benefit from, a culturally (or protoculturally) learned system of social production. In such a context, reproductive selfishness is dialectically transformed into behavioral cooperation and reciprocity, for it is these sorts of behaviors that are both necessary for the system and advantageous to the individual manifesting them.

It must be stressed that the societies with the most direct relevance to any discussion of human origins are hunting and gathering societies. Such societies have variously been termed

"egalitarian" (Fried, '67; Harris, '75), "familistic" (Service, '66), and even "communistic" (Engels, '72; Leacock, '72; Morgan, '63; White, '59). Importantly, hunting and gathering societies lack the hierarchy, exploitation, oppression, and personal aggrandizement of civilized societies in general and the competitiveness of capitalist society in particular. Such features only became built into social structures in the last 5000 years and over a million years *after* the decisive transition from pongid to hominid had been completed. As Lenski ('70:235-236) has noted, there appears to have been an "ethical regression" at the time of the neolithic revolution, which was accompanied by "increased head hunting, scalp taking, cannibalism, human sacrifice, and slavery," by "the decline of the practice of sharing," and by "the growing acceptance of economic and other kinds of inequality." The sorts of features which characterize historical and contemporary human societies, then, emerged rather late in human cultural evolution and have at best only a tenuous relevance to the problem of human origins. This important point has been too frequently ignored, and this ignorance mars many popular and even scientific discussions of human origins (e.g., Alexander, '71; Ardrey, '61, '66, '70; Lorenz, '66; Wilson, '75).

With this introduction, we may turn to a closer examination of the way in which social labor transformed pongid nature into human nature. The discussion will focus first, on the manner in which cooperation in production and sharing in consumption leads to the creation of more sociable individuals, second, on the emergence of a new female sexuality and the human family, and finally, on the emergence of genuine altruism in human populations.

It seems reasonable to suggest that the earliest social productive enterprise was group hunting and that cooperation in hunting tends to inhibit the development of strong dominance hierarchies seen in other plains dwelling primates, notably baboons. A hunting dog analogy is most instructive in this regard, for African hunting dogs exhibit a life pattern remarkably similar to early hominids: males engage in group hunting, share the kill, and return to the den to regurgitate meat for the stay-at-home females and young. African hunting dogs lack the strong dominance hierarchies of baboons (Schaller and Lowther, '69). Although H. and J. van Lawick-Goodall have observed dominance hierarchies among hunting dogs, their evidence tends to corroborate the above generalizations, for dominance behavior still does not occur associated with protolabor. Separate dominance hierarchies exist for males and females, those associated with females are much stronger. Dominance behavior is most marked during sexual heat, but does not occur during social hunting or feeding ('71:54, 59, 92-101). Further, not only are hunting dogs, along with humans and other social carnivores, the only mammalian species to exhibit a sexual division of labor and share food, but, as the following description of the hunting ceremony of dogs suggests, they are also the only non-human species to use ritual as an adjunct to production:

> All four began nosing and licking each other's lips, their tails up and wagging, their squeaks gradually changing to frenzied twittering. In a moment all the adult dogs had joined them and soon the pack was in swirling round and round in the greeting ceremony . . . And then, as suddenly as it had begun, the wild flurry of activity subsided and the pack started to trot away from the den on its evening hunt . . . Most of the gestures which occur in the ceremony appear to have been derived from begging behavior—there is the same nosing and licking of the lips. And, in this context, there seems to be little or no difference between the behavior of a high-ranking and a low-ranking individual. It seems, most perfectly, to express the unity of the pack in hunting: "I submerge my identity " the twittering cries seem to say "I will do my share of the hunting, I will share in the feeding. Let us go! Let us go!" (H. and J. van Lawick-Goodall, '71:58-59).

It has been noted that dogs are psychologically similar to humans in their ability to learn and follow rules and are even said to exhibit a superego and be capable of feelings of guilt and shame. Significantly the dog was humanity's first and still closest domesticate.

That productive labor, as opposed to mere appropriation of nature, calls forth distinctive behavioral patterns is further confirmed by studies of chimpanzee predation. Observers have noted that normally dominant males do not simply appropriate the remains but rather will stand by and "beg" for portions from the predator, even if the latter is sub-dominant (Teleki, '73a, '73b). It is tempting to see this as a primitive primate recognition of the right of the laborer to his product. Without some such recognition, systematic labor activities could not be

sustained. Social production, therefore, demands and creates a distinctive patterning of consumption according to principles other than sheer brute strength.

In the social production of their existence, the early hominids became dependent upon social relations in a new manner. In primate society, the adult individual is dependent upon society for protection from predators and for social and sexual satisfaction, but not for food. In such a situation it may well be the biggest, strongest, most aggressive individual that gets most of the food and is therefore reproductively favored. In human society, by contrast, even adult individuals are dependent upon social relations for food and the best fed individual is likely to be the one who is best able to manipulate social relationships.

The material interdependence of early hominids in cooperative hunting and food sharing, then, created selective pressures favoring not only a more sociable creature, but one capable of learning and conforming to socially established rules.

One of the most important of these social rules is reciprocity, which has been seen as an essential basis of human social life (Mauss, '67; Sahlins, '59, '60, '72). Reciprocity has biological survival value in that it provides individuals with a way to "store" food in other people's stomachs. It seems likely, therefore, that a Maussian biogrammar is somehow genetically encoded in humans in the same way that Chomskian transformational grammars are said to be. Joan Robinson has observed that

> Our brains refuse to conceive of a language without, in some form or another, a distinction between nouns and verbs to reflect the distinction between objects and actions; equally, our brains refuse to admit the possibility of a society which, for instance, admires cowardice (though it may value prudence), or that prefers cruelty to kindness within its own kind ('71:122-123).

Perhaps it is too much to suggest that our brains could not function in a society where favors and gifts were never repaid and where no one ever acted out of consideration for others, but it is certainly difficult to conceive of a human society constructed along these lines. But before prestation can occur, the gift must be produced. It is only within a population dependent upon labor, therefore, that reciprocity can develop. Reciprocity, in increasing the dependence of individuals on each other's good will, goes hand in hand with egalitarianism.

