

# CHAPTER 1

# Engendering Human Evolution

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Prior to the 1960s there was little discussion about social life in prehistoric times, much less an examination of women's roles. Up to this point the cultural ideals of the 1950s prevailed in the wider society and were unquestioned within anthropology: women as stay-at-home moms with men bringing home the bacon, a sexual division of labor, and the nuclear family were all regarded as "natural" and part of an ancient pattern. During the 1960s advances in several areas of research revolutionized our understanding of human origins. This evidence and a growing social awareness of women's roles influenced anthropologists to reconsider the evolution of human behavior and where women fit into the picture. Hence, the 1960s and 1970s gave rise to an altered view of human evolution that focused on female primates, women cross-culturally, and women's roles in the evolutionary past.

The 1970s saw a scientific as well as popular flowering of articles and books about women that shifted the default setting away from men. "Woman the Gatherer" became the counter to "Man the Hunter" and identified women as central in anthropological theory. The discussion of gender continued and expanded in several fields during the 1980s and 1990s through research, conferences, and publications. At the same time, counter forces challenged, undermined, and ignored evidence that gave balance to women's roles. Darwin's ideas on sexual selection resurfaced with female choice of mates although he, along with later researchers, maintained an emphasis on male dominance. Sexual selection and male-male competition became centerpieces for the then new field of sociobiology, which narrowed evolution to "reproductive strategies."

Sometime in the 1990s, "feminism" developed into a pejorative term, especially among women scientists, and researchers in their publications shied away from mentioning gender and connecting women to any interpretations of activities during human evolution. References to gender diminished so that the behavior of ancient hominids became "genderless," and ultimately retained males in the central position.

As we go forward, a wealth of research emerging in the twenty-first century and a life history framework hold renewed potential for incorporating gender into evolutionary reconstructions. An appreciation of the history and limitations of the fossil and archaeological records can help steer clear of androcentrism and untenable assumptions about the past. Recognition of the complexity of human and nonhuman primate societies is replacing one-dimensional explanations of past societies. Membership then and now consists of all ages, both sexes, and more than two generations. When human biology goes beyond reproductive function and addresses the intersections with sociality and cultural practices, a less simplistic and more balanced approach to gender and human evolution becomes possible.

## **HISTORICAL BACKGROUND: EVIDENCE FOR RECONSTRUCTING THE PAST**

The human lineage originated about 5–6 million years ago and diversified into many species that represented different stages of anatomical and behavioral development through time. As other species died out, *Homo sapiens* came to dominate during the last 50,000 years. In the 1960s, however, studies of human evolution focused on the origin and early fossil species belonging to the australopithecines. Several lines of evidence contributed to these evolutionary issues and questions and became part of the support for reconstructing gender roles in the past.

### **Molecular data and primate field research**

The application of molecular data to questions about human origins extended into anthropology through the comparative study of proteins and amino acids in different species. Sarich and Wilson (1967) demonstrated unequivocally that the African apes, chimpanzees, and gorillas are most closely related to humans. These data provided an unexpected time frame, namely, that the three lineages (gorillas, chimpanzees, and humans) are so closely related that their separation occurred as recently as 5 million years ago, which contradicted the view accepted at the time about human origins of a separation 15 million years ago.

These molecular data added significance to discoveries from field studies on the natural history of African and Asian monkeys and apes. The highly popularized research of Jane Goodall (1968) initiated in 1960 documented the lives of chimpanzees, particularly the matriarch Flo and her offspring. A detailed film record brought to public attention chimpanzee mother–infant interactions, skills in tool using and making, gestures and social communication, and the ability to catch and eat monkeys. These and other behaviors seemed to narrow the gap between apes and humans and highlighted the social centrality of females.

