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THE CHANGING ROLE OF WOMEN IN MODELS OF HUMAN EVOLUTION

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INTRODUCTION

Imagine three anthropologists:

A primatologist observes a female chimpanzee fashioning several crude tools from grass stems, which she will use to fish termites from an underground nest over many hours, in the presence of her sometimes intrigued, sometimes impatient offspring. An ethnographer lives with a group of human foragers at one of their campsites on the edge of a waterhole, recording in detail the daily patterns of adult women and men as they go about their lives, obtaining and preparing food, caring for their children, enjoying their leisure, interacting with their neighbors. An archaeologist and a team of bone hunters fan out across an escarpment slowly descending the years, squatting every now and then to peer and scratch carefully at the surface; they walk and look and listen for the call that will signal a "find."

Probably the primatologist and ethnographer would quite properly deny that the objective of their research was the reconstruction of the lives of our earliest human ancestors. The latter is there first and foremost to understand the lives of these contemporary human beings before their way of living disappears entirely, and the former works to explicate the animal species for itself, another life form in danger of disappearing before we can understand it. Nonetheless, the information obtained from all these studies will be gathered up, if not by the original researchers, then by others, and woven into a scientific story of the origins and evolution of early human behavior. For we have a powerful urge to know our origins—scientists and public alike—allied

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to a strong cultural imperative to justify our present social arrangements through reference to historical precedents. And what more significant guide to comprehending the structure of our own underlying nature could we discover than the original blueprint for human society?

That is why the practice of modeling the life of early humans, although shunned by many anthropologists, is nevertheless a scientific game played with great determination; its reward is the right to propound a view of human nature. Some of these models are widely disseminated, in high school and college textbooks, in popularized scientific writings, in fiction, on film. And in a society which tends to believe that what is natural is good, or at least acceptable, "scientific" statements about the original nature of human society represent applications of data which even those who disapprove of such modeling can ill afford to ignore.

In this review, I take one aspect common to models of early hominid life, namely, the reconstruction of sex roles, examining in particular the part that women are seen to have played in human society and in the evolution of those characteristics that distinguish us from our primate relatives. The title of this review allows me to examine not only how the perceptions of women's roles in human evolution have changed, but also to describe how women lately have come to play a part in the very construction of models of their origins. As anthropologists, we might have expected that women, with their distinctive life experiences, would have origin stories to tell that would differ in significant ways from those of men.

This review begins with an historical overview of the more influential models, from Darwin's ideas in 1871 (15) to those of Lovejoy in 1981 (71). Then I attempt to dis-articulate the models for an examination of their significant parts by discussing separately the major sources of evidence and/or analogy for early human social life: the comparative data from studies of primate societies; the indirect data from contemporary human foraging societies; and the archaeological and paleontological evidence drawn from the material remains of our ancestors. Throughout these sections, I also make reference to the cultural assumptions about the appropriate behavior of men and women that inform our theories. The final section suggests how we may improve our ability to reconstruct an early human society that is more than a backward projection of current cultural beliefs and practices.

HISTORICAL CONTEXT

Although evolution as a concept was in use by social philosophers and natural historians long before Darwin's time, it was in scholarly treatises of the second half of the nineteenth century that the idea of gradual, adaptive change came to be widely applied to the place of humans and human societies in the natural world. Evolutionary models became something of a fashion among

European and North American scholars, including those interested in explaining the social nature of humans, as well as those more concerned with the biological nature of humankind.

Biological Evolution in the Nineteenth Century

After publishing *The Origin of the Species* in 1859 (16), which set out his theory of, and evidence for, natural selection, Darwin was left with several puzzles. Two of these were: the explanation of secondary sexual characteristics in a wide range of species, and the extent to which evolutionary theory could be applied to human behavior and biology. He set out to explore both of these topics in his 1871 book, *The Descent of Man and Selection in Relation to Sex* (15). The book thus has two intertwining objectives: the development of a theory of sexual selection applicable to the entire animal kingdom, and the establishment of the human species as subject to the laws of both natural and sexual selection. In the process of demonstrating that the characteristic features of the human phenotype and the human way of thinking and living show rudimentary similarities with those of other animals, Darwin also provided sketches of his own view of early human life. Especially in the course of discussing the application of sexual selection theory to humans, he provided us with a clear picture of how he saw the roles and the interrelationships of men and women in human society. First let us look briefly at Darwin's conclusions on sexual selection and the human place in nature, the two platforms on which he was to build his scenario of early human social life.

Darwin's reasoning was that secondary sexual characteristics, which neither are directly necessary for reproduction nor for survival, were the result of two types of interactions involving the sexes: competition and choice. Competition, Darwin believed, generally occurred between males for access to female mates, and choice, he reasoned, was exercised by females from among the male mates available to them. Thus, certain traits in males which enhanced their ability to win in competitions and/or to be chosen by females were sexually selected. It seemed obvious to Darwin that sexual selection had occurred in humans, because he believed the human male to be more courageous, energetic, inventive, pugnacious, and sexually assertive than the female. The human male is also bigger than the human female, because, Darwin argued, in primitive times men fought to the death for access to women, and in modern times his size advantages are maintained because he has to work harder than woman for their joint subsistence. Women are more nurturant, more reclusive, and more altruistic than men, traits which occur because of the lack of selection for the assertive, selfish male traits listed above, and also because of an extension of "maternal instincts" toward other members of the group as well as toward infants.

Several authors (e.g. 25, 77, 108) have pointed out that Darwin projected onto the large screen of nature his own images of appropriate role behavior for men and women, images which were clearly drawn from upper-class Victorian culture in Britain in the 1800s. Not so often pointed out (but see 125) are certain inconsistencies in the conceptualization and application of sexual selection theory itself. For example, Darwin saw selection as operating almost entirely on males. Competition selected for male armaments (size, strength, weapons) and choice selected for male ornaments (colors, elaborate headdresses, beautiful voices). Females of the species were seen to be, as a general rule, similar in appearance and behavior to juveniles, their traits occurring in the absence of sexual selection. Darwin weakened his principle of female choice by equivocating about the actual power of females to exercise choice in determining which males would mate. At times he thought females had the selective power to bring about elaborate male features such as the peacock's tail. At other times he thought that females could do no more than accept the least distasteful male available, or accept the winner of a previous male-male competition, a lack of selective power which elsewhere I have likened to "Hobson's choice" (24).

Having already equivocated about the power of female choice to bring about sexual selection in animals, Darwin then contradicted himself when applying the theory to humans. For Darwin believed that the human female was sexually selected by males. Since this is the opposite of his principle of female choice, it is odd that Darwin argued repeatedly that men in various societies around the world exercise choice among possible female mates on the basis of the latters' appearance and behavior. He did seem to believe that female choice had operated on human progenitors, but apparently at some point in human evolution he saw the process reversing. The human species appears to be the only one for which Darwin argued that males presently exercise both the mechanisms of competition and of choice, although nowhere does he discuss the matter of how or why the process of intersexual selection reversed, with choice as well as competition becoming the prerogative of the human male.

Darwin's second objective in *The Descent of Man* was to demonstrate that many human features, then thought to be unique, had simple analogs in other animal species. Thus, he spent two chapters discussing the evidence for rudimentary beginnings of higher mental powers in animals: faculties of mind such as reasoning, imagination, aesthetics, ability to produce material objects, and religious beliefs. He also argued that humans shared with many animal species the "social instincts": desire for company, sympathy for others in the social group, altruism, love of praise and fear of blame. However, the most important characteristic to distinguish early humans from animals was a sense of morality. Once humans had developed the "self-regarding virtues,"

which Darwin saw as self-control and awareness of good and evil, they began to develop societies based on higher mental faculties than those of other animals. He believed that early men developed their tool-making skills to produce weapons and to become efficient hunters. They also began to accumulate property which helped to bring about social stratification. To alleviate sexual jealousy and because of their ability to exercise self-control, marriage practices were instituted which would regulate sexual behavior, primarily of women. In some societies, powerful men could take more than one wife.

In sum, Darwin suggested that early humans lived in small hunting communities made up of monogamous or polygynous units. Before cultural practices such as infanticide were introduced, which he thought would counter the effects of natural and sexual selection, these biological processes selected for courageous, intelligent, tool-using men. In the absence of an understanding of how traits are biologically transmitted to the next generation, Darwin used a concept he called "equal transmission of characters" to explain how women were not left totally behind in the process of human evolution. In this way, Darwin helped to pioneer what I call the "coat-tails" theory of human evolution: traits are selected for in males and women evolve by clinging to the men's coat-tails. This model became, and remains, the predominant image of human evolution, though rarely so candidly stated as by Darwin:

> Thus man has ultimately become superior to woman. It is indeed fortunate that the law of equal transmission of characters to both sexes prevails with mammals. Otherwise it is probable that man would have become as superior in mental endowment to woman as the peacock is in ornamental plumage to the peahen (15, p. 874).

Social Evolution in the Nineteenth Century

In the nineteenth century, the biological and social sciences were not the widely separate fields built on often incompatible paradigms that they are today. There was great overlap and cross-fertilization of ideas between those interested largely in human biological nature and those interested mainly in human social evolution. All of the writers discussed in this section were contemporaneous with Darwin, and most of their major works were published after *The Origin of the Species* but before *The Descent of Man* (e.g. 3, 72, 74, 81, 82). Thus, some of these scholars such as McLennan are widely quoted in the human behavior sections of *The Descent of Man*, and must have had an impact on Darwin's view of early human society, even though they did not share the same understanding of "evolution" (see below). On the other hand, a few of the writings discussed in this section (21, 105) appeared after Darwin's *Descent of Man* and were clearly influenced by the latter. Perhaps it is

because of such cross-fertilization of ideas that many of these multiple schemes of human social evolution seem to be variations on a single theme.

In essence, the theme of the nineteenth century social modelers was that all human societies pass through a series of stages which represent technological and social progression from an initial primitive aggregation to the final civilized state. Furthermore, most of these scholars believed that contemporary societies of the world are at various stages along the path toward their common goal of civilization, and therefore they could be used as representatives of landmarks along the way in a reconstruction of the human social journey. It is important to note at this point that such a view of the evolution of societies is different from Darwin's view of the evolution of species, and may in fact have little in common other than a concept of "change over time." Certainly the principles of natural and sexual selection are irrelevant to these models of social evolution, whereas *progressive* change (only episodically implicit in Darwin's works) is the leitmotif of nineteenth century social evolution theory.