Human sexuality is also profoundly influenced by our dependence on social labor. Human sexual activities are characterized not only by their intensity and variety but also by cortical rather than hormonal control over sexual urges and by the lack of periodicity in female sexual receptivity. The fact that humans are sexy apes appears to be related to our dependence on social production. Periodicity in sexual receptivity is in most cases the most efficient reproductive pattern, since it concentrates sexual activity in times when fertilization is most likely. Continuous sexual receptivity, by contrast, involves wasteful expenditure of time and energy. More or less continuous sexual receptivity and cortical control over sexual impulses become adaptive in a way of life based on social production and food sharing.[3] A discriminating, continuously receptive female is better able to form enduring bonds and ensure a more stable food supply, and hence, better able to care for her young. These altered selective pressures molded a new, human female sexuality which became enlisted in the formation of the family and extended kinship relations networks (cf. Gough, '75).

The human family, in turn, becomes the social womb permitting the prolongation of human infancy and childhood, demanded to learn increasingly complex systems of production. Productive techniques, among social carnivores as well as humans, must be learned. Human productive techniques, involving the use of tools, require much more in the way of learning than, say, the hunting techniques of carnivores for the skills of tool use require a lengthy period of practice to be effective. It is by no means clear just when or precisely how the human family, with prolonged interaction between male and female in domestic life and child care, the incest taboo, and extensions of kinship beyond the nuclear group, arose from its pongid base. It is clear, I think, that the transition cannot be understood except in relation to the transition to social production, for the family presupposes production.

Labor's role in creating a more complete interdependence among humans is also important in the creation of altruism. Although much human behavior is explicable in terms of self-interest,

nonselfish and even self-sacrificing altruistic behavior is sufficiently common and important in human affairs to demand explanation. Altruistic behavior has been difficult to explain in terms of natural selection, since the cost of such behavior would appear to reduce the reproductive efficiency of the individual manifesting it while the benefits would increase the reproductive efficiency of other members of the group, so that the genetic base of altruism would be rapidly eliminated from the gene pool. A theory of human origins, therefore, must be able to account for the rather frequent occurrence of altruism in human affairs.

The question can be tabled, of course, by saying that humans are adapted to learn culture, and to do what culture tells them to do, regardless of whether this is egoistic or altruistic. It is the ability to learn that is adaptive, in other words, even if what is learned is mal-adaptive for the individual. This approach, however, is unsatisfactory in that it reduces the individual to a blank slate on which culture writes its rules, and ignores the biological constraints and drives of individuals (cf. Tiger and Fox, '71:11-23). Culture grows out of the activity and needs of individuals, not vice versa, and even though culture may react back upon and shape the individual's will, it does so only within definite limits. Culture is not, therefore, an independent entity in this regard, and could not cause individuals to act altruistically unless such altruism already existed in embryonic form in biological human nature.

Another common approach is to regard altruism as a product of group selection: although it may be deleterious to the individual, altruism provides benefits to the group so that groups with altruistic individuals are better adapted and replace groups without such individuals, and thereby perpetuate altrusitic genes. Unfortunately, however, biologists have pretty much rejected group selection as an explanatory device, for two major reasons (cf. Durham, '76; Ruyle, '73a; Williams, '66, '71).

First, group selection is mathematically unlikely, since selective pressures at the individual level would operate more strongly, rapidly, and persistently than those at the group level. Second, much altruistic behavior is in fact explicable by natural selection at the individual level since, to the extent that the benefits are enjoyed by offspring or close genetic relatives of the altruistic individual the altruistic gene will in fact be contributing to its own differential reproduction, as was observed by Haldane in 1932:

> In so far as it makes for the survival of one's descendents and near relatives, altruistic behavior is a kind of Darwinian fitness, and may be expected to spread as a result of natural selection ('66:131, cf. pp. 207-210).

Hamilton ('64) has suggested the term "inclusive fitness" to take account of the role of biological kinship in reproductive efficiency and natural selection.

This concept of inclusive fitness goes a long way toward explaining altruism in human populations. For the ability to learn altruistic behavior, or even a genetically based drive toward altruism, could become set by natural selection given the way of life of populations of early humans, marked by close interdependence based on social labor and close kinship ties of a genetic nature. There are, however, some further considerations which should be mentioned.

In a population dependent upon social labor and hence with a high degree of mutual interdependence, the *willingness* to engage in altruistic behavior may provide significant benefits to the individual in terms of increased social solidarity and respect from other members of the population. The costs, on the other hand, may be relatively slight if the occasions which would demand self-sacrifice by the altruistic individual are sufficiently rare. Natural selection, in such cases, would favor a latent altruism, even if the manifestation of such altruism were deleterious for the individual.

Finally, it must be noted that whatever genetic base altruism may have must necessarily be polytypic, and selection for some optimum level would therefore yield a range of variation including some individuals who are more altruistic and some individuals who are more selfish than the optimum. A dependence on social production would raise the optimum level and thereby produce some saints, as well as some sinners, with most of us somewhere in between.[4]

LABOR AND LANGUAGE

Labor contributes to the development of language in two ways. First, it generates the selective pressures which favor the kinds of mental abilities on which language is based. Second, it provides the need for a more effective and complex communication system. Let us examine each of these in greater depth.

Human languages share a variety of design features with primate call systems (Hockett, '60; Hockett and Ascher, '64). Like primate call systems, language uses a vocal-auditory tract to carry meaning of an arbitrary (i.e., nongenetic) nature and this is the sole or at least the main function of the sounds. But language is distinguished from primate call systems by its greater scope, or universality, and by its subtlety and complexity. The former is made possible by the latter, by the greater structuring of language. We may note three aspects to this structuring: *duality of patterning* (the structuring of meaningless elements into meaningful units), *grammaticality* (the structuring of meaningful units into higher order meaningful sentences, whose meaning is in large part dependent upon the structure), and *transformations* (the structural rules for substituting one structure for another, with equivalent meaning). In short, language involves the arbitrary imposition of meaning on the auditory environment through a highly complex structuring of that environment.