### **Ethnographic evidence**

Hunter-gatherer societies have been of particular interest for prehistory because a nomadic foraging way of life persisted throughout evolution until about 15,000 years ago, like yesterday in evolutionary time (Thomas 1959; Marshall 1976). During the 1960s, research by Richard Lee on the Kalahari Bushmen, the !Kung San, elaborated

the reality of women's lives through detailed documentation of work effort and energy output in collecting and sharing many types of plants, in walking long distances while carrying infants and food items, and in using tools to acquire food (Lee 1968a, 1968b, 1979). He also showed that women fashion, transport, and use digging sticks with a fire-hardened point, along with a stone for sharpening it. This all-purpose tool is effective for unearthing underground roots and tubers hidden from view and deeply buried. Finding and extracting them requires knowledge, skill, and strength. Women as active problem solvers, who shared food and contributed to the social fabric of the group, provided a model for reconstructing women's multiple roles in the ancient past.

### Record of the past

Until the 1960s the only evidence for an early stage in human evolution consisted of fossil bones from South African caves of unknown age. When Louis and Mary Leakey announced their exciting discoveries from Olduvai Gorge in Tanzania, they captivated the anthropological world. They uncovered associations of animal bones, stone tools, and the remains of hominids in contexts of ancient lake and river margins. Breakthroughs in radiometric dating methods verified the time depth of almost 2 million years – a time frame that doubled the previous estimates of the extent of human evolution (Morell 1995).

These eastern African discoveries of known age lent support to the antiquity of the cave findings in South Africa first discovered in 1925 by Raymond Dart, with later findings by Robert Broom and John Robinson from the 1930s to 1950s. At that time there was no geological method that could establish the age of these cave deposits. Furthermore, there was little agreement on how the animal and hominid bones had accumulated in South African caves, initially maintained by Dart to be the result of human hunting activities. C. K. (Bob) Brain undertook the challenge and demonstrated that the bones were due to carnivore activity and that the hominids, rather than the animals, were often the victims (Brain 1970, 1981).

During the 1970s a wealth of fossils, including footprints preserved in volcanic ash in Tanzania, extended the evidence of human evolution to more than 3.5 million years. In Ethiopia a partial skeleton of the famous fossil dubbed “Lucy” raised questions about sexual dimorphism in this species of australopithecines. In Kenya numerous fossils representing more than one species were excavated along with stone tools and animal bones. According to their pelvic morphology, these early hominids were bipedal, but they had chimpanzee-size brains one third the size of *Homo sapiens*, as well as large and well worn molar teeth.

### Evolutionary theory

In the realm of evolutionary theory, Darwin's *Descent of Man and Selection in Relation to Sex* (1871) gained renewed interest in anthropology from Bernard Campbell's edited volume *Sexual Selection and the Descent of Man 1871–1971* (1972). After publishing his ideas about evolution by natural selection to explain the appearance of new species, Darwin shifted his attention to variation within a species and formulated the concept of sexual selection. Mating behavior, he surmised, is a mechanism that shapes female and male differences within a species and consists of two components leading

to sexual dimorphism: male–male competition and female choice. Reproductive success is at the center of the concept, and though Darwin primarily highlighted males, female choice presented a new framework for field primatologists and evolutionary theorists. Robert Trivers (1972) connected mate choice with parental investment, the notion that the sex investing the most in its offspring likewise invests more heavily in the choice of mates. Because female primates put more time and energy than males into reproductive effort, sexual selection points to female primates as the principal choosers.

These lines of evidence, singly and in combination, gave a clearer picture of the when and where of human origins, and at the same time provided a basis for challenging traditional views about gender and the evolution of human behavior.

### MAN THE HUNTER AND WOMAN THE GATHERER

Research on the evolution of social behavior was initiated during the late 1950s by anthropologist Sherwood Washburn, first in a paper with Virginia Avis (1958), and later in a conference on social life (1961). A joint paper with his student Irvén DeVore (Washburn and DeVore 1961) contrasted baboon life with that of pre-agricultural humans to highlight the behavioral gap and the uniqueness of human social life. For the first time, a specific species, savanna baboons, was used for comparison with early hominids, another savanna species.