Although there were variations, a common concern of the authors was the increasing regulation of human sexual behavior as societies progressed toward more complex technological, political, economic, and kinship systems. Since this concern with the regulation of sexuality directly reflected their definitions of male and female roles, it is upon this aspect of the models that I shall focus. All of these scholars, except Maine, believed that the original human societies were promiscuous. (Interestingly, Darwin, anticipating modern opinion, expressed doubt about this assumption because he believed that no known human society or nondomestic animal society is totally promiscuous, even if individuals mate with multiple partners.) This initial stage of promiscuity was followed by a universal matrilineal stage, which in turn was followed by the present patrilineal stage. During the matrilineal stage, the only kinship ties that were recognized were those of women to their children, so that what we would now call "matrifocal" units prevailed. It was because many of these scholars believed that group or "consanguineous marriages" were occurring in the matrilineal stage that they concluded the fathers' relationships to their offspring would not have been recognized.

There was considerable confusion in these works and in many subsequent interpretations of them between matrilineality, or reckoning of descent through the female line, and matriarchy, or rule by older women. Bachofen (3) used ancient myths to argue that women had dominated society in its earliest stages and were later to lose power. Morgan (82, 83) used his extensive knowledge of the Iroquois to argue that women in the promiscuous and matrilineal stages were either equal to, or dominant over, men, and were in control of sexual relations, descent, and property. He believed that these forms of female power were lost as societies evolved toward civilization (see discussion in 77). However, for the other modelers (72, 81, 105) the story of

social evolution was not one of the decline of female power during the evolution of societies, but rather of the rise of female prestige. In particular, they argued that when matrilineality was overthrown by patrilineality and the monogamous marriage, women were finally and rightfully protected and supported by individual men. Women were thus able to give up unseemly productive labor and overt sexuality in the public domain and retreat to their "natural," socially valued domestic functions.

Some years after the publication of these works and of Darwin's *Descent of Man*, Engels (21) was to reinterpret Morgan's extensive work on the Iroquois in order to argue that early human promiscuous and matrilineal societies did offer greater social power and prestige to women, that these earliest societies were in fact socially egalitarian, the opposite conclusion to that of McLennan, Lubbock, and Spencer. According to Engels, it was only with the invention of agriculture that the accumulation of property became important to men, and patrilineal descent systems were instituted to afford men greater control over the disposition of their property, of which their wives and children became a part.

Respective Fates of These Early Models

Darwin's views on the evolution of human behavior were reinterpreted by Herbert Spencer to support his views of appropriate political action in Britain in the late 1800s. A coverage of social Darwinism is beyond the scope of this review. However, it is fair to say that whereas Darwin's ideas on the biological mechanisms of evolution throughout the plant and animal kingdom were to have continual and increasing influence on the life sciences of the twentieth century, his ideas specifically on human social and racial evolution were largely dropped or forgotten. Even when aspects of his thoughts on early humans reappear in modern models, his work often is not cited and apparently not remembered.

The ideas of the social evolutionists suffered a more severe fate than mere neglect. In the first half of the twentieth century, the Boasian school of historical particularism took it as part of their mandate to discredit the methodology, the data, and the conclusions of the nineteenth century social evolutionists. The teleology and ethnocentrism of these models (that all societies are progressing toward one goal, represented by European civilizations) was particularly offensive to a discipline founded on cultural relativity. Furthermore, the nineteenth century modelers had worked largely in the absence of good ethnographic data. With the rise of extensive field research in the early twentieth century (much of it conducted on nonindustrial societies by Boas and his students), it became increasingly obvious that the earlier models had relied on incomplete and often incorrect data. Although there have continued to be some evolutionists among social anthropologists, the days of

"modeling" early human societies from a social scientist's perspective largely ended at the turn of the century.

Engel's work had a somewhat different fate. Recall that he had drawn the opposite conclusion about female status from that of several of his contemporaries, namely that the amount of labor which women put into subsistence is directly correlated with their social power and prestige. Although his work has been largely ignored in Western anthropology, it has been taken up by Russian anthropologists, and by a few American women anthropologists such as Leacock (59, 60) and Reed (93), who continue to theorize on the evolution of women's status in relation to productive labor and in the context of hypothesized evolution in social organizations.

Overview of Twentieth Century Models

For the first half of the twentieth century, sociocultural anthropologists labored mainly in an effort to collect vital information on nonindustrial societies before the latter transformed entirely under the impact of contact with colonizing or emergent nation-states. Various theories of sociocultural patterns such as functionalism and structuralism emerged, and social evolution remained very much out of favor. Physical anthropologists for their part, largely under the influence of Ales Hrdlicka, also occupied themselves greatly with data collection, primarily in the area of anthropometry. Although occasional sparks of interest in human social origins appeared throughout this time, it was not until the 1960s that a strong interest was rekindled among physical and some social anthropologists.

When models of human social evolution and origins began to reappear widely (28, 65, 96, 101, 102, 113, 115–117), they shared one powerful theme: "Man the Hunter." The lines of thought, drawn from the accumulating anthropological literature of the first half of the century, by mid-century seem to have converged into a strong focus on one distinguishing human trait: the pursuit, killing, and eating of animals with the use of tools. The most influential and widely quoted expression of this new model was undoubtably Washburn & Lancaster's 1968 paper on the "Evolution of Hunting" (117). In it they argued that hunting demands all those qualities of human behavior that separate man so sharply from the other primates. Thus, although the exact sequence of events varies in the different versions that were to follow (e.g. 2, 11, 44, 87, 113), the hunting model was premised on the idea that this means of procuring food was the catalyst for all of the technological, social, and intellectual achievements of human beings. Just a short list of traits believed to have resulted from hunting (which was said to be not simply a subsistence technique, but a way of life) would include: bipedalism, elaborate tool kits, development of language, appreciation of beauty, male aggressiveness and pleasure in killing, division of labor, the nuclear monogamous family, loss of

female estrus, the invention of incest taboos, and bonding between males. Furthermore, Washburn and Lancaster argued that the killing of animals with tools dominated human history for such a long time that it became the shaping force of the human psyche for all time, even when men no longer hunt for a living. This argument was repeated in so many articles and introductory textbooks that it took on something akin to the status of a received truth.

Although the Washburn and Lancaster paper was later to be singled out for both emulation and criticism, it was by no means the most extreme statement of the hunting hypothesis. For example, it only traced human hunting patterns (by which the authors clearly meant big game hunting) back to the beginnings of *Homo erectus* (dated at 600,000 years B.P. when their article was written), whereas most others extended the hunting argument back to "99%" of the entire 2–3 million years of hominid evolution. The latter was in spite of the lack of any paleoanthropological evidence of hunting at these early dates. Indeed, if one takes the parsimonious view that hunting can be said to be a common activity only when an extensive hunting technology is found, which the Oldowan and Acheulian tool industries clearly were not, then we must wait until the Upper Paleolithic for the first incontrovertible evidence of hunting-based societies. Furthermore, Washburn and Lancaster recognized that "gathering" as a means of procuring food also set humans apart from other primates, and that "receptacles for carrying vegetable products may have been one of the most fundamental advances in human evolution" (117, p. 297). In contrast, Debetz (17) denied the possibility of gathering having played any role in human evolution, and most authors of the two influential compendiums of the time, *Man the Hunter* (65) and *The Social Life of Early Man* (115), simply failed to mention means of procuring food other than hunting.

The picture of human sex roles that emerges from the hunting models is altered in metaphor, but is little changed in essence from that drawn by Darwin a century earlier. Men are still seen as actively and aggressively engaged in procuring food and defending their families, whereas women are seen as dependents, who remain close to home to trade their sexual and reproductive capacities for protection and provisioning. Some authors such as Sahlins (96) retained Darwin's concern over the control of human sexuality, which at least implied a consideration of two sexes. However, many of the human evolution models of the 1960s, premised as they were on the idea that "hunting is the master behavior pattern of the human species" (37, 58), and assuming that women do not participate in hunting, effectively omitted the female half of the human species from any consideration whatsoever.

In retrospect, there are two significant peculiarities of the book *Man the Hunter*. Based on a symposium that gathered together ethnographers from around the world to exchange information and ideas on foraging societies, this

volume stands as a landmark for studies of contemporary foraging peoples and as a sourcebook for Man the Hunter models. The first peculiarity is that the participants were unable to agree on a definition of hunting (see 18, p. 281; 66, p. 4; 97, p. 341), a failure which could not help but weaken any resultant theorizing, and which inevitably led to later disagreements over generalizations about the importance of hunting in human foraging patterns (e.g. 20). The second rather odd aspect of the book concerns its title and its ostensive promotion of the hunting model. For it was the very same ethnographic information collected on modern hunter-gatherers, and the interpretations made by the collectors for this volume, which were to turn the minds of many researchers away from hunting as a central humanizing activity and toward alternative explanations of human origins, that is, to the significance of human gathering, carrying, and sharing of mainly vegetable foods. For example, Lee (61) argued in a paper entitled "What hunters do for a living," that plant and marine resources are far more important than game animals (i.e. "hunters" gather for a living); and Deetz (18) cautioned of hunting that we must not let the label overdescribe the subject. From this perspective, the papers in *Man the Hunter*, championing as they did the explanatory power of hunting, also provided the insights and the data that were to lead to its undoing.

In 1971, Sally Linton published a paper entitled, "Woman the Gatherer" (70), in which she pointed out various shortcomings and examples of androcentric bias in the Washburn and Lancaster paper, and then drew on a variety of sources to develop a model of early hominid females gathering, carrying, and sharing foods with their young. It seemed to her that these three patterns exhibited by hominid females would have been a logical extension of the intense mother-infant bond found in all primates, and she suggested that the first cultural inventions were containers to hold the products of gathering and the infants. According to Linton, the hunting of large animals by males was a late development, after the matrifocal sharing family was well established. She argued that the first hunters shared food not with sexual partners, but with their mothers and siblings who had shared with them. Such a scenario would obviously set human sex roles on a very different foundation from the "male as husband and provider/protector" model that has come down to us from Darwin. Men would still hunt and women would still gather, but sexual bonds and sexual exchange would not be the cornerstone of society, and the activities of women as autonomous individuals in society would play for almost the first time a significant part in the story of how we evolved those traits that make us uniquely human.