Now, labor involves the arbitrary creation of utility from the environment through a modification of the environment to create use values through a highly structured behavioral pattern, and the labor process is characterized by design features analogous to the duality of patterning, grammaticality, and transformations of language (cf. Critchley, '60:296-298; Hill, '72:315; Holloway, '69; Lewis, '62:38-42; Lieberman, '75:163-170; Pilbeam, '72:80). Consider, for example, what must have been a common productive process during the middle paleolithic. A stone (properly selected as to size, material, and transported to a proper place) is subjected to a series of what are individually meaningless acts, resulting (duality of patterning) in a useful object, a handax, and this handax is then embedded in a behavioral sequence (grammaticality) to produce a useful article of consumption, say a dead zebra. Further, the behavioral sequence must be altered (transformations) depending on the situation, but to produce the same result, for example, waiting in ambush by a waterhole might be transformed into chasing a zebra into an ambush but still produce the same result, a dead zebra.[5]

Perhaps this analogy will be seen to be farfetched. However, when one considered the complex sorts of information which need to be taken into account in selecting materials and making tools, in tracking animals and killing them, it is not unreasonable to suggest that a "grammar" of the productive processes in the most rudimentary human societies would prove to be every bit as complex as linguistic grammars, as is suggested by the analysis of cheeseburger-making of Harris ('64:72-90).

It seems quite clear, however, that there must have been an evolutionary series of increasingly complex communication systems bridging the gulf between the calls of our pre-human, ape-like ancestors and human language, just as there was an evolutionary series of increasingly complex productive systems bridging the gulf between the life processes of apes and humans. The linguistic series left no trace, but the succession of productive systems did, and can be reconstructed with a fair degree of accuracy. Further, the move onto the hominid evolutionary trajectory can only have been taken through labor, not simply by talking about it.

Thus, labor creates the *possibility* of the emergence of language. It does more than this, however, for it also created the *need* for language. Again, Engels:

> the development of labor necessarily helped to bring the members of society closer together by increasing cases of mutual support and joint activity, and by making clear the advantage of this joint activity to each individual. In short, men in the making arrived at the point where *they had something to say* to each other ('72:253-254; cf. Critchley, '60:296, emphasis in original).

Apes have no need for elaborate, efficient communication systems for there is little need to integrate the activity of individuals. But there is such a need in a way of life based on social

production, a need to coordinate the activity within a hunting group as well as between hunters and non-hunters.

If a labor dependent life process was an essential precondition for the emergence of human language, so too it was an essential precondition for the emergence of human thought. The basic qualities of the human mind are called forth by the labor process "to designate objects, qualities, and actions and to express judgments connected with the labor process" (Novack, '73:32). As Novack argues, the labor process

> . . . requires *hindsight* (remembrance of suitable materials, repetition of techniques, knowledge of their specific functions); it requires *insight* into the properties of materials for fashioning tools; it requires *foresight*, since tools take time to make and are designed not for instant application but for use at some future date . . . The functions of foresight, insight, and memory called forth by the labor process are the real source of the exceptional development of consciousness and reasoning in our species. Like society and speech, and together with them, intelligence is an offshoot of cooperative labor ('73:36, emphasis in original).

LABOR, MAGIC, AND RELIGION

Like labor, magic and religion are both unique to and universal in human societies. The magico-religious urge to create and interact with a non-sensory world of sacred and supernatural entities (meanings) appears to be an essential part of human nature. Indeed, so deep rooted is this urge that it not infrequently overrides what a "layer theory" would see as more basic biological needs for food and sex. While I cannot agree with those theorists who see religion, values, and meaning as the foundation of social life, neither do I have any desire to deny the importance of these considerations in human affairs. A theory of human origins cannot regard these urges as mere epiphenomena, but must be able to account for their important place in human nature. I shall argue that the magico-religious urge and the need for ultimate orienting values has become an essential part of the biological (i.e., genetic) nature of the human animal because of their survival value in a way of life based upon social production.

In one of his more famous passages, Marx laid the foundation for a materialistic view of religion:

> The basis of irreligious criticism is: Man makes religion, religion does not make man. In other words, religion is the self-conscious and self-feeling of man who has either not yet found himself or has already lost himself again. But man is no abstract being squatting outside the world. Man is the world of man, the state, society. This state, this society produce religion, a reversed world-consciousness, because they are a reversed world. Religion is the general theory of that world, its encyclopedic compendium, its logic in a popular form, its spiritualistic point d'honneur, its enthusiasm, its moral sanction, its solemn completion, its universal ground for consolation and justification. It is the fantastic realization of the human essence because the human essence has no true reality. The struggle against religion is therefore mediately the fight against the other world, of which religion is the spiritual aroma.
>
> Religious distress is at the same time the expression of real distress and the protest against real distress. Religion is the sigh of the oppressed creature, the heart of a heartless world, just as it is the spirit of a spiritless situation. It is the opium of the people (in Selsam and Martel, '63:226-227).

Now, however telling their materialist criticism of religion in bourgeois society may be, the general position on religion set forth by Marx and Engels is incomplete and one-sided, and hence, inadequate. For purposes of the present discussion, we may see this inadequacy as related to Marx's failure to analyze the positive role of religion in pre-class societies. This failure,of course, was a natural if not inevitable one in Marx's time, for throughout the nineteenth century investigations of primitive religions stressed their fallacious qualities. It was not until the twentieth century that the more modern view of religion was generally accepted. Malinowski has discussed this modern view as follows:

> The place of religion must be considered in the scheme of culture as a complex satisfaction of highly derived needs. The various theories of religion ascribe it to either a religious "instinct" or a specific religious sense (McDougall, Hauer) or else explain it as a primitive theory of animism (Tylor) or