Early human evolution came to be summed up in the “Hunting hypothesis,” which was based on the premise that, like the baboon, our ape ancestors were strict vegetarians and that meat was the “new” component of the diet. As part of this dietary shift, a configuration of behaviors emerged in which men acquired meat through hunting and shared it with their pair-bonded mates and nuclear families back at the home base. Thus men assumed the primary role in foraging, food sharing, tool using, and tool making. Furthermore, male aggression, bonding, and warfare, along with the nuclear family and the sexual division of labor, came to be explained as “natural” outcomes of evolution (e.g., Tiger 1969).

When Richard Lee returned from his research on the Kalahari hunter-gatherers, he and Irvén DeVore organized a conference in 1966, later published as *Man the Hunter* (1968). A paper in this volume by Sherwood Washburn and Chet Lancaster (1968) on the evolution of hunting helped seal “Man the hunter” as an icon in human evolution. Ironically, Lee’s introduction to the volume pointed up the bias in the material record of women’s activities. In an archaeological context, he noted that important organic objects, such as women’s digging sticks and skin bags (karosses), leave no trace whereas stone tools and animal bones, traditionally associated with male activities, do. Consequently, one important component of women’s activities is no longer visible. Additionally, Lee (1968a, 1968b) found that women contributed a majority of the family’s daily calories through gathering and sharing activities. But these points did little to offset the emphasis on hunting in that volume or in the wider context.

Richard Lee’s fieldwork, however, sparked interest in taking a deeper look at the role of women in evolution. Picking up on the active dimensions of women’s lives as portrayed by Lee, Sally Linton’s landmark paper, “Woman the Gatherer: Male Bias in

Anthropology,” presented at the 1970 annual meetings in San Diego of the American Anthropological Association, offered a counter to the mainline hunting thesis. Initially circulated on blue-ink dittoed paper, it was subsequently published in 1971 (and again in 1975 under Sally Slocum). Soon the phrase “Woman the gatherer” caught on as a counter to “Man the hunter” and drew attention to women by narrowing, and in a way stereotyping, economic roles for both genders.

Confronting issues about hunting and gathering from the comparative perspective of diet, Harding and Teleki (1980:3) challenged the idea that hunting and eating meat were new in human evolution. They reviewed historical reasons for the preoccupation with hunting: glacial periods in Europe projected back in time; tools as weapons (Darwin); and meat-eating of early hominid hunters (the broken bones in South African caves). Research papers in the volume provided “hard data that have been lacking” from primate field studies and from cultural studies on several populations of hunter-gatherers. Although not directly focused on gender, the data presented challenged the assumption of a vegetarian ancestor that needed meat in order to become human, although the idea about diet and the primacy of meat persists to the present time.

### EXPANDING WOMEN’S ROLES

During the 1960s and 1970s research in Africa provided new data for formulating an alternative: field studies of African apes; ethnographies of the Kalahari hunter-gatherer way of life; discoveries of fossil and archeological sites from South Africa; Tanzania’s Olduvai Gorge; Kenya’s Koobi Fora, and later, the Hadar region of Ethiopia; developments in methodologies for dating volcanic geological deposits (potassium argon) that extended human origins back in time to nearly 4 million years ago; new excavation methods applied to archaeological sites that established context of bone and stone assemblages; and comparative anatomy and molecular data to establish evolutionary relationships – all provided a rich context.

Within this context Nancy Tanner and I began to develop new hypotheses about the similarities between a chimpanzee-like ape ancestor and early humans, and about differences that arose in the divergence of the two lineages and the transformation of early humans some 3 to 5 million years ago. Interpreting this early stage of human evolution, we incorporated discoveries of chimpanzee behavior, fossil hominids that were bipedal with small brains, and ethnographies documenting human activities. Combining social anthropology and its “people focus” with an evolutionary framework integrated socio-cultural and physical anthropology. Rather than an exclusive focus on human differences, we emphasized continuity between chimpanzee and human biology and behavior, and at the same time proposed new patterns that might have emerged in the transition from ape ancestors to early hominids.