Linton's ideas, only generally sketched out in her essay, obviously struck a chord with a number of women anthropologists, because several of them (13, 14, 33, 53–55, 77, 108, 109) began to focus simultaneously on the question of what women did in early human societies.

Zihlman (109, 123–133) produced a series of elaborations on what came to be called the "Woman the Gatherer" model, in which she stressed that obtaining plant food with tools was the "new" or catalytic event in human evolution. She argued that bipedal locomotion and the invention of carrying devices first enabled women to walk long distances with babies in slings in order to exploit the resources of the more open savannah areas, and to carry these gathered plant foods back to safer familiar areas for shared consumption with their children. Plants and not meat were the focus of technological and social innovation for the emerging hominids three million years ago, and females, ever responsible for the nourishment of themselves and their young, were the providers and the inventors. It might be said by critics that males have now become the inconsequential sex in the story of our origins, because they may bring in meat, but these modelers see it as being of little importance, and it is shared with the matrifocal unit to which the males belong rather than with dependent female sexual partners. Indeed, in some early versions of the Woman the Gatherer model, the male's role was so little described that he might be said to have evolved clinging to the apron strings of the women. In more recent versions (133), called simply the "gathering model," the male's role is elaborated, but still considered to be secondary to the part played by women in unique human inventions.

In retrospect, it may seem discouraging that the choice had to be seen as either hunting *or* gathering, with either men *or* women inventing the cultural patterns that make us distinct. However, at the time, it must have seemed necessary to establish that a credible scientific origin story could be constructed in which women invented tools, chose mates, developed social systems, provided for themselves and their offspring, and generally participated in the evolution of significant human abilities.

Zihlman (127) described four types of reaction to the gathering model: to accept it wholeheartedly; to reject it as sex-biased; to integrate its parts into existing models; or to ignore it even while taking its salient features. The latter two reactions are of most interest to this review, since they brought changes to the scenarios of human evolution.

The response of some of the proponents of the hunting model was to superimpose the new model on the older hunting scheme, and to emphasize a mixed economy in which early hominid men and women were mutually interdependent (e.g. 46, 53–55, 60a, 62, 63). In many respects this has been a gesture of conciliation and a genuine attempt to modify the models to accommodate new thinking. Many authors now emphasize the importance of *sharing* between gathering women and hunting or scavenging men as the key human invention, i.e. the sexual division of labor. Isaac (45–49) has done the most to develop a model in which food sharing is the "central platform." He argued that the archaeological evidence from East Africa demonstrates that the earliest hominids carried food and tools to certain locations where we now

find their remains. In his view, this is evidence that the unique human social and economic arrangement of sexual division of labor had already begun to take place, and the reason they carried food to consistent locations was in order to share it. He hypothesized that males and females ranged in separate groups, engaging in specialized activities, and brought food back to a home base to share, as do contemporary foragers.

Unfortunately for the sake of conciliation, and for what seems at first sight an anthropologically pleasing "holistic" approach, models are constructed on a foundation of assumptions about causal chains and about human sex roles. It may not be possible to simply superimpose one on the other like so many building blocks without resulting faults in the logic of the whole. Gould (36), for example, has said that food-sharing models are really about meat sharing, and both Hayden (41) and Isaac (45, 47) have stated that neither sharing nor social living would have been particularly advantageous to foragers living largely on vegetable foods. Indeed, Isaac in his later versions (48) still tended to see meat eating, now scavenged rather than hunted, as the key factor in the development of human intelligence, language, and social patterns. And since he saw women as encumbered with children and handicapped in meat-obtaining activities (45), females still do not seem to be credited with full partnership in the "sharing" model. The recognition that simple choppers and hand axes would have facilitated scavenging, but not hunting, has been slow to find its expression and implications in the sharing model (e.g. 60a). There has been no "scavenging model"; rather, scavenging has replaced or been added to hunting, without any concomitant changes to other aspects of the model or consideration of its implications for sex roles.

The fourth reaction described by Zihlman has been to ignore women's productive roles (and women anthropologists' models) altogether, while incorporating some of their undeniably salient points. The currently most quoted model of human social evolution contains such borrowings and could be said to illustrate this fourth response.

In 1981 Owen Lovejoy published a paper entitled "the Origin of Man" (71), in which the postulated sex roles and division of labor of early hominids were described precisely as Darwin had imagined them 100 years earlier; women remained around home bases to bear and rear children and were dependent on men to protect and provision them. The arguments as to why women had to remain dependent and sedentary were new, but otherwise the origin story remained familiar. Lovejoy's argument drew from several new and diverse sources (such as life history theory) and can be summarized as follows. The earliest hominids were able to become successful as a lineage, especially in comparison to their ape relatives, by facilitating higher fecundity and lower infant mortality rates than the present chimpanzee life history pattern of one infant every four years and only five live offspring in a female's lifetime.

Hominids increased their reproductive success by reducing the mobility of lactating mothers and inventing the provisioning of the sedentary females by mobile, bipedal males. Lovejoy's scenario began with the assertion that hunting was not the crucial human technological invention, but rather that gathering was the key innovation. It did so without any reference to the published Woman the Gatherer models, which had accumulated the major body of evidence and arguments for gathering (and against hunting) as the "master behavior pattern."

Further, Lovejoy attributed the collecting of plant food items, and all the ramifications of gathering and sharing in hominid evolution, to the early hominid men. Since male anthropologists had shown no previous signs of wishing to associate their sex with gathering, and since all of the ethnographic evidence points to women as primary gatherers, this sudden enthusiasm for gathering has been seen as the co-opting of the gatherer model (127). The core assumption of Lovejoy's scheme is that for hominoid females, successful rates of reproduction *and* productive activities are incompatible, and thus men produced the impetus for hominid success by inventing the provisioning of vegetable foods to sedentary, monogamous female mates.

No extended analyses of Lovejoy's model have yet appeared (but see 7, 10, 43, 80, 85, 130, and below); however, his view of early hominid sex roles is cited in many recent editions of physical anthropology textbooks and popular accounts. Appearing as it did in an invited article in the prestigious journal *Science*, Lovejoy's model could be said to represent the current orthodoxy about human evolution.

Another recent, but much less widely noted, model of human origins (68) began with a similar question to that of Lovejoy's (how were early humans able to survive and succeed?), but offered a very different, even opposing answer. Leibowitz argued that a sexual division of labor was a very late human invention, and that for much of hominid evolution both males and females engaged in the same sorts of productive activities (126). Females simply combined productive activities with reproductive activities, as do many contemporary women. In Leibowitz's view, the key human invention was production, by which she means food-getting with tools, and which was initially unspecialized and undifferentiated by age or sex within the group. She drew an analogy to the manner in which every weaned member of a monkey or ape social group is an independent foraging unit.

Like Lovejoy, Leibowitz interpreted the material evidence to mean that early hominids were "hovering precariously on the edge of extinction" (68, p. 135), and argued that their major hedge against a marginal replacement rate was to invent the practice of accumulating surplus food through production. All individuals in the group participated in gathering surplus and in the resultant sharing or exchange. In her view, it was only with the invention of

fire and projectile weaponry at the time of late *Homo erectus* that a sexual division of labor began to appear. The sexual division of labor also served as an instrument for stabilizing and extending both intragroup sharing and intergroup exchange. However, for most of human history, production alone (and not a specialization of roles by age and sex) was necessary and sufficient to create the characteristic human patterns.

Leibowitz's idea is noteworthy for two reasons: it shows again how the same data can be interpreted in quite different ways, and it is one of the very few attempts (see also 12) to strip away the remaining assumption common to all models, that sex differences must have been significant in the earliest stages of human evolution. It seems that one of our own cultural patterns is to oppose male to female characteristics and to assume and emphasize sex and gender differences rather than similarities. That human technological and social success can be attributed to a specialization of tasks by sex is an often repeated assumption of anthropology, and some type of sexual division of labor seems to be universal in human societies today, although the importance accorded it is variable. Yet it can be very enlightening to think through what we have assumed to be the less probable solution. Could characteristic human societies have originated without a sexual division of labor beyond that directly related to insemination, gestation, and lactation? Could some behavioral invention, characteristic of neither males nor females and requiring equivalent participation, have been the catalytic event that set humans moving along their own distinctive evolutionary path? Given that primate females are able to combine foraging with infant care, and that women in most societies contribute at least as much as men to subsistence in addition to their reproductive activities, Leibowitz's scenario may be no more or less data-based and plausible than the many models that seek to give preeminence to one of the other sex in the story of human evolution.

In the following sections, I review these "data bases" or the sources of evidence from primatology, ethnography, and paleoanthropology for the models just described.

THE PRIMATE EVIDENCE

Primatologists who are trained as anthropologists not infrequently study their infrahuman subjects with an eye to casting some light on the behavior and evolution of our own species. It is reasoned that since humans are members of the order Primates, the study of our nearest animal relations can help us to understand both the ways in which we are similar to other species and the ways in which we are distinctive. Although many primatologists are uncomfortable with inferences drawn from animals to humans, and unhappy with what they regard to be facile analogies made in the past, there exists

considerable pressure from colleagues and the public alike to make primate studies more directly relevant to the study of humans.

Such was the intent of one of the earliest and most widely publicized field studies of a nonhuman primate, the baboon. DeVore and Washburn (19, 116a) observed common baboons in East Africa in 1959–60 and constructed a model of early human life based on baboons. They argued that early hominids, like baboons, differentiated from other primates by exploiting the resources of the East African savannah. Like baboons, humans would have become both predators of savannah flora and fauna and the prey of the large savannah carnivores. In order to protect themselves, given their relatively ineffectual physical abilities as individuals, the model proposes that both humans and baboons came to rely upon a social system of defense. This social system was said to be based on the bonding and cooperation of mature males organized into a rigid dominance hierarchy and employing an "army-like" pattern of "troop" movement across the dangerous plains [e.g. "Baboons move in a carefully structured defense formation, guarding the nucleus of females and infants. Early humans may have traveled in similar formation" (31, p. 94]. According to the model, and there are many versions of it (1, 84, 87, 113, 114), human males distinguished themselves even further as exploiters of the savannah through the invention of weapons and thus hunting, which in turn led to unique human traits like language and the family. However, it was argued, this complex of distinct human characteristics initially was founded on a social system very like that which DeVore described for baboons.