> pre-animism (Marett) or ascribe it to the emotions of fear (Wundt) or to aesthetic raptures and lapses of speech (Max Muller) or the self-revelation of society (Durkheim). These theories make religion something superimposed on the whole structure of human culture, satisfying some needs perhaps, but needs which are entirely autonomous and have nothing to do with the hard-worked reality of human existence. Religion, however, can be shown to be intrinsically although indirectly connected with man's fundamental, that is, biological, needs. Like magic it comes from the curse of forethought and imagination, which fall on man once he rises above brute animal nature. Here there enter even wider issues of personal and social integration than those arising out of the practical necessity of hazardous action and dangerous enterprise. A whole range of anxieties, forebodings and problems concerning human destinies and man's place in the universe opens up once man begins to act in common not only with his fellow citizens but also with the past and future generations. Religion is not born out of speculation or reflection, still less out of illusion or misapprehension, but rather out of the real tragedies of human life, out of the conflict between human plans and realities.
>
> Culture entails deep changes in man's personality; among other things it makes man surrender some of his self-love and self-seeking. For human relations do not rest merely or even mainly on constraint coming from without. Men can only work with and for one another by the moral forces which grow out of personal attachments and loyalties. These are primarily formed in the processes of parenthood and kinship but become inevitably widened and enriched. The love of parents for children and of children for their parents, that between husband and wife and between brothers and sisters, serve as prototypes and also as a nucleus for the loyalties of clanship, of neighborly feeling and of tribal citizenship. Co-operation and mutual assistance are based, in savage and civilized societies, on permanent sentiments (Malinowski, '72:71).

This functional view of religion as a positively functioning social process growing out of human nature and serving an important, dynamic role in social life and not simply "reflecting" that life does not, however, tell us why the magico-religious urge is so important an aspect of human nature. An important clue is provided by a statement of Hudson Hoagland that "the religious urge appears to be a primitive tendency, possessing biological survival value" ('41, as quoted by Kluckholn '72:105). This view enables us to articulate modern anthropological theories of religion with a more general theory of human origins. For if religion has survival value, this serves to account for the development of the abilities and urges upon which it is based. The theory, however, must not only describe the survival value of the abilities and urges on which magico-religious thought and feeling are based, it must also be able to specify why these characteristics would not also have survival value for great apes, monkeys, and hyenas. It must be able to show, in short, not only why humans can believe in gods and demons, but also why other creatures cannot. The labor theory of human origins, I submit, accomplishes this by relating the positive survival value of magic and religion specifically to a way of life based on social production.

First of all, it is important to note that religion cannot appear until after labor and language develop hominid mental abilities to the point where it is *possible* to begin to conceive of non-existent supernatural beings. Religion, therefore, is very likely a late development in the hominid evolutionary trajectory. The "rain dances" and "carnivals" of chimpanzees seem to pre-figure religious sentiments (Reynolds and Reynolds, '65:408-409; J. van Lawick-Goodall, '71:52-54). But only labor can bridge the gulf which separates these and, for example, the corroborees of the Australian aborigines. Malinowski notes that religion, like magic, "comes from the curse of forethought and imagination, which fall on man once he rises above brute animal nature." But it is precisely these qualities that are developed by social labor. The possibility therefore, of religion and magic only appears after several million years of dependence on social production.

It is not, however, simply a matter of abilities developed for one purpose being turned to another, for it can be argued that the appearance of the most primitive forms of magic and religion helped intensify the selective pressures favoring the mental abilities on which they are based, and thus helped pave the way for the emergence of more complex forms of magico-religious behavior. To understand this, it is essential to examine more closely the positive survival value of magico-religious beliefs and feelings in a laboring existence. This examination will consist essentially of a reformulation of the insights of Malinowski on magic and Durkheim on religion. Very briefly, I shall argue, with Malinowski, that magic develops as

an adjunct to production in areas of uncertainty and danger and, with Durkheim, that religion develops as an expression and reinforcer of social solidarity among producers. In both cases, the development of magico-religious urges and abilities are linked into dependence on social production.

Magic is the attempt to control reality through the instrumentality of supernatural agencies. The importance of the Malinowskian perspective in this regard is that magic does not substitute for "scientific" or purely practical means but rather supplements them.

> . . . however much knowledge and science help man in allowing him to obtain what he wants, they are unable completely to control change, to eliminate accidents, to foresee the unexpected turn of natural events, or to make human handiwork reliable and adequate to all practical requirements. In this field, much more practical, definite, and circumscribed than that of religion, there develops a special type of ritual activities which anthropology labels collectively as magic . . . Magic is used as something which over and above man's equipment and his force helps him to master accident and to ensnare luck ('72:64).

Malinowski's analysis is clearly applicable to the big game hunting which was an important part of the life of early hominids. Magic develops as an adjunct to production, giving the producer greater confidence in his efforts and therefore making him more effective. Those individuals who are able to engage in magical activities to supplement their purely practical hunting techniques, therefore, become better hunters and are reproductively favored over those who lack such abilities.

Similarly with religion, which, rather than facilitating a more effective relationship between the individual and the environment, facilitates a closer, more solidary relationship between individuals. An essential part of any definition of religion is the concept of the sacred, which, as Durkheim argues, flows from the dependence of the individual on society:

> In a general way, it is unquestionable that a society has all that is necessary to arouse the sensation of the divine in minds, merely by the power that it has over them; for to its members it is what a god is to his worshipers. In fact, a god is, first of all, a being whom men think of as superior to themselves, and upon whom they feel that they depend . . . society also gives us the sensation of a perpetual dependence . . . religious force is nothing other than the collective and anonymous force of the clan ('72:35).

But the religious urge not only expresses the individual's dependence on society, it also serves to reinforce the solidarity between individuals who manifest it. Durkheim makes this an essential part of his definition of religion:

> *A religion is a unified system of beliefs and practices relative to sacred things, that is to say, things set apart and forbidden—beliefs and practices which unite into a single moral community called a Church, all those who adhere to them.* The second element which thus finds a place in our definition is no less essential than the first; for by showing that the idea of religion is inseparable from that of the Church, it makes it clear that religion should be an eminently collective thing (Durkheim '72:30, emphasis in original; cf. Marx, in Selsam and Martel '63:318: "the 'religious sentiment' is itself a *social product.*").