Our approach was as important as the data we gained from different lines of evidence. Washburn (1951) emphasized the use of all the available evidence from both fossils and living species as a basis for testing hypotheses. To understand the transition to a human way of life in eastern Africa, he argued it was necessary to take into account the social behavior of primates and hunter-gatherers (Washburn and Avis 1958; Washburn and Lancaster 1968). Our conclusions differed from Washburn’s.

He later insisted to me that he had always acknowledged the importance of gathering, but emphasized hunting as the fundamental new element in human evolution. We agreed to disagree.

Drawing on available research, Nancy and I used the molecular discovery of a recent ape–human divergence to support our choice of chimpanzee behavior to represent the transitional population of apes, rather than using baboon, carnivore, or a grab-bag of behaviors from several species that were proposed at the time. The fossil record is limited because behavior does not fossilize; consequently, we relied on observations of behavior in present-day societies. Chimpanzees are omnivores, not strictly vegetarians as is often assumed, use tools, share food, and carry offspring for several years. Similarly, women in foraging societies are omnivorous, adept tool users, carry their young, and are part of social networks. We concluded that these attributes were selected for in early hominid females. As the first hominids moved into the savanna environment away from the forests some 4–5 million years ago, innovations involving tools for gathering food and walking long distances increased effective exploitation of resources. These behaviors contributed to survival and reproduction more than did a shift to meat and hunting. Digging sticks and carrying bags were new inventions that would have left no trace in the archaeological record, as Lee pointed out. The earliest evidence of the hominids themselves predate the appearance of stone tools by almost two 2 million years (see Table 1.1). Given chimpanzee talents, we maintained that early hominids would have been just as intelligent in inventing and using tools, even if the tools themselves were not preserved in the record. Because we emphasized social flexibility in individuals and in groups, we maintained that a pair bond or nuclear family did not reflect chimpanzee mating behavior and was too narrow and rigid to be used as a model for the patterns present in human societies.

Chimpanzees and hunter-gatherers live in social communities with both sexes and all ages and therefore offer a broad view of interconnected facets of society, that is, what

**Table 1.1** Timeline of selected events in human evolution.

<i>Time estimate</i>	<i>Event</i>
60,000 years	<i>Homo sapiens</i> expands out of Africa to Australia, Asia, Europe
150–200,000 years	Origin and population evolution of <i>Homo sapiens</i> in Africa <i>Homo neanderthalensis</i> in Europe
600,000 years	Estimated time of divergence of lineages leading to Neanderthal in Europe and to modern <i>Homo sapiens</i> in Africa
1 mya	Wide geographic distribution of several species of the genus <i>Homo</i> in Africa, Asia, and Europe
2 mya	Evidence of another hominid, <i>Homo</i> in eastern and southern Africa; recognizable stone tools in context; increase in brain size
2–4 mya	Australopithecine fossils widespread: Ethiopia, Chad, Kenya, Tanzania, South Africa including fossil footprints and much of a skeleton (known as “Lucy”)
4 mya	Fossils in Africa, showing bipedal anatomy and small brains (Australopithecines)
5–6 mya	Estimated time of separation of human and chimpanzee lineages
5–7 mya	Fossils of uncertain status, though claimed to be hominid

*Note.* mya = millions of years ago.

individuals do day-to-day in getting food, avoiding danger, and raising offspring. The range of interactions that individuals have with each other within their environment reveals the dimensions and challenges faced in everyday survival. We argued that this perspective formed a more realistic basis for reconstructing past ways than the reliance on a fragmentary fossil record or on modern human society. At the same time, we recognized that chimpanzee and hunter-gatherer societies are not replicas of human societies some 2–4 million years ago. Rather, we attempted to address the interrelationships of behaviors (a sort of “whole package” approach) and from this suggested innovations that led to diverging paths of apes and early hominids (Tanner and Zihlman 1976a).

We elaborated the gathering hypothesis and argued that hunting emerged much later and developed out of a foundation in gathering (Zihlman and Tanner 1978). We discussed human communication, details of early human social life, the chimpanzee model (Tanner and Zihlman 1976b; Tanner 1981), the role of women in a later stage of evolution with the origin of the genus *Homo* (Zihlman 1978), and the ways in which gender shaped the course of human evolution, including the idea of male assistance in caring for the younger generation (Zihlman 1981). In more recent papers I have analyzed the resistance in mainstream physical anthropology to the importance of women and gathering (Zihlman 1987, 1995, 1997).