Such a "baboonization" (87) model of early human life experienced a popularity that may have surprised even its authors. Throughout the 1960s and 1970s, no textbook or course in introductory anthropology, and no concluding chapter on the human species in the animal behavior and evolutionary theory texts, seemed complete without reference to the baboon analogy for early humans. Even an elementary school social science curriculum, called "Man, A Course of Study" included extensive coverage of the baboon model.

Criticism of this depiction of baboon social life and of this model for early human life has come from many quarters, including primatologists, ecologists, and social anthropologists, and such critiques will not be covered in detail here (but see 24). For the purposes of this review, the portrayal of primeval sex roles in the baboon model can be said to have been traditional and consistent with contemporary role expectations for Western men and women (73, 77): males were seen as aggressive, competitive, and protective; females were seen as nurturant, dependent, and submissive.

Today, with the extensive evidence available from anatomical, biochemical, paleontological, and behavioral studies, it is widely accepted that chim-

panzees are the nonhuman primate most closely related to humans, and it may seem odd to have chosen any other species from which to draw analogies. However, at the time the baboon model was developed, this presumably was not so evident, and the ecological analogy between these two distantly related primates was widely accepted.

In the past decade, many reconstructions of early hominid life have drawn heavily from the accumulating data on the behavior of common chimpanzees *(Pan troglodytes)* and pygmy chimpanzees *(Pan paniscus)*. Following a line of argument established by Darwin nearly a century ago, some of the recent models suggest that chimpanzees show rudimentary patterns of behavior that also might have been exhibited by our common ape forebears, and which were greatly elaborated by hominids as the latter differentiated from the other hominoids. Some of these patterns of behavior, it is argued, were ultimately to become the distinguishing characteristics of the human lineage. Even though chimpanzees have traveled their separate evolutionary route for the past 5 million years, it is believed that their traits can give us some clues to the general "ape-like" way of life of our hominoid ancestors, a way of life that was to set the stage for the human pattern. The rest of this section is organized around the behavioral characteristics of chimpanzees which modelers have isolated and suggested as possible antecedents for human patterns (see especially 35, 79).

Social Bonds

The core of chimpanzee social life (indeed, almost all mammalian social life) is the enduring mother-offspring bond. In most primate species, the male emigrates at puberty whereas the female remains close to her mother for life. In chimpanzees, the reverse seems to be the case, with adolescent females leaving their mothers and communities at first estrus, but whether temporarily for mating, or permanently to live in a new community, is not yet well established. Nonetheless, a chimpanzee mother suckles each infant for around four years and remains physically close to her offspring until they reach sexual maturity at ten to twelve years of age. Since a female chimpanzee bears an infant approximately every four years, she may have two or more dependent offspring traveling with her at any one time, but usually only one that is suckling and being carried. Her mature sons, and less frequently her mature daughters, also travel with her on occasion. Some male-male bonds are formed (often between maternal brothers), and estrous females may travel and forage with male parties, but the enduring and primary social unit is matrifocal, that is, centered upon and articulated around the ties between a female and her offspring.

Most versions of the Woman the Gatherer model have used this aspect of chimpanzee social bonding (and primate social life in general) to argue that

the matrifocal unit, and not the nuclear family, whether monogamous or polygynous, was the core of early hominid society. The intensive and extensive mother-offspring bond of the ape, it is argued, could only have become more elaborated in a lineage such as hominids, with their increasingly altricial infants. Following this argument, the initial social ties of adult males would have been to their maternal kin and not to their temporary sexual partners.

Chimpanzees are not as promiscuous as initially reported; still, sexual bonding is temporary. Individuals of both sexes avoid mating with close kin, and although males may occasionally act possessively or competitively in a mating context, most copulations are casual and opportunistic, with females exhibiting preferences for certain males over others. Much has been made of the "loss of estrus" in the human female as compared to other primates and its supposed causal relationship to permanent pair bonds. However, we now know that female pygmy chimpanzees in the wild copulate throughout their monthly cycles [Badrian & Badrian (4)] but are not pair bonded to males, whereas monogamous nonhuman primate species all show pair bonding but no loss of estrus. Thus the hypothesized correlation between loss of estrus and monogamy is not supported by the primate data.

Social Dynamics

Chimpanzee social life is complex in that two levels have been identified: (*a*) a large community of individuals who recognize each other and are not mutually antagonistic when they meet, and (*b*) smaller parties of individuals who travel, sleep, and forage together. Their social life is fluid in that the composition of parties fluctuates frequently, with only the mother-dependent offspring unit remaining constant. Such a pattern has been referred to as a "fission-fusion" social organization.

Wrangham (121) has conceptualized a chimpanzee community as a cooperative group of related males who overlap the individual ranges of individual female-offspring units and sometimes behave antagonistically toward members of neighboring communities. Foraging parties within the community are believed to fluctuate in size and composition in relation to the changing abundance and distribution of food resources. This complex, fluid, and environmentally responsive social system has been described by many modelers (e.g. 79, 94, 124) as containing the essential ingredients for early hominid foragers to adapt their social groups to both the resources and the technological innovations important in the human way of life.

Feeding, Food Sharing, and Tool Use

Probably no aspect of chimpanzee behavior has interested anthropologists more than their dietary and technological habits. It is now widely known that chimpanzees learn to make a variety of simple tools which vary in structure

and function from community to community. Tools are occasionally used in agonistic contexts, usually by males, but more commonly for food collecting and processing. Hammerstones are used to crack open hard fruits, and probes are used to collect insects from underground nests. The majority of tool making and tool use is done by females. This is because mature females consume many more social insects than do males and thus exhibit much more fishing for termites than their male counterparts. The pursuit and killing of small animals, primarily carried out by males, is done without the use of tools.

As exciting as the reports of tool use and "hunting" by chimpanzees were the initial descriptions of food sharing in these animals. Except for suckling infants, the basic primate rule of feeding seems to be each individual for itself. Although it is likely that social groups enhance the abilities of individuals to find and defend food sources, each nonhuman primate past the age of weaning, male or female, is in all other respects an economically independent foraging unit. Provisioning of dependents is not a characteristic of the primate order, and even minimal sharing of food [which Isaac (45) dubbed as "tolerated scrounging"] is very rare.

The first descriptions of food sharing in the chimpanzee placed such behavior in the context of meat eating (34, 111). It is mainly adult males that kill animals and eat meat, and mainly old, past-prime males who are the recipients of shared meat. However, close female kin of the meat possessor and estrous females also receive more than expected shares. These data seem ideally constituted to construct a model of how human hunting innovations would lead to male provisioning of a nuclear family with meat, and indeed they have been used to this end (27).

However, further field studies of both the common and pygmy chimpanzees and specific investigations of the nature of food sharing (52, 78, 104) have since demonstrated that a great deal of sharing also occurs with plant food, particularly large or hard-to-open fruits. More importantly, in common chimpanzees the vast majority of such sharing (McGrew reports 86%) occurs within the matrifocal family. And the provision of food by mothers to their offspring, either through cadging of scraps or through unsolicited donations, accounted for almost all cases of plant food sharing in McGrew's study.

Several authors (79, 108, 126) have used the information on sex differences in chimpanzee tool use and food sharing to reconstruct how these patterns might have been further elaborated upon by transitional hominids. They argue that gathering, the catalytic innovation in hominid technology, was invented by females whose digging sticks and unmodified stone hammers were refinements on the female ape's tool kit of termite probes and pounding stones. Furthermore, gathering as a pattern of accumulating surplus vegetable food leads to carrying and sharing of foods. Primate females, with few exceptions, are adapted to the burden of carrying infants, and hominid females would

have invented slings to carry their nonclinging infants and their food supplies. Extended human sharing of accumulated or surplus foods would have been founded primarily on the ape pattern of matrifocal sharing.

Chimpanzee females are also mobile and clearly capable of finding food for themselves and their dependent young, thus undermining Lovejoy's argument that a hominoid female could not combine successful reproduction with subsistence activities. Lovejoy's view of the chimpanzee life history pattern as leading to a marginal existence, hovering on the edge of extinction, has been criticized by several other researchers (40, 47, 119, 120). They counterargued that chimpanzee females produce and rear offspring at about the same rate as the other great apes, and more importantly, at comparable rates to human females in foraging societies. At Gombe Stream Reserve, the chimpanzee females who have been followed over their lifetimes have each raised several offspring to maturity, a replacement rate that certainly would not lead a population to the brink of extinction if it were also maintained outside the protected park. It is clear that the low population of chimpanzees in Africa today is the result of historically recent human destruction of the animal and its habitat.

Still, there clearly exists enough complexity in chimpanzee behavior and enough diverse conclusions from the studies of these animals to give rise to many different scenarios. Specifically with reference to sex roles, some of the resultant models have tended to continue the emphasis on males as the main actors in the development of distinctive human abilities, using as a foundation the data on male chimpanzee aggressiveness or male ranging behavior or male hunting patterns (94, 107, 111). Whereas others, using the findings on the central significance of the female chimpanzee in social bonding and in food procurement patterns, have proposed a radical or nontraditional view of human females as prime movers in the evolution of the essential hominid traits such as tool use and sharing (13, 70, 126). Finally, some authors have explored the manner in which sex differences in chimpanzee behavior might have set the stage for sexual division of labor in the first hominid societies (32, 38, 53, 54, 78).

THE ETHNOGRAPHIC EVIDENCE

Until the advent of agricultural practices based on the domestication of plants and animals no more than 12,000 years ago, peoples around the world must have lived as foragers. The archaeological evidence of lithic artifacts dating back some 2 million years indicates that human foragers have long acquired and/or processed their food with the assistance of tools. And the evidence appearing at various, mainly later Pleistocene dates of cut marks on animal bones, of homebases with remains of plant food collections, of the use of fire,

and of increasingly sophisticated tools for food collecting and processing all point to a hunting and gathering subsistence pattern at least in late-middle and upper paleolithic peoples. Reserving for later the issue of whether the earliest hominds were already hunter-gatherers, or simply generalized foragers with tools, or perhaps even tool-less primates who differed little from the ape forms except in being bipedal, the significant point for this section is that the vast majority of the cultural remains of paleolithic peoples have been interpreted as resulting from the technological system of hunting and gathering. And since there are obvious technological similarities between these archaeological remains and the material culture of contemporary hunter-gatherers, and in some cases ecological/environmental similarities, some researchers have turned to the study of modern hunter-gatherers to shed light on the reconstruction of the social patterns of prehistoric foragers. The logic is that social structures respond to environmental exigencies and correspond to technological systems. Thus, it is argued that the basic social forms widely found in contemporary hunter-gatherers, especially those dwelling in tropical zones, probably occurred as well in paleolithic hunter-gatherers.