In unifying those who feel it into a more solidary community, the religious urge confers a relative reproductive advantage on those who possess it. It seems reasonable to suppose, therefore, that whatever genetic base the religious urge may have would become established, spread, and extended through natural selection.[6]

The link-up between labor, magic and religion is then complete. Labor and language raise humanity to the level where it can begin to create the sacred and supernatural world. Once this world is created, those individuals who can operate in it are reproductively favored over those who cannot because the sacred and supernatural world helps give people the strength to operate in the world of social production. Therefore, the genetic base of the magico-religious urge is maintained and extended and becomes, accordingly, an essential part of human nature. Further, natural selection favors not only the ability to traffic in this non-sensory realm but also the ability to express these feelings in ritual and myth and therefore facilitates the development of abilities in art, music, and dance.

LABOR AND THE ADJUSTMENT TO PLAINS LIFE

The functional relationships discussed above are diagramed in figure 4. But once it is agreed that certain pongid populations transformed themselves into hominids through social labor, the next logical question is, why did some apes become human and others remain apes? If labor was advantageous for some, why not for all? The answer, I believe, lies in the shift to life on the open plains, as opposed to the forest floor.

A shift to the open plains would have created more opportunities for labor activities and eventually, a dependence on social labor which would inevitably embark our ancestors on a human evolutionary career. Observations of wild chimpanzees, for example, suggest that in populations living on the fringes of the forest, as opposed to deep within the forest, there is an increased incidence of predation and tool and weapon use, as well as increased danger from predators (Kortlandt. '62; Suzuki, '69; Teleki, '73a, '73b). Now, as already noted, chimpanzees exhibit, at different times, all of the essential attributes of the fully hominid labor process, so that, should ecological conditions warrant it, they would be capable of recombining these and engaging in social labor. It would be within the range of observed chimpanzee behavior, for example, for a group of chimpanzees to surround an animal, beat it to death with clubs, and share the kill. It does not stretch our imagination or the observed ethological facts, therefore, to suggest that as our ape-like ancestors moved out further and further onto the plains, such behavior would have become more and more common until it formed an essential part of the creature's life pattern.

But hunting is not the only type of labor that would develop on the plains. DeVore and Washburn have observed that baboons spend much of their time during the dry season digging for roots, which are critical for survival.

> Digging these rhizomes out of the hard, dry soil with the fingers is a laborious task, and in the dry season baboons spend longer hours getting their food than they do during the rest of the year. The use of a simple digging stick or sharp stone would enormously increase their efficiency in extracting food from the ground, but no baboon was ever seen trying to use a tool in this or any other way ('63:354-356).

However, an ape capable of making a tool for termiting would sooner or later begin making digging sticks for digging roots. If the food supply during the dry season is indeed a limiting factor on the size of the population, one would expect a very powerful selective pressure favoring tool using and tool-making individuals in such a population. Further, as Brace ('70) has noted, a pointed stick can be used both as a digging tool and as a weapon.

All of this suggests very strongly that as certain pongid populations moved onto the plains they almost immediately (in thousands of years, not millions) began to engage in social labor

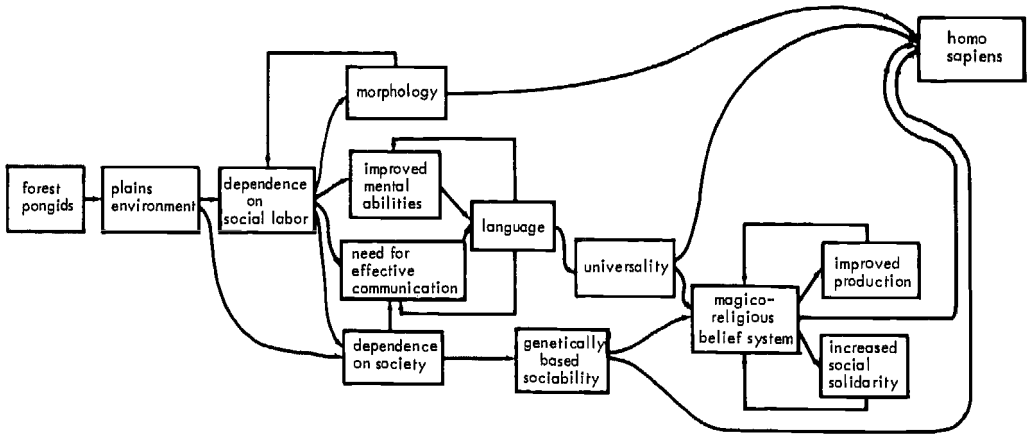


Fig. 4 Functional relationships in the labor theory.

and to embark on a way of life increasingly similar to that of modern hunters and gatherers. And we would expect that if contemporary chimpanzees were to be left free to occupy a plains niche, they would increasingly become dependent upon social production and would, in the course of millions of years, transform themselves into human beings, for better or worse.[7]

The adoption of social labor by some pongids is thereby explained; but, it could be argued that this merely pushes the explanatory problem one step backwards. Why did some apes who were doing quite well in the forest move out onto the plains? But this poses no real explanatory problem as one may simply utilize the general ecological principle of niche-filling. Open ecological niches adjacent to those already occupied have a tendency to become filled since random variation within existing populations ensures that they will be entered and the advantage for variants entering these niches will initially be very high. The movement to the plains, therefore, requires for its explanation only the familiar principles of Darwinian evolution and general ecological theory.

We may assume, therefore, that by late Miocene times, evolution in an arboreal way of life had carried the generalized primate tendencies to visual acuity, prehensile hands and feet, enlargement of the brain for greater hand-eye coordination, and increased complexity of social behavior to a very high degree of development (Cartmill, '74). Further, among the pongid Dryopithecine populations, the adaptation of brachiation as a locomotor and feeding pattern had carried further the differentiation of forelimb and hindlimb and had led to structural changes in the shoulder girdle. Thus, the purely blind, opportunistic forces of natural selection had created a creature uniquely "preadapted" to social production. When this creature moved out onto the plains, it placed itself on a trajectory leading to an entirely new kind of evolution, the cultural evolution of social productive forces.