### **OTHER EARLY RESEARCH ON SEX AND GENDER (1970s TO EARLY 1980s)**

The climate of the 1970s encouraged and stimulated thinking about gender. Interpretations of women in evolutionary time joined the expanding literature that shared common questions about gender, and explored new realms of scholarship (e.g., Gale 1970; Martin and Voorhies 1975). Shelly Rosaldo and Louise Lamphere recognized deficiencies in ethnographic accounts and attempted to rectify this problem in their edited volume *Woman, Culture and Society* (1974). Their sentiment resonated widely: “our conceptions of human social life will be broadened when they *address women’s lives* and strategies along with those of men” (1974:iv, my emphasis). Reiter’s edited volume *Toward an Anthropology of Women* (1975) included Sally Slocum’s key paper (mentioned above) and Patricia Draper’s paper (1975) on the sexual division of labor. Based on her research among the !Kung hunter-gatherers, Draper noted that in the shift from the traditional nomadic foraging way of life, to one of settled life in villages, the work load of women and girls increased and they lost their traditional autonomy. This study demonstrated how environmental circumstances, rather than strictly biological imperatives, influenced gender roles, and should have been a caution against a rigid portrayal of a sexual division of labor.

Others also noticed the neglect of women’s activities, and this led to convening conferences in the 1970s, some organized by men, with the intention to focus on women’s roles. In 1974 Lionel Tiger acknowledged the disproportionate attention given to males in human and other social systems, and the conference on female hierarchies was intended as a corrective (Tiger and Fowler 1978). In 1979 Glynn Isaac and Richard Leakey organized a public symposium in New York entitled “Men and Women in Prehistory” with contributions on gathering and women’s activities along with discussions about hunting, scavenging and the archaeological record. Isaac’s

interest in dietary adaptations in prehistory led to an emphasis on early hominid subsistence as a mixed economy that included both gathering and hunting that is still widely accepted today, though little discussed (Isaac 1978).

Influenced by a statement in *Man the Hunter* that “early woman would not have remained idle during the Pleistocene” (Lee and Devore 1968:7), and intent on countering that book’s exclusive focus on men, Frances Dahlberg brought together articles about females and women in primatology, human evolution, and ethnography to highlight the intersection of women and evolution in a landmark volume, *Woman the Gatherer* (1981). In her introduction, Dahlberg concluded that the evidence from the many dimensions of female lives demonstrates flexibility, diversity, and interdependent cooperation between the sexes, and leads to a complex story (1981:27). Her points were borne out as new findings presented alternative ways to view gender as a component of reproduction, work, and social relationships.

## RECENT RESEARCH ON GENDER AND EVOLUTION

Research on gender and evolution gained momentum and flourished into the 1980s and 1990s. New ideas were forthcoming from primatology and ethnography, and groundbreaking conferences and monographs covered a wide range of topics that spoke to gender issues. These are summarized in the following sections.

### Primatology

Based on years of fieldwork on baboons in Kenya, Jeanne Altmann (1980) documented the extensive physical investment and behavioral alterations of females in producing and caring for their offspring. Her innovative formulation of time-energy budgets, the costs of reproduction, and social relations of baboon females shaped the way primatology would come to study foraging effort, energetics, and all phases of reproduction.

Combining her own research on macaques with that from long-term studies on free-ranging populations of baboons and chimpanzees, Linda Fedigan (1982) challenged the sex-stereotypes of male aggression, dominance, and alliance, as contrasted with female passivity, and documented the variation in female-male relationships in primate societies. Moreover, sociobiological theories interpret behavior in terms of selection on males, while female “strategies for reproductive success,” when considered at all, are viewed as unsuccessful. Language has power, Fedigan maintains, in describing differences between the sexes, and too often research terminology encourages the perception of females as passive or inferior to males.