A number of anthropologists have objected to the use of ethnographic evidence to reconstruct early human social life, and these objections will be described briefly since they do have a bearing on the assessment of the models themselves. Freeman (29) has objected to analogies drawn between prehistoric and modern groups on both methodological and theoretical grounds. First, he argued that to force archaeological evidence into frames of reference developed for contemporary data inevitably distorts and obscures the prehistoric analysis. It also prevents the development of frameworks based directly on the prehistoric material. Secondly, he argued that like environmental stimuli do not necessarily produce like cultural responses, because sociocultural systems have tended to regional-and-resource specialization during the course of human history. More recently, in an extensive analysis of the relevance of contemporary hunter-gatherers to paleolithic societies, Testart (112) also emphasized the particular nature of each society's history, the importance of regional events, climate, fauna, flora, and the 10,000 years of individual histories that separate today's hunter-gatherers from their paleolithic antecedents. Nonetheless, Testart's detailed analysis of the ethnographic evidence led him to conclude that at least some contemporary hunter-gatherers can provide insights into prehistoric patterns.

A second criticism of the ethnographic analogy rests on ideological grounds. Berndt (5), for example, has objected to the implication that the study of modern Australian aborigines can help us to understand early human societies. She suggested that this view is harkening back to the nineteenth century social evolutionist and colonialist racist attitudes that aboriginal peoples are "primitives" or "survivals"; that they are lower on an evolutionary

scale and thus inferior. Schrire (99) has argued for the !Kung, on somewhat similar grounds to Berndt for the Australian aborigines, that we should not regard contemporary foraging peoples as "living fossil groups." This objection is also in part substantive; following Boas, most social anthropologists have argued that there are *no* modern representatives of past cultural stages. Therefore, many draw the conclusion that any attempt at reconstruction or analogy based on contemporary peoples is not only futile speculation, but also contrary to those tenets of anthropology based upon a nonhierarchical view of cultural variation.

Others (e.g. 62) reply that to suggest that similar economies and similar technologies may be associated with similar social structures, and to construct hypotheses on the basis of such similarities, is not to suggest social evolution in any pejorative sense. Similar reservations about the appropriateness of animal analogies to human behavior have been expressed. A discussion of the proper use of analogy in natural and social science might be useful in the context of human evolution theories, but it is beyond the terms of this review. Without presupposing the conclusions of such a discussion, it is nevertheless necessary here to accept the usage and to go on to the question of which, if any, of the modern hunting and gathering societies provide the most appropriate analogies.

The most systematic attempt to answer this question is by the French ethnographer Alain Testart (112). In the process of considering the issue of why some hunting and gatherering societies persist in their subsistence system rather than adopting sedentary or pastoral lifeways, Testart drew up a classification of six types of hunter-gatherers. Of these six, only two categories, one largely comprised of North American Indian societies, the other containing notably the !Kung and Australian Aborigines, were found by Testart to have structural features that would make them good choices as models for earlier foraging societies. Testart then eliminated North American Indian societies because of their recency, geography, and specialization for a habitat unsuitable to agriculture, leaving as the group of choice such societies as the !Kung and the Australian Aborigines. At the end of his careful and well-reasoned analysis, Testart returned to the ideological question by noting that the choice of a contemporary society and its application by analogy to paleolithic peoples may be informed as much by subjective factors as by overt criteria.

Lee (62, 63, 66) has directly refuted several objections to the ethnographic analogy (see also 122), arguing that the use of !Kung data to illuminate the past is not to regard these people as living fossils. The !Kung have a long history in southern Africa, over which time regional events would have had an impact on social forms, and they have not lived in isolation from nonforaging peoples and ways of life. Nonetheless, Lee believes that by proceeding

cautiously with these caveats in mind, there is much to be learned about a hunter-gather way of life from studies of contemporary !Kung and other foragers. In his view, they have a core of features in common which "represents the basic human adaptation stripped of the accretions and complications brought about by agriculture, urbanization, advanced technology, and national and class conflict—all of the 'advances' of the last few thousand years" (63, p. 3).

As a result of extracting these "core features," Lee characterized the basic or generalized hunter-gatherer society as a flexible, bilaterally organized, nonterritorial group, with a particular emphasis on the genealogical core as consisting of both related males and related females (62). Earlier, Lee & DeVore (66) had defined several features generally characteristic of the hunting and gathering way of life: 1. groups are small and mobile, with fluctuating membership; 2. food surpluses are not prominent, and mobility places constraints on the accumulation of any type of surplus, thus the system is basically egalitarian; 3. groups are not strongly attached to any one area and do not ordinarily maintain exclusive rights to resources (i.e. they are nonterritorial); and 4. reciprocity and a division of labor lead to an emphasis on sharing resources.

Leacock (59, 60) has identified several of the same features in her analyses of present and past hunter-gatherers, although she placed somewhat more emphasis on egalitarianism and the lack of specialization or hierarchies related to resources. Lee (62) stated that his view of hunter-gatherers and thus early humans as living in flexible, bilaterally organized groups is a correction to the "patrilineal horde" model first developed by Radcliffe-Browne for Australian Aborigines (91) and then applied by others (e.g. 28, 101, 102) to the reconstruction of early human social life.

The Roles of Women in Hunter-Gatherer Society

The picture that was painted of the social role of women in much early ethnographic and ethnological work on hunter-gatherers was of a dependent, lesser, and even passive social category. Ethnographers, mainly men, studied social phenomena of greater interest to men and talked mainly to male informants. The emphasis on hunting, weapons, and warfare ignored the contributions of women to subsistence and to social dynamics. Theoretical models (e.g. 69) viewed men as actors and women as objects of sexual exchange. However, in the last two decades, many new ethnographic studies employing female as well as male perspectives have been undertaken (see extensive review in 90). Thus, a picture of women as active, competent, contributing, and even self-sufficient members of hunter-gatherer societies, with their own stories to tell, has begun to emerge from the shadows of early ethnographic scenarios.

In particular, Lee's (61, 64, 67) continuing analysis of women's contribution to subsistence in contemporary hunter-gatherer societies has been an important starting point in a reassessment of the parts women might have played in early human society. In a survey of 58 foraging societies from around the world (61), Lee concluded that on average hunted foods contributed only 35% of the diet and thus, contrary to popular conception, men provided less than half of the food of "hunting" peoples. Of the 58 societies he surveyed, 29 (slightly more than half) depend primarily on gathering, one-third primarily on fishing, and only one-sixth primarily on hunting. Thus, he concluded that except in the Arctic, where meat is of primary importance, plant food, shell fish, and fish, collected primarily by women, form the bulk of the diet. Hence his argument that foraging women generally are capable of feeding themselves and are not dependent on men for subsistence.

These conclusions were taken up enthusiastically by the various modelers of Woman the Gatherer and are also occasionally mentioned in introductory textbooks, perhaps to temper the emphasis on males as providers in descriptions of hunter-gatherers. Hiatt (42) extended Lee's analysis to demonstrate the economic importance of women in Australian Aborigine society in particular and in tropical hunter-gatherers in general. Martin & Voorhies (77) and Whyte (118) also extracted samples of foraging societies from Murdock's *Atlas* and concluded that women generally contribute substantially to subsistence. However, the different samples and definitions used in these studies render detailed comparisons impracticable. Ember (20), for example, drew a different sample from the *Atlas*, using different definitions of hunting, and came to differing conclusions from those of Lee, Hiatt, Martin & Voorhies, and Whyte.

There is a serious problem in any attempted generalizations from Murdock's *Ethnographic Atlas*. The foraging societies described in the *Atlas* are not a random sample, nor a representative sample, nor a complete compilation of all the hunter-gatherers societies that have existed, even in historical times. Worldwide surveys taken from the *Atlas* may well be biased toward those cultural zones which for many reasons have been more often studied, unless some form of corrective representative sampling is attempted. Furthermore, the quality of the data coded for the various societies is uneven and often unrefined, as noted by Hayden (41), and ethnographers often have not collected the original data with Murdock's ultimate categories in mind.

Also taking a different view from that of Testart, Ember argued that North American foragers are more instructive about the past than those of the Old World. However, for the purpose of extrapolation to early human societies that existed in the African equatorial zones, it seems clear that one would not want a comparative sample composed predominantly of North American temperate and arctic zone dwellers. Tropical and subtropical zones offer a

greater abundance and diversity of edible plants than do more northerly latitudes, and various researchers (42, 77, 112) have demonstrated that in contemporary tropical and subtropical foragers, meat forms a small proportion of the diet, whereas vegetable foods provide a high percentage of the subsistence base. Testart found that the percentage of meat in the diet of hunter-gatherers correlated with latitude, going from a low of 10% near the equator to 90% in the Arctic.

Finally, the issues are further muddled by the fact that although women are primarily associated with gathering plant foods, they do also obtain small animals and occasionally hunt with weapons for larger ones (22). Men, on the other hand, often help with gathering or feed themselves on plant matter while hunting. Dahlberg (14) presented a short but cogent overview of the results of various surveys on male and female contributions to subsistence, using different samples and different definitions of hunting, gathering, and fishing.

The issue of differential contribution to subsistence has been dealt with at some length because it is important in assessing women's status in early foraging societies. Women's reproductive roles have never been in question (except the degree to which they are handicapping); it is their productive capabilities that are contentious. Anthopologists who have followed Engel's argument at its most basic (e.g. 59, 60) have long argued that those women who actively contribute to subsistence, and who are not economically dependent but interdependent with all the other producing members of the group, will have equivalent status to that of the men. Others (30) have modified this argument to add that women must not only contribute to subsistence but also have a measure of personal control over the disposition and distribution of the fruits of their labor in order to achieve power and prestige equivalent to that of the men. The ability to control production and distribution is more difficult to demonstrate, and possibly is less true of women than the ability to contribute to production. However, if the data continue to show that women are not economically dependent on men for provisioning in most hunter-gatherer societies, indeed that they often produce more than do the men, then the assumption of the nonproductive female, which has been a key element in most reconstructions of our earliest ancestors, must be seriously reexamined.