MAJOR PHASES IN HOMINID EVOLUTION

Figure 5 illustrates the functional temporal relationships in articulation with the fossil record. Some discussion of the major phases of hominid evolution is in order.[8]

Australopithecine Phase

By roughly four to six million years ago, the decisive transition onto the hominid evolutionary trajectory had been taken. The australopithecines were almost certainly dependent upon the fully elaborated labor process and exhibited a life process quite similar to living hunters and gatherers: bipedalism, use of stone tools, a sexual division of labor in which males engaged in

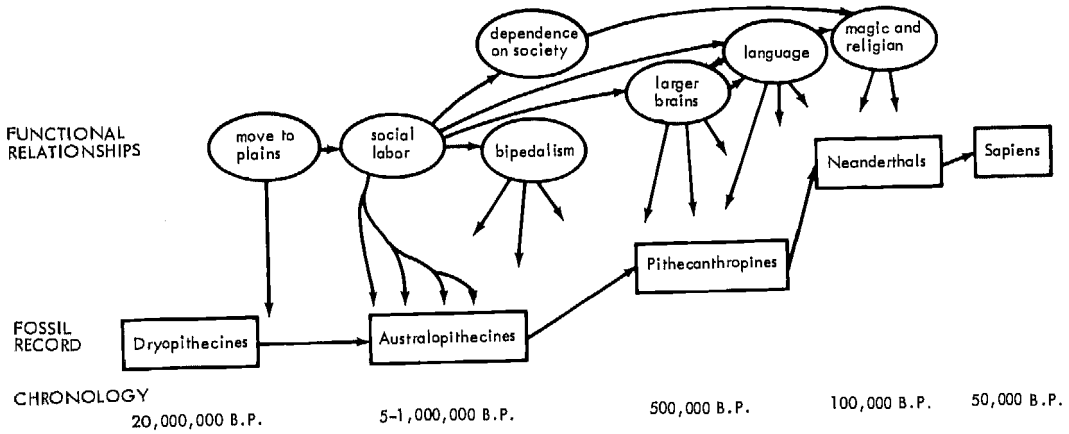


Fig. 5 Functional/chronological relationships and the fossil record.

group hunting, with tools, and females generally stayed nearer the home base and gathered vegetable food (seeds, roots, grasses, etc.) and cared for the young, which were marked by an increasing infancy and dependency. The evidence for this included first, the ethological data that each of these elements are found singly in species that are either phylogenetically or behaviorally closely related to hominids: tool making (chimpanzees), seed and root foraging (baboons), group hunting (hunting dogs and chimpanzees), division of labor (hunting dogs), nest making (chimpanzees), semipermanent dens (hunting dogs) and sharing of food (hunting dogs and chimpanzees). Chimpanzees, the closest relatives of the hominids, in fact exhibit at different times all of the characteristics of the fully elaborated labor process (see table 1, columns 2 and 3). It would therefore have involved no great leap for a chimpanzee-like creature to adopt this way of life and place itself on the hominid evolutionary trajectory.

It is likely that already by australopithecine times the division of labor had led to the emergence of rudimentary forms of the family (that is, to the economic cooperation of males and females within a single productive and reproductive unit), the incest "taboo", and extensions of kinship. Likely too, that the economic integration of male and female was facilitated by cortical control over sexual impulses and loss of periodicity in sexual receptivity. Further, if human hairlessness is indeed an adaptation to a hunting way of life, this may well have begun at this period.

The australopithecine phase, which lasted several million years, was marked by the beginning of a human way of life, that is, dependence on social production rather than mere appropriation of nature. The productive forces of society were as yet relatively undeveloped and the human organism had not yet accumulated the genetic material to enable it to handle more highly developed productive forces.

Pithecanthropine Phase

By about 500,000 B. P., genetic and cultural evolution had developed to the point where clear evidence of advancement appears in the paleontological and archeological record. The significant changes include a more efficient bipedalism, fully adapted to long distance walking, and increased cranial capacity, probably evidence of an increased mental ability to handle the developing productive forces, which include fire, more elaborate stone tools (Acheulean hand-axes), and more efficient big game hunting. The pithecanthropine phase, then, exhibits a continuation and intensification of the basic tendencies of hominid evolution.

Neanderthal Phase

The neanderthal phase is marked by a further increase in cranial capacity and by further elaboration of productive techniques, especially as seen in the Levalloisian "tortoise-core" and other middle paleolithic techniques. This elaboration of production may have been accompanied by the earliest true speech, since, as Lieberman (1975) argues, it is not until the Levalloisian that one encounters stone working techniques whose productive "code" is comparable to the complexity of human grammar. It is at this time that the earliest suggestions of religion appear in the fossil and archeological record.

Sapiens Phase

By about 30-50,000 B. P., fossil humans indistinguishable, for all practical purposes, from contemporary populations appear in association with upper paleolithic cultures equalling or surpassing those of contemporary hunters and gatherers (in terms of material culture): elaborate stone working techniques producing highly specialized tools, projectile points for spears and arrows, awls and needles for making skin clothing, cave art, and so on. It is important to understand that the 50,000 years or so of the sapiens phase constitute but one percent of our human evolutionary career. In spite of the tremendous cultural changes that have occurred

during this time, especially during the last 10,000 years (no more than .2% of human life on earth) there is no evidence that these have been associated with significant genetic changes in the area of culture bearing abilities.

CONCLUDING REMARKS: "PEOPLE MAKE THEMSELVES"

The views set forth in this paper, that human beings are, in their morphology and psychology, themselves the product of social labor, that, to paraphrase V. Gordon Childe, "people make themselves", these views have the profoundest implications for general anthropology. These implications include the theory's contribution to the understanding of human origins and evolution, its contribution to the development of a theory of human nature, and its articulation to the more general theory of historical, or dialectical, materialism. We may conclude by reviewing briefly each of these areas.

1. In the area of human evolution, a most important aspect of the labor theory is that it provides a framework for integrating currently competing theories of human origins. The divergences between the tool use theory, the predatory, social carnivore theory, the social behavioral theory, the seed-eater theory, and the sex theory are more apparent than real. The positive contributions of each can be subsumed within the labor theory once it is understood that tool use, group hunting, seed collecting, and root digging are all aspects of social production. At the same time, the labor theory facilitates the criticism of erroneous theories, such as the "killer ape" theory. The working ape was a tool using, hunting, seed eating, and sociable ape, but not a killer ape.[9]

2. In the area of human nature, the labor theory emphasizes the crucial disjunction between human, cultural evolution and animal, genetic evolution. The latter results from blind, biochemical forces acting without regard to the happiness of individual organisms or to "progress" in general. Human cultural evolution, by contrast, is based on social production, the conscious, purposeful activity of human beings in pursuit of their own ends. To be sure, this activity often produces unanticipated and unintended results, but these are reduced as human control over the forces of social production is extended. For this reason, considerations of human happiness and human progress, which are quite properly excluded from genetic evolution as irrelevant, are appropriate in a discussion of human cultural evolution (cf. Ruyle, '77).