Building upon Thelma Rowell’s field research on the structure of baboon troops and concepts of social dominance, Barbara Smuts (1985) and Shirley Strum (1987) have offered alternatives to the stereotypes of the aggressive dominating male baboons at the center of social life. Smuts’ discussions about friendships formed between adult females and males reflect a more textured picture of relationships between the sexes. Strum emphasizes that social skills rather than fighting ability secure a male’s position in a new social group. Thelma Rowell (1988a, 1988b) has further challenged stereotypes of males by closely analyzing male-male relationships and their ways of communicating in the presence of sexually receptive females.



Documenting life histories of female chimpanzees, Goodall (1986) has demonstrated the breadth of female participation in daily social life and species survival. She has also shown how male chimpanzees vary in personality and behavior from highly aggressive, dominance-seeking individuals to those who are more laid-back or relatively solitary.

### **Ethnography**

Ethnographies of hunter-gatherer populations published during the 1970s and 1980s provided rich descriptions of foraging peoples across cultures, and ethnoarchaeological studies added another dimension to understanding past societies. Some of this research has contributed new perspectives on gender and on the relationship between women's subsistence, nutrition and work, and reproduction. Shostak, for example, has dramatized women's lives through the personal portrait of one woman, Nisa, who narrates a rich emotional and social life; growing up, getting married, having children, getting divorced (1981). Such revelations alone are sufficient to negate stereotypic or simplistic notions about relationships between women and men in this society and probably also in prehistoric ones. Anne Vincent's innovative study among the Hadza documented the abundance of tubers in a savanna environment, their prominence in the diet, and women's effort in digging and carrying them (1985).

Other ethnographic studies have focused on the relationships between women's work effort and conception, pregnancy, and lactation (e.g., Bentley 1985; Peacock 1985; Panter-Brick 1989). Women, even those with children, hunt quite effectively in some cultures, and men gather food, further challenging what was touted as strictly a female or male domain and a rigid sexual division of labor (Estioko-Griffin and Griffin 1981; Estioko-Griffin 1985). These and other studies convey the dimensions of women's lives and activities and underscore the need to recognize the role of gender when discussing early human social life.

### **Conferences and Publications**

During the 1980s and early 1990s, conferences and publications reflected interest in gender within all areas of anthropology as well as the reach of these ideas into other arenas, including primatology and archaeology (e.g., Small 1984; Morgan 1989; Gero and Conkey 1991; Walde and Willows 1991).

A Wenner-Gren conference in 1987 convened researchers in all the four anthropological sub-disciplines; it focused on gender and hierarchies across the discipline and recognized the commonalities and linkages as well as the contrasts and complexities (Miller 1993). Additionally, *Gender at the Crossroads of Knowledge; Feminist Anthropology in the Postmodern Era* (di Leonardo 1991) introduced new debates within each subfield as a way to share the wealth of new research and theoretical analyses with a wide audience. In rethinking the sexual division of labor, biological anthropologist Nadine Peacock (1991) drew on direct observations of *individual* women's and men's lives based on her fieldwork among the Efe forest people of central Africa (author's emphasis). She placed breastfeeding, childcare, and carrying infants and heavy loads into a social and ecological context and documented how women negotiate, cooperate, and compete with other women as well as with men.

Lori Hager's *Women in Human Evolution* grew out of her course at Stanford in 1990 and like the goals of the course, the essays focused on "females in prehistory as agents of evolutionary change" and on the contribution of women as researchers in paleoanthropology (1997:x). Topics explore reproduction, biology and culture, gender and ideology; although written only by women, the essays do not represent one voice. Taking life history as its framework, a 1990 conference *The Evolving Female: A Life-History Perspective* moved away from simplistic approaches to female biology and their lives by recognizing the many layers of complexity of organisms and their worlds (Morbeck et al. 1997). Evolutionary continuities exist in the shared biology of female mammals, primates, and humans (internal gestation, lactation, and weaning), and while they build on a common foundation, species differ from each other in the timing and duration of their life stages, and in humans, in their cultural practices (Zihlman and Bolter 2004; Trevathan 2010). Reproductive "success" or, more accurately, reproductive "outcome" is not an abstraction; it involves more than simply finding a mate, and must be measured over a lifetime in order to ground interpretations of natural selection and evolutionary theories.