Implications for Recent Models

Since the ethnographic evidence on contemporary hunter-gatherers in tropical and subtropical zones supports the economic independence claimed in the Woman the Gatherer model, and since no ethnographic example exists of sedentary women in foraging societies being provisioned by their husbands with plant foods, it is not surprising that the male provisioning model makes

no reference to ethnographic sources. Lovejoy's argument that early human females would not have been able to carry babies and burdens, and would have had to remain sedentary in order to reproduce successfully, is also contradicted by ethnographic evidence. It is clear that in most parts of the world foraging women are assigned the tasks of carrying heavy burdens: food, children, water, and firewood. Sedentary women simply do not exist in hunter-gatherer societies. Where quantitative data have been collected, it has been found that women are away from basecamp for equivalent amounts of time and walk equivalent distances, carrying infants and heavier burdens than do the men.

Finally, Lovejoy's argument that the earliest foragers would have differentiated from the apes by rapidly increased reproduction (becoming "*r*" selected) is not supported by any of the ethnographic (or paleolithic) evidence. Contemporary foraging women only produce one child that is raised every three to four years (a reproductive rate that is strikingly similar to the rate found in female apes), and may be assumed to arrange their reproductive lives around the demands of their productive activities (a unique skill in humans which, however, never seems to appear on the trait lists). The paleoanthropological record shows that the great population increase, indicating heightened fecundity and possibly concomitant sedentarization of women, which Lovejoy postulated as one of the first and necessary events in human evolution, actually does not occur until much later in human evolution, when humans radically altered their subsistence techniques to domesticate their food resources.

Although she did not use ethonographic sources, Leibowitz's model of an early human society in which every mature individual could feed itself and also contribute to the group without a sexual division of labor could have been supported by the example of one contemporary foraging group, the Tasaday (26). Although much controversy and too much publicity surrounded the contacting of this isolated foraging group in the Philippines in the 1960s, there are many noteworthy aspects to their lifeway. The Tasaday seem to have been isolated from all but two neighboring groups of people, similar to themselves, for at least 600 years, and they practiced a simple but successful way of living. The small band (24 people) practiced no sexual division of labor, and until first contacts with explorers, no hunting or trapping. However, they collected small animals from riverine areas, without the use of tools, to supplement their vegetable foods. The technology was very simple, food was easily gathered in a few hours, a short distance from the home base, and readily shared throughout the group. As Hayden (41) noted in his worldwide survey of hunter-gatherer groups, an unmeasured but possibly large proportion of food is simply "snacked" in an ad hoc fashion as people move about

collecting a surplus to be brought back to camp. In the Tasaday, all decisions were made by consensus, with no evidence of an authority structure or dominant sex. In these respects, the Tasaday would illustrate Leibowitz's model of an egalitarian, unspecialized, autonomous-yet-sharing, tool-using, foraging group.

THE MATERIAL EVIDENCE

Paleoanthropologists work with three types of material evidence about the early hominids: their osteological remains, the physical traces of their various activities, and the associated or contextual information on the environment in which they lived. The latter two will be discussed under "archaeological evidence" in a following section; here I will discuss briefly how these osteological remains are described and interpreted, focusing on those aspects that are relevant to sex role reconstruction.

Before describing the data, a few comments on the distinction between material evidence and inferred evidence would be useful. Bones and stones are a very fragmentary record of the past, and, like other empirical phenomena, cannot speak for themselves. Thus in some respects, inference and interpretation must occur in every description, at every level. However, to clarify the distinctions, Isaac & Crader (49) have suggested three levels of interpretation in paleoanthropology: first, interpretation of the empirical evidence (the "finds"); second, interpretation of the processes that led to this material evidence; and third, the formulation of general models to explain the evidence. In terms of the earliest hominids, we can use the fossil material to draw some first-order, descriptive inferences about body size and shape, locomotor and dental patterns. At a second level, we can infer behavioral and environmental patterns and the selective pressures that might have led to these characteristic phenotypes. Finally, we can construct models that incorporate our various second-order inferences into a coherent framework of explanation. Although interpretation does occur even in seemingly straightforward descriptions of the fossil remains, which are fragmentary and often must be "reconstructed," still, as we move from descriptions of material remains to processes and then to models, our inferences are increasingly dependent upon assumptions to be tested by internal consistency and plausibility, and decreasingly by reference to empirical evidence.

Fossil Evidence for Early Hominid Sex Role

DESCRIPTIVE DATA In East Africa, approximately three million years ago, one or more species of hominid lived in a savannah-like habitat of grasslands interspersed with pockets of forested and riverine areas. Paleoanthropologists have classified these creatures as hominids because they were bipedal and had human-like dentition, but they have not yet agreed upon the number of species living contemporaneously. For the sake of simplicity, I will refer to the very earliest hominids collectively as australopithecines. These hominids were small in frame and short in stature, with brains no larger than those of contemporary chimpanzees. Their dentition was distinctive from that of the pongids, with characteristically small, incisiformed canines in both males and females and large thickly enameled molars. Relative dimensions of their limbs and aspects of their fingers and toes indicate that they continued to have some grasping ability and may still have spent some time moving around in the trees, but their lower limbs and the shape of the pelves indicate they walked on two legs on the ground. Beyond these rather minimal descriptive statements (and even they are not without contention and exceptions), we move quickly into the realms of either morphological detail or of second-order interpretations. Because this review focuses on the reconstruction of sex roles, comments on the processes that led to the general australopithecine phenotype will be limited to those aspects that seem most relevant to female and male patterns.

DIET Diet plays a major role in models of human evolution and thus many researchers have turned to an analysis of tooth shape, and more recently, tooth wear patterns, in order to infer what the earliest hominids might have eaten. One recent consensus appears to be that their tooth morphology indicates omnivory, with no clear specializations for meat-shearing or seed-grinding or bone-gnawing (e.g. 39, 75, 76). Studies of tooth wear, masticatory musculature, and "microscratches" on the surfaces of teeth indicate that although there is variation between species (especially between later robust and gracile australopithecines), these early hominids were eating a variety of foods, some of them soft fruits and others tough, fibrous, and hard to chew. There does not seem to be consensus on whether these foods were generally gritty, indicating that they were mainly tubers and roots dug from the earth, or clean, which might suggest that they were fruits and other products from trees (cf 48 to 128). More importantly for this review, it is not yet possible to determine from tooth wear or from chemical analysis of bones what proportions of plants and meat occurred in these early human diets.

One feature of human dentition that has long intrigued physical anthropologists is that canines are relatively small in males as well as in females. In most primate species, and in the fossil forms that are believed to be ancestral to the australopithecines, canines are larger in males than females. It is usually suggested that large male canines in primates are selected for, either as part of a male protective role against predators or as part of sexual

selection, resulting from male-male competition. For hominids, the traditional explanation, which forms part of the hunting model, is that male canine size was reduced after the invention of weapons removed the need for canines as defensive tools (see 116). This explanation has become dated with the growing recognition that the reduction in hominid canines began long before the appearance of tools in the paleontological record. On the other hand, following the principle of female choice, but contradicting Darwin's contention of male choice in humans, some versions of the gathering model (124) have suggested that female proto-hominids may have selected males with smaller canines as preferred mates because the latter represented less of an aggressive threat to them and their offspring. Finally, it may simply be that smaller anterior teeth (incisors and canines) and larger, thicker posterior teeth (premolars and molars) were adaptations to produce flat, durable surfaces for chewing the fibrous foods that comprised the omnivorous diet of the earliest hominids.

BODY SIZE AND SEXUAL DIMORPHISM A second aspect of the fossil record that would bear directly on models of sex roles concerns the degree of sexual dimorphism in the earliest hominids. Although degree of sexual dimorphism does not correlate perfectly with sex roles, dominance relations, or mating systems in the other primate or mammalian species (92), nonetheless monogamous primates tend to be monomorphic and behaviorally undifferentiated by sex, whereas highly dimorphic species tend to be polygynous and male-dominated.

Unfortunately, there is little agreement on whether or to what degree the earliest hominids were dimorphic. It is not a simple matter to sex fragmentary fossil hominids, especially when only a few individuals are known of a given "type" or species. The gracile and robust australopithecine material from South and East Africa was sometimes interpreted as representing the females (gracile) and males (robust) of one species (e.g. 9). However, most would now agree that separate gracile and robust species existed in South and East Africa, and it is not clear what the degree of sexual dimorphism would have been within these species.

The problem of distinguishing species differences from sex differences has now reemerged with the very earliest hominid material from Hadar, presently dated at 2.9 to 3.2 million years ago. The famous "Lucy" and "First Family" fossils are interpreted by finders Johanson & White (50) as one highly variable, sexually dimorphic species, *Australopithecus afarensis*, whereas they are interpreted by some of the French members of the team (100, 110) and by Zihlman as two separate species. All agree that there is a great deal of size variation in the fossil hominids from Hadar, so much so that Zihlman has argued from the limited published measurements that if these hominids do

represent only one species, they would be more dimorphic than any known primate (131). Other researchers, however, continue to discuss and analyze the Hadar material as one highly variable and dimorphic species (e.g. 80, 106)

BIRTH, GROWTH, AND DEATH The evidence for relatively small brain size in the earliest hominids suggests that although the shape of the pelvis had altered to accommodate bipedal walking, the process of giving birth was not yet the problem for these females that it was to become for their large-brained descendents. However, the earliest hominid infants would have had feet adapted more for bipedal walking and less for grasping, and thus may have needed support from their mothers, a problem that pongid mothers do not have to accommodate. Even if their infants were more precocial than those of modern humans, and even if the long arms and stronger hands of an *afarensis* infant would have helped them to cling (especially if their mothers were hairy, something not recorded), it is probable that early hominid females would have had to find some way to support poorly grasping infants. Or perhaps mothers would have had to restrict their long-distance traveling. Mann's study of early hominid dental development (75) indicates that at least some australopithecine children (perhaps only those of two million rather than 3–4 million years ago) matured over roughly comparable periods to human children today, and thus more slowly than modern apes. This would also have presented caretakers with an increased burden, and females would either have had to space birth intervals widely apart to accommodate dependent children as do modern hunter-gatherers, or they would have had to find some method to care for more than one dependent child at a time. Mann's analysis of dental indicators of age at death in australopithecines suggests that life spans were short, perhaps no more than 25 years. Again, this is the kind of first and second-order evidence that can be used to construct quite different models. For example, it can be used to support the arguments that Lovejoy and Leibowitz made for a highly stressed, even threatened, hominid population, or more conservatively, as simply evidence for a demographic pattern similar to that of most modern hunter-gatherer societies and thus not a significant feature.