3. In the area of general theories of cultural causation, the labor theory fits into and supports the general theory of historical, or dialectical, materialism. That social production was the "initial kick" placing humanity on a distinctively human evolutionary trajectory lends credence to, and derives credence from the general materialist position which stresses the priority of social production in sociocultural causation (Marx, in Selsam and Martel, '63:186; cf. Ruyle, '75).

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NOTES

[1] The term "ethnoenergy" has not been received very warmly by either Marxists or non-Marxists; indeed, the former are, if anything, more hostile (see, e.g., the comments in Ruyle '73b). I would gladly abandon the term if a better one could be suggested. Perhaps "time-energy" (Wilson, '75:142-143) or "behavioral energy" would be preferable, but since I have already committed myself to ethnoenergy (Ruyle, '73b, '76), I will continue using the term until convinced of the folly of my ways. It is the *concept*, however, and not the term that is scientifically important, and I am convinced that the concept has not been given the scientific and theoretical attention it deserves. The framework offered here was inspired by the thermodynamic, culturological theory of White ('49, '59, '75) and the ecological energetics of E. P. Odum ('71), but it has its closest affinities to Marx's analysis in *Capital*. Value, in Marxian analysis, is essentially a thermodynamic concept: the amount of socially necessary labor embodied in a commodity. The value concept, however, is limited in its applicability to capitalism, since it is only in capitalism that a significant portion of use values take the form of commodities (Marx '65:35-41). Ethnoenergetics is an attempt to generalize Marxian value analysis to noncapitalist societies (Ruyle, '73b, '75) and, in the present discussion, to nonhuman species, as well as human societies. The advantage of the thermodynamic framework offered here is that it provides a way of integrating within a single theoretical framework ideas concerning human origins, the origin and nature of class societies, and the Marxian analysis of capitalist society.

[2] Production through protolabor is quite common in the animal world. The production of nests and hives is almost universal among social insects and birds. Among mammals, predation is a form of production since it transforms an environmental resource, a live animal, into a use value, a dead animal which can be eaten. Many herbivores also perform operations on food resources to make them consumable: "elephants uproot trees to munch the foliage, baboons and wart hogs dig up roots, squirrels remove the husks from nuts, bite the embryos to prevent sprouting, and store the result for future retrieval" (quote from one of the reviewers' comments on the original article). Special mention should be made here of Morgan's pioneering work on the American beaver, who build dams over 100 feet long and dig canals up to 450 feet long for transporting wood (1868). According to Morgan, all this is done through individual, as opposed to collective, labor. Tool use is also very widespread among non-human animals, being observed not only in primates but in a variety of species of other orders (Alcock, '72; Hall, '63; A. Jolly, '72; Lancaster, '68). It is worth noting that tool use is almost invariably learned behavior (Harris, '75:55), and Alcock has noted that

> Sea otters, woodpecker finches, and human beings may be especially proficient in the use of feeding tools because all have invaded unusual niches for their phylogenetic groups and have faced potentially severe competition from species well established in their environments ('72:472).

Production, then, is widespread in the animal world. Animal production processes, however, are extremely rudimentary compared to the social labor processes of even the most technologically unsophisticated population. Animal production is based on protolabor rather than labor, the sole exception being certain species of ants which do in fact use tools and therefore do exhibit all the characteristics of the human labor process enumerated above (Fellers and Fellers '76). Significantly, chimpanzees also exhibit all these characteristics, but not at the same time.

[3] One of the reviewers of the original manuscript objected that continuous sexual receptivity also occurs among female marmosets, and therefore does not correlate with a way of life based on social production. Marmoset sexuality, however, is quite likely related to family life and child care patterns, for, according to the Los Angeles Zoo, it is the father marmosets that carry the young about after birth, only relinquishing them to the mother for nursing. The marmoset example, in other words, serves to corroborate the postulated relationship between female sexual receptivity and paternal investment in child rearing.

[4] It may be noted that Spencer's theory of ethics presages many of the ideas embodied in the present discussion (1892:vi-vii, 302).

[5] Hill has objected to the analogy between tool-making and language:

> It is the embedding and recursivity features of language which seem to me to make analogies between language development and tool-making, of the sort proposed by Holloway (1969) singularly infelicitous. Holloway has noted that stone tool production displays the design feature of duality of patterning. Duality of patterning, however, is a pale reflection of what actually goes on in languages. Modern linguistics emphasizes the enormous depth of derivations that link underlying conceptual structure to the phonetic output of any human language. Toolmaking, by comparison, is an exceedingly simple gesture, and a derivational depth in behavior of the sort that might involve embedding and recursivity would be associated not with the tools themselves, but with the behavior patterns in which they are used ('72:315).

Now, I don't believe I would concur with Hill's objection in this regard, but even if it were true, it is noted that in objecting to the analogy between tool-making and language, Hill implicitly embraces the analogy between *labor* and language, for tool-making is but one part of the total behavioral pattern involved in the labor process.

[6] An additional reason for the development of religious sensibilities has been suggested by Waddington:

> the specifically human mode of evolution, based on socio-genetic transmission of information, essentially requires the existence, as a functional part of the mechanism, of something which must have many of the characteristics of

ethical belief. It is necessary, before socio-genetic transmission can operate, that some sort of "authority-bearing system" is formed in the mental apparatus of those who will transmit and those who will receive ('60:202-203; cf. Huxley and Huxley, '47, and also Rappaport, '71a).

I do not believe, however, that it is necessary to postulate the necessity for any sort of religious "authority-bearing system" in cultural transmission. I believe that if the information is practical, it will be transmitted (cf. Ruyle, '73a).