## CONTINUING THEORIES OF MALE DOMINATION

While theoretical frameworks and feminist scholarship infused research on gender and the evolution of social behavior, other accounts continued to press for male dominance, meat-eating, hunting, and male provisioning and parental investment, while either directly or indirectly eliminating any gender balance.

### **A chimpanzee model**

Evolutionary psychologists have generally dismissed the gathering hypothesis as a "feminist track." Tooby and DeVore (1987), for example, criticize it because it is based on chimpanzee, rather than baboon behavior (DeVore's study species). They maintain that chimpanzees "are preferred by feminists," not because they are more closely related than baboons as the molecular data show, or that chimpanzees are skillful tool users and communicators, but because "male dominance is less popular as a research perspective than the putatively more peaceful chimpanzees" (1987:222). Apparently, the authors assume that male dominance and hunting are givens and therefore cannot/should not be questioned, even though molecular data and comparative behavior make a compelling counter-argument for chimpanzees as a baseline.

### **Meat as a significant dietary item**

As a counter to the importance of plant foods proposed in the gathering hypothesis, the emphasis on hunting in the 1960s and 1970s expanded to include scavenging of meat from carnivore kills. From hominid sites in eastern Africa dated between 1 and 2 million years ago, a few animal bones showed cut and percussion marks, presumably made with the associated stone tools of hominids. The finds fostered speculation on whether the hominids were scavengers, butchers, hunters, or some combination.

However procured, meat is widely presumed to be a major dietary item and a hallmark of human behavior (Stanford 1999).

Since the 1990s, meat as a major dietary item has been invoked as the basis for the increase in brain size during the last 2 million years. Bunn summarizes this view as follows: “The direct evidence of early hominid diet allows us to dismiss models of human evolution which do not incorporate meat-eating as a significant component of early hominid behavior” (1981:577). This argument is based on the assumption that meat supplied critical nutrition for “feeding the brain” and therefore made it possible for hominids to grow a large, energetically expensive brain that is three times the size of chimpanzee brains (e.g., Aiello and Wheeler 1995).

This predominant focus on meat glosses over the omnivorous diets of chimpanzees and other primates (e.g., Harding and Teleki 1980), and although human foragers hunt, meat is not usually a significant dietary component (e.g., Milton 2000). The preoccupation with meat, scavenging, and hunting obscures the breadth of foods consumed, and can perhaps be regarded as an ethnocentric projection of the Western overconsumption of meat.

### **Bipedal locomotion**

Bipedal locomotion in the earliest hominids has long been recognized as a defining feature, distinct from the quadrupedal behavior of apes (Washburn 1951). A hallmark of mammalian evolutionary success is that females carry young internally during gestation, retain their mobility during this phase of reproduction, and therefore can survive and reproduce in extreme environments. Female primates added on to this pattern by carrying their dependent young for months and years after birth, and the infants’ grasping hands and feet enable them to hang on for dear life while sailing across the open tree canopy. This locomotor/reproductive combination gave primate societies considerable flexibility because females during foraging could keep up with the group and maintain social relationships during all phases of reproduction. Women in foraging cultures continue this primate mobility by carrying their infants with them while they engage in subsistence and other activities. Yet, male-centered hypotheses about the origin and evolution of bipedal locomotion – to provision females, to run long distances, to fight effectively – have gained wide coverage, though they are narrowly conceived and necessarily ignore the reality of the stages of reproduction. According to these views, females could not possibly have evolved because locomotion and reproductive demands would be at odds.