Third-Order Interpretations: Modeling Sex Roles and Social Bonds from Fossil Material

Pilbeam (57, 88) has said that despite their claim to be based on fossil evidence, most paleontological models of human evolution are relatively "fossil-free." This is perhaps best demonstrated through reference to the following list of the traits commonly focused upon by modelers of early hominid evolution.

PHYSICAL TRAITS:	Upright posture and bipedal walking; Reduced anterior tooth size and enlarged cheek teeth; Increasing brain size; Increasing hand-eye and fine motor coordination.
ECOLOGICAL TRAITS:	Open-country, savannah habitat; Heavy predator pressure; Terrestrial diet.
TECHNOLOGICAL TRAITS:	Tool use; Hunting and scavenging; Gathering; Homebases.
COGNITIVE TRAITS:	Language; Intelligence; Self-awareness.
SOCIAL DYNAMICS:	Food sharing; Division of labor; "Loss" of estrus in females; The husband-father role; Altricial infants and long dependency periods.

Many theorists have drawn up attribute lists such as the one above, in which traits found in contemporary human beings, but not in modern apes, often are projected back along the hominid record to an assumed very early appearance at the time of the divergence between hominids and apes. However, it is important to recognize that fossil evidence for these traits, having occurred in the earliest hominids of 3–4 million years ago, only exists for the first two of the 19 attributes listed. In addition, we have archaeological evidence for tool use some two million years ago and for aspects of a scavenging/hunting and gathering subsistence pattern (homebases with hearths, projectiles) only much more recently, in the middle to upper Paleolithic. For the majority of these assumed early hominid traits (e.g. self-awareness, loss of estrus), it is unlikely that we will ever find material evidence, and thus, as Pilbeam has argued, most stories of human origins are "unconstrained" by the fossil data, which are used instead to support or embellish preexisting frameworks of explanation.

For example, the analyses of teeth of the earliest hominids indicate that they were omnivorous, but they do not make it possible to determine what proportions of plants and meat occurred in the diet. Therefore, a scavenging or a hunting or a gathering model could claim some support from tooth measurements and wear patterns, and theorists have offered widely different interpretations of the reduction in canine size. Likewise, until the question of sexual dimorphism versus species differences is resolved for the earliest australopithecines, it is possible to argue for any type of hominid mating

system, unconstrained by the apparent relationship between phenotype and mating patterns in primates, that is between extreme dimorphism and polygyny or between monomorphism and monogamy. Indeed, Lovejoy appeared to accept the one, highly dimorphic species argument for *Australopithecus afarensis*, while arguing at the same time that they were monogamous. Finally, the evidence that early hominid infants had poorly grasping feet and possibly were dependent for long periods of time, which may have presented early hominid mothers with a special problem, can be interpreted in two opposing manners. First, as in the homebase model, it is possible to argue that the females became less mobile and more dependent upon males to provision and protect them, or second, as in the gathering model, we can argue that females resolved this problem themselves through technological inventions which in turn led to innovations with wider applicability.

Archaeological Evidence for Early Human Social Life

The assumption that the earliest hominids practiced a way of living that was somewhere along a direct line between the generalized lifeway of the chimpanzee and that of the contemporary hunter-gatherer is best exemplified by the earlier work of Glynn Isaac (44–46, 49). Several of Isaac's papers began by listing the traits that distinguish modern humans, *Homo sapiens*, from the common chimpanzee, *Pan troglodytes*, and attempting to identify the time periods in the archaeological and paleontological record when these distinctively human traits first appeared. As Isaac himself acknowledged in his recent papers (e.g. 48), there was a strong tendency to extrapolate the modern traits as far back into the record as possible. The earliest hominids were credited with complex social, intellectual, and technological abilities, not quite at the level of modern hunter-gatherers, but recognizably "human" nonetheless.

More recently, there has been a reassessment of the archaeological evidence for, and interpretations of, early hominid behavior (6, 48, 89, 103, 128). Although the study of human evolution often has been characterized by heated debate, not all of it enlightening, these recent attempts to test fundamental archaeological assumptions and to develop alternative ways of explaining the material evidence have been, in Isaac's own words, "liberating" and an "exciting exercise of alternating leaps of imagination with rigorous testing" (46, p. 66). Most of these new problem-oriented studies and experimental investigations of the processes that produce archaeological remains are beyond the range of this review, but the recognition that early hominids may have been very different in lifeway from modern humans has also been liberating from the perspective of sex role reconstruction. And the most important aspect of this minor paradigmatic revolution for women's

roles concerns the new interpretations of bone-and-artifact associations, or what were traditionally known as "home bases."

Isaac, it will be recalled, had developed a "sharing" model which was founded on the fact that in the early East African sites of around two million years ago, tools are found in dense patches in association with the bony remains of many animal species. Both stones and bones appear to have been transported to "central locations." Beginning with this one piece of material evidence, Isaac suggested that humans carried food and possessions to consistent locations as part of a social system involving home bases, division of labor, hunting and gathering, substantial meat eating, food sharing, and food preparation. As Potts (89) has noted, Isaac's model could as appropriately have been entitled a "home base" model as a "sharing" model, since all the other social characteristics are constructed upon the initial interpretation that stone-bone associations are evidence of "social and industrial foci in the lives of the early hominid tool-makers to which food was brought for collective consumption" (48, p. 24).

Several researchers (e.g. 6, 89) have now challenged the home base interpretation. Binford (6) analyzed some of the published evidence from Olduvai Gorge to argue that the "so-called" living sites or home bases were in fact the remains of carnivore activities. Isaac (48) countered that the published data sets on which Binford worked were declared by their author (M. D. Leakey) to be incomplete and preliminary, and that Binford had not accounted for the fact that the bone assemblages come from patches in which thousands of humans artifacts (tools) also occur. Thus Potts's (89) detailed, first-hand analysis of the Olduvai Gorge and Koobi Fora stone-bone concentrations was to be very influential.

Potts came to a different, but nonetheless startling, conclusion from both Binford and Isaac about the processes which formed the bone-stone tool assemblages. He argued that the animal bones at these sites were marked *both* by carnivore teeth and by stone tools, including tooth marks from gnawing and cutmarks made by slicing, scraping, and chopping with stone. Somehow, both early hominids and large carnivores were active at these locations, in some cases upon the same parts of the carcass, even the same bones. However, it is not whole carcasses of animals that are represented and the bones were not completely processed for meat and marrow, suggesting that hominids were abandoning considerable portions of the available food. Finally, the incredible density of bones at some of the sites and the patterns of weathering indicate bone accumulation spanning 5–10 years. All four factors, according to Potts, argue against a home base interpretation of the sites. The presence of large carnivores would certainly have restricted the activities of early hominids at such locations, and surely campsites would never have been established in such unsafe places. Modern hunter-gatherers carry whole or nearly whole carcasses back to camp, not restricted portions, and they intensively modify the bones of animal food. Finally, hunter-gatherers rarely occupy a campsite for a long period of time, and seldom reoccupy an old site. Thus Potts concluded that it is not possible to assume that the behaviors associated with home bases (sharing, division of labor) occurred at the early sites in Olduvai.

How then can one explain the presence of hominids at these sites? Potts argued that the sites represent stone tool caches and meat-processing locations. Because animal carcasses attract many meat-eaters, the hominids were forced to transport parts of the animal away from the original location where it was obtained either by scavenging or hunting. These portions of meat were taken to the nearest stone tool cache in the foraging area, where raw stone, manufactured tools, and bones remained from previous visits. Even chimpanzees are known to take food, in this case vegetable food, to consistent locations where tools have been left for processing (8). It is hypothesized that the hominids processed the meat quickly with the stone tools in the cache and abandoned the site before direct confrontation occurred with the carnivores who were attracted to the remains. Thus, over the years, many remains of partially processed, gnawed bones and large numbers of stone tools were accumulated in one location. Such sites could represent the antecedents of home bases, but Potts believes that until hominids gained the controlled use of fire to make home bases safe from carnivores, and the first evidence of controlled use of fire is much more recent in the record, they may well have continued to sleep in trees and to range widely during the day as do the other primate species.

One implication of this new understanding of bone-and-artifact associations for early hominid sex roles is clear: if there is not evidence for home bases where the sick and the dependent waited for the well and the productive, then perhaps we can finally free our minds of the image of dawn-age women and children waiting at campsites for the return of their provisioners. Even though the sharing model and many other anthropological scenarios appear to be about a division of labor in which women return to camp with vegetables and men with meat, it has almost always been assumed that women would have been more tied to the campsites. Women and homes have been inextricably linked in our cultural imagery, and thus the shaking loose from the home base focus for early hominid social life may allow our imaginations to turn to alternative scenarios.

CONCLUSION: HOW CAN WE IMPROVE OUR RECONSTRUCTIONS OF EARLY HUMAN SOCIAL BEHAVIOR?

Given the necessarily limited evidence of social life and the correspondingly large role played by speculation in the endeavor to reconstruct early hominid

society, it seems appropriate to ask if it is worth doing at all. As I have pointed out, many primatologists and anthropologists oppose such modeling, often for different reasons than the one offered by Evans-Pritchard some years ago (23), that it is a waste of time to speculate upon unanswerable questions. Yet origin myths exist in all societies, leading me to suspect that humans have "wasted their time" in just this manner ever since self-awareness became one of the hominid characteristics. Indeed, some scholars have argued that storytelling itself is a defining human trait (see 56); that "our need for chronological and causal connection defines and limits all of us—helps to make us what we are" (98, p. 207).