[7] The model proposed here would appear to be at variance with Jolly's ('70) "seed eater" model. Jolly's suggestion of a seed eating phase in hominid evolution has been fairly widely accepted with only passing critical evaluation (e.g., A. Jolly '72:62-63). While Jolly is quite correct in stressing the importance of seed eating and other dietary features of early hominid evolution, his two phase model is simply untenable in the form presented. Jolly suggests that the first phase is marked by a seed-eating adaptation to plains life, and that it was only after several million years of accumulating various plains adaptations, most importantly bipedalism and certain dental characteristics, that some of the seed eaters began the tool-using, hunting way of life leading to hominidization. The theory, however, raises more problems than it solves and leaves a number of serious questions unanswered.

Jolly suggests that bipedalism arose as part of a feeding-locomotor pattern similar to that of the gelada baboon, Theropithecus, which eats while squatting on its haunches. But this proposed reason for bipedalism rests upon the same sort of illogic he denies to others: "it is illogical to invoke the behavior of living apes to explain something that they themselves have not developed" ('70: 9). One may ask, why didn't the gelada become bipedal? Further, and most telling, I think, is that the proposed behavioral adaptation provides too slight an advantage to be able to account for bipedalism which, given its many disadvantages, is a rather unlikely adaptation. Bipedalism, as already noted, is maladaptive in that it is inefficient in terms of speed for short dashes (as in escaping to trees from predators), in terms of the structural strength of the lower back, and in terms of childbearing. The advantages of bipedalism, on the other hand, are fourfold: (1) it frees the hands for carrying and using tools and other objects, (2) it raises the head and eyes above grass level to enable a hunter to see more distant game, (3) it raises the head and eyes to permit detection of predators, and (4) it is an efficient way of traversing long distances. Now, of these advantages, only (3) would apply to a seed-eating ape, but in raising the head to see predators, bipedalism would also raise the visual and feeding apparatus farther away from the seeds. Further, contemporary baboons have developed other techniques of predator detection. A seed-eating ape would be nothing more than a knuckle-walker. On the other hand, bipedalism fits very well into the life pattern of a hunter who must traverse long distances while carrying weapons in search of game and who must carry his kill back to his home base. In short, where we see bipedalism we must suppose labor, and since Australopithecus was clearly bipedal we must conclude that he was already engaged in a hunting and gathering way of life.

Finally, Jolly's model provides no explanation for the inception of his phase two hominidization, other than a mysterious allusion to "a further, comparatively minor, ecological shift" which "would put a premium on exploiting meat as an additional staple" ('70:21), but this is clearly forced. There is no reason to suppose that a seed-eater would wait millions of years before beginning to engage in tool use and hunting.

Although his two phase model must be rejected, Jolly is undoubtedly correct in suggesting that seed eating was important in early hominidization. Jolly's two phases are in fact two *aspects* of a single transition to plains life. Seed-eating and a graminiverous diet was one aspect of the transition, an aspect which may have been dominant for thousands of years (not millions), but tool use and hunting must have become increasingly important and were dominant in the development of the distinctive human characteristics (cf. Washburn and Lancaster, '68). Both of these aspects, however, were clearly operative in the evolution of the earliest known hominids, the australopithecines. It should be further noted that Jolly's argument is useful in correcting what some have seen as an overemphasis on hunting in human evolution, and might profitably be developed in conjunction with the emerging feminist perspective in anthropology. As Slocum ('75:46) has recently suggested, two of the earliest cultural inventions were probably containers to carry the products of gathering and some kind of sling or net to carry babies.

[8] My discussion is in general accord with standard treatments of human evolution (Birdsell, '72; Brace and Montagu, '65; Buettner-Janusch, '66; Poirer, '74), but there are a number of unresolved problems in the interpretation of the fossil record which this brief discussion must ignore, but for the most part, the labor theory does not depend upon their resolution. For example, the labor theory can be accommodated to either a single species or a multiple species view, although I feel the former is more elegant. I am aware that the single species hypothesis has been declared "dead", but perhaps such reports are premature (cf. Fried, '73:68; Pilbeam and Zwell, '72; Washburn and Ciochon, '76; Wolpoff, '68, '71, '73, '76). Similarly with the ramapithecine and gigantopithecine problems. The suggestion that Ramapithecus was ancestral to later hominids (Simons, '61, '72) has been widely accepted, but also questioned in terms of the fossil analysis (Frayer, '74; Harris, '75:46; Vogel, '75; Walker and Andrews, '73), as well as serological analysis (Sarich, '73, Sarich and Wilson, '67; Washburn and Moore, '74; but also see Read and Lestrel, '72; Uzzell and Pilbeam, '71). Gigantopithecus is also considered to be possibly ancestral to later hominids (J.T. Robinson, '72:255). My own feeling is that the decisive question of whether these creatures were hominid or not must rest upon a judgment of whether or not they were bipedal, for bipedalism implies social production. The positing of a pre-australopithecine

stage of hominid evolution, therefore, must await more complete fossil evidence, especially from the post-cranial skeleton.

[9] Proponents of the "killer ape" theory originally proposed by Dart ('53) but recently elaborated by Ardrey ('61, '66, '70), Lorenz ('66), and Tiger and Fox ('72), also stress the fact that human nature has been formed by millions of years as a hunter, but argue that this has formed a human nature in which aggressiveness, hierarchy, competition, territoriality, and even private property have become genetically fixed. Such theories, however, draw on a limited data base which overstresses baboon and bourgeois society to the neglect of real hunters, both social carnivores and living hunting and gathering human populations. One does not need the labor theory, of course, to criticize very effectively the killer ape theory (see, e.g. Alland, '72; Montagu, '73), but the criticism is even more effective when based upon the labor theory, for the "killer ape" theory ignores the fact that group hunting is simply one form of social production. From all indications, group hunting leads to social psychological features precisely opposite to those claimed by proponents of the "killer ape" theory. Hunting, like social production in general, tends to create cooperation and egalitarianism, not aggression and hierarchy. The killer ape theory also neglects the ethnological fact that hunting and gathering peoples are generally the most pacific and least aggressive of any in the ethnographic record.

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