Furthermore, it is hard to imagine other sciences such as physics attempting to restrict themselves only to nonspeculative, empirically answerable questions. Pilbeam has argued that some unanswerable questions in paleoanthropology "still ought to be asked because they help to direct research efforts and channel thinking into fruitful pathways. The problem comes in knowing which unanswerable questions to ask" (88, p. 268). Elsewhere in the same article (and see 57) Pilbeam made it clear that, in his opinion, reconstructions of early hominid behavior would be much improved through greater reference to the actual fossil and archaeological data. Because contemporary apes are not necessarily like fossil apes, and because the hominoid fossil record in any case is virtually nonexistent, Pilbeam has concluded that a comparative approach is not likely to yield fruitful theories. It should be added to Pilbeam's point about these models being "fossil-free" that few reconstructions, even ostensibly comparative ones, take complete or accurate account of the primate and ethnographic data that are available. Zihlman's most recent publications on the gathering model attempt to account for more of the data from all three sources than any other model I have seen, and yet her interpretation of early hominid life has received no more attention from the paleoanthropologists than other less "data-based" models.

Thus one answer that has been offered to the question of how theories of early hominid behavior can be improved is by giving them a firmer empirical foundation. However, it is clear that the data-bases of human evolution will always remain limited, and as Isaac has noted, the really important aspects of any model cannot be addressed "purely by recovering bones, stones, and pollen from layered prehistoric deposits" (48, p. 248). Isaac believed that there are two related routes to a fuller understanding of the dynamics of human evolution. The first is an emphasis on problem-oriented and experimental studies of the processes that might have led to characteristic archaeological remains by making use of analogous modern activities and environments. The second is that propositions should be expressed as a series of falsifiable, alternative hypotheses, and tests should involve attempts to overturn intuitively favored hypotheses. His suggestion was that reconstructions would be better served by each researcher providing a series of alternative models, rather than promoting and defending a single model.

Both Pilbeam's and Isaac's suggestions reflect the view that greater scientific rigor will solve, or help to solve, the problems of subjectivity in models of human evolution. But another analyst (56) has suggested that it will probably be impossible to remove the subjective or "storytelling" element from evolutionary accounts. Landau argued that many scientific theories are essentially narratives, that is, the creative piecing together of an organized and plausible sequence of events by application of the imagination to standard forms. Particularly paleoanthropology with its description of the events of human evolution is, in her view, a form of storytelling, open to narrative analysis (see also 86). Landau did not address the question of the part played by "fiction" in human evolution models which would be one implication of a literary analysis to which many scientists would object. But surely any modeler would agree that it takes creativity as well as data to create a plausible account of human evolution. And neither creative nor scientific minds function in a cultural vacuum. Landau's narrative analysis attempts to make some of the implicit structural guidelines of any human origins model explicit. I recount her approach here with the suggestion that the process of attempting to bring hidden assumptions and structures into the open will allow us, if not to eliminate or even agree upon them, at least to become critically aware of their potential presence and influence.

Landau took a structural approach that looks for common elements in the different versions of the human evolution story. For example, she identified four major events or episodes that are consistently emphasized by paleoanthropologists: a shift from trees to the ground (terrestriality); development of upright posture (bipedalism); the development of the brain, intelligence, and language (encephalization); and the development of technology, morals, and society (culture). She suggested that the question of which episode came first has been a major source of debate since Darwin, but in all versions the same episodes are recognized. She then argued that the diverse theories of what happened in human evolution actually follow a common narrative structure. This structure takes the form of a "hero story" in which the protagonist (= hominid) starts from humble origins on a journey in which he will be both *tested* by environmental stresses (savannah predators, etc) and by his own weaknesses (bipedalism, lack of biological armaments), and *gifted* by powerful agents (intelligence, technological inventions, social cooperation) until he is able to transform himself into a truly human hominid, the hero's final triumph which always ends the story.

Landau regards this approach to human evolution accounts not as a criticism but as a demonstration to scientists that they are interpreters of text as well as of nature, and as a potentially useful tool in comparing structural and

conceptual differences between theories. If she is correct that human evolution theories follow a common narrative structure and adhere to a recognizable literary model (the hero's tale), which can be traced back through many centuries of European storytelling, this approach may give us some insight into why women generally play a subordinate role in these stories. For clearly the tale of the hero is about men and not heroines; women function in such stories either as secondary characters (mothers, sisters) related to the hero, or as potentially desirable sexual partners, often in need of rescue. If the contemporary Western raconteurs of human evolution had been raised in different narrative traditions, for example learning as children the enduring Chinese legend of the woman warrior, the female troubleslayer who rides into adventures carrying her infant in a sling inside her armor, then perhaps women would not have been so consistently restricted to the merely reproductive/domestic roles in our origin stories.

I have argued that one recurring theme in the human evolution accounts, from Darwin to Lovejoy, is that early men were the achievers, the producers, and technological innovators; whereas early women were limited by the reproductive demands of bearing and rearing children. Or as Sacks (95) has put it: men make culture and women make babies, two mutually exclusive activities. Anthropologists have long applied sets of dichotomous attributes to the roles of men and women in human society: public/domestic, productive/reproductive, culture/nature. However, a number of women anthropologists (e.g. 60, 95) have begun to challenge these dichotomies as being largely a reflection of the Western cultural belief in the opposition of the sexes that has been mistakenly generalized into a universal and "natural" human principle. These dichotomies are also present as hidden assumptions in most models of human origins, and yet we do not know how generally they express the human condition today, much less in the past. For example, foraging societies do not have secluded family units or households within the band, nor are women confined to campsites. Thus a discussion of public/male versus domestic/female spheres has not been a particularly insightful approach to understanding the lives of these people. If Potts (89) is correct that our early ancestors lived without home bases, the domestic, "house-bound" vision of early women becomes singularly inappropriate.

A similar inapplicability may exist for the productive/reproductive dichotomy. Does a foraging woman or a foraging society functionally compartmentalize human lives and activities into these two supposedly opposing realms, or is this merely an abstract and possibly ethnocentric conceptualization of how lives should be arranged? Is it necessary to assume, as does Lovejoy for example, that the human female's energy is so limited that productive activities must necessarily be detrimental to reproduction, that the behaviors involved in subsistence and child rearing are incompatible and mutually exclusive? One of the peculiar human phenomena that anthropologists have identified is that it is possible for people to widely and passionately hold cultural beliefs that are in direct contradiction to their social actions. I suggest that this is the case with our own cultural belief that the people who are reproductively engaged cannot be productively active, a tenet clearly belied by the sexual makeup of the workforce in our society today. When Spencer first articulated this "ideal" in Victorian England (called by historians the "cult of female domesticity"), women of the working classes were widely employed in industry at the same time as they were reproducing at a rate alarming to the social Darwinists. Indeed, in all social systems except those based on intensive agriculture or some forms of pastoralism, the same women who bear and rear offspring always have contributed actively to subsistence, and in many societies they are even more responsible for production than the men. The assumption of female domesticity has functioned as a pillar in the construction of most theories of human social evolution, and yet its accuracy and applicability have never been openly debated.

Theories of human origins do function as symbolic statements about and indeed prescriptions for human nature. By making the assumptions of any theory more explicit, one can test or debate them rather than continuing to act as though differences between models reflect only varying descriptions of the material evidence. When the evidence changes, as when gathering replaces hunting in economic importance, but the implications for men and women are seen to remain fundamentally the same, as when Man the Hunter becomes Man the Provider, it is clear that powerful cultural sex role expectations inform these reconstructions even more strongly than does material evidence.

Some readers may find it hard to accept that cultural beliefs and narrative traditions play a significant role in scientific models of human evolution. However, I would argue that the theories reviewed in this paper do combine the realms of science and of storytelling. If this is so, we can begin the useful exercise of learning to analyze how the two realms interact and overlap in a given model and how we can evaluate the model according to the criteria appropriate to each realm. To paraphrase Kermode (51), if we cannot free ourselves of subjectivity, then we must attempt to make sense of it. People will not stop wanting to hear origin stories and scientists will not cease to write scholarly tales. But we can become aware of the symbolic content of our stories, for much as our theories are not independent of our beliefs, so our behavior is not independent of our theories of human society. In these origin tales we try to coax the material evidence into telling us about the past, but the narrative we weave about the past also tells us about the present.

SUMMARY

1. Scientific models of early human social life are not simply plausible inferences from the material evidence, but also function as statements of

human nature. Such models rely heavily upon speculation, which often is culturally informed. Some social and natural scientists doubt the value of such theorizing.

2. Darwin developed the theory of sexual selection to account for secondary sex differences. Applying it to human traits, he argued that men were selected for courage, intelligence, and technological abilities, whereas women were selected for generalized maternal attributes, only acquiring intelligence secondarily through males.

3. Nineteenth century social theorists believed all societies go through common stages: promiscuity, matrilineality, and patrilineality. However, they disagreed on whether or not women benefit from increasing social control of human sexuality. The rejection of social Darwinism and the collection of systematic ethnographic data led to the abandonment of theorizing about human social evolution in anthropology until the 1960s.

4. Man the Hunter, a model drawn from primate, ethnographic, and archaeological evidence, became the dominant theory of the 1960–1980 period. Although differing from Darwin's scenario in evidence and concepts, Man the Hunter represents a continuation of his belief that only male traits were selected and that women play an insignificant part in human evolution.

5. A reappraisal of the primate, ethnographic, and material data led some anthropologists, most of them women, to propose a "countermodel" called Woman the Gatherer, in which gathering, sharing, and tool use were described as female inventions, crucial to the evolution of humans. Both hunting models and gathering models appeal to similar sources of evidence, yet present opposing and mutually exclusive accounts of human social evolution and thus of human nature.

6. The most widely discussed current theory, Lovejoy's male provisioning model, makes male gathering and the provision of sedentary, highly fecund, and monogamous females the central adaptation in human evolution, and is premised upon the supposed failure of pongid reproductive life history patterns.

7. Appeals to theorists to tie their models more closely to empirical evidence and to account for more of the evidence led to modifications, especially to the gathering model and to some extent to the hunting model, where the importance of scavenging was recognized. However, the resulting models have received no more attention than more speculative ones.

8. Isaac advocated more testing of experimental models with multiple hypotheses to increase the rigor of the models and to reduce the advocacy of modelers. Yet it seems unlikely that increased scientific data, or rigor, would solve the problem of subjective interpretations. Most of the important features that define sex-role differentiation are intangible.

9. If theories of human evolution are seen as narratives as well as scientific discourse, the literary analysis of the structure of origin stories might allow us

to distinguish the subjective from the empirical, the art from the science. Reconstructions of the past are in some respects also reflections of the present.

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