In a leading article in *Science*, Owen Lovejoy (1981) proposed a new hypothesis for the origin of bipedal locomotion: it allowed males to range widely to collect food to provision their mates and biological offspring. According to this model, females became tied to a home base, exercised less mobility, and had more closely spaced offspring, thereby reproducing more frequently. To ensure that a male did not spend effort caring for someone else’s offspring, a pair bond developed to guarantee paternity. This highly unusual monogamous mating system, Lovejoy maintained, called for epigamic characters not seen in other primates: permanent breasts and large penises. Lovejoy’s hypothesis reinforced the traditional pair bond as an ancient pattern. But rather than provide meat from hunting, hominid males shared plant foods. In this way Lovejoy co-opted gathering. Tooby and DeVore (1987) praised

Lovejoy for his conclusions about monogamy and male parental investment, as well as a sexual division of labor, but maintained that hunting behavior best explains what they believe to be human hallmarks.

Lovejoy presented no evidence that mobility equates with infant mortality in primates or humans and ignored the evidence for compatibility of locomotor mobility and reproduction obvious in female monkeys, apes, and hunter-gatherers (Goodall 1968; Lee 1972; Howell 1979). Due to the slow growth and long dependency in apes and humans, intervals between births in chimpanzees and humans are most often spaced three to five years apart. During human evolution, and with the shift in subsistence activities from foraging to food production in the last 10–15,000 years, populations increased and births could be more closely spaced together (Lee 1972).

The proposal that endurance running shaped human musculature and body form is another variation on the locomotor theme (Bramble and Lieberman 2004). In an article published in *Nature* with a naked running man on the cover, the authors argue that running long distances may have contributed to exploitation of meat and marrow by enabling the hominids to arrive more quickly at animal carcasses and so successfully compete with carnivore scavengers or to get close to prey for effective hunting. This hypothesis also connects fat and protein with large bodies, small guts, big brains, and small teeth of the genus *Homo*.

It is the case that endurance running is a recreational sport for women as well as men. However, women who excel have a narrow pelvis and relatively low body fat. This type of body works for men, but for women, a broad pelvis and sufficient body fat are necessary for success during all phases of reproduction – ovulation, conception, pregnancy, and lactation. Women foragers are endurance walkers while carrying infants, tools, and heavy loads. One cannot account for women’s bodies based on endurance running; by this account only the male half of the species would have evolved.

My last example also relies on sexual selection and male-male competition. In what is presented as a “new view” of the evolution of bipedal locomotion and social behavior, Lovejoy (2009) elaborates on, though only slightly modifies, his 1981 article. The basis for this new rendition is *Ardipithecus ramidus*, 4.4 million-year-old fossils, first named 15 years ago though only recently reconstructed and presented in a cover issue of *Science* (October 2009). Lovejoy’s argument relies on a small sample of the *Ardipithecus* canine teeth, described as “feminized” canines of males. These teeth are the basis for Lovejoy’s conclusion that early hominid males lost what had been the “norm” of large canine teeth of ancestral ape males who aggressively competed for females. The smaller canine teeth and reduced aggression combined with the males’ ability to carry food to form pair bonds, and so increased their parental investment.

The changes in dentition and locomotor anatomy, Lovejoy maintains, meant that a male would target a female, supply her with high fat, high protein foods – no longer just vegetables! – and in return would gain exclusive sexual favors that ensured the children he was providing for were his own. Lovejoy concludes that this combination resulted in “a breakthrough adaptation ... for early hominids *and for all their later descendants including ourselves*” (2009:74, my emphasis). This more elaborate, though unsubstantiated statement that a mating pattern has persisted for over 4 million years into the present time is outdated and harks back to the progressive, goal-oriented evolution of the nineteenth and early twentieth centuries. This erroneous notion of

directed evolution fell by the wayside when evolution by natural selection was more fully understood (Bowler 1992).

Lovejoy's "new" account of human evolution incorporates no new evidence from primatology or ethnography, and the genetic and evolutionary closeness of chimpanzees and humans is rejected. It does, however, continue the typical though very questionable tradition in paleoanthropology of freely assigning male or female sex to fragmentary bones and teeth, estimating body mass, and extending it to declare the degree of difference in female and male body size and mass, or sexual dimorphism. The reality of the fossil record of between 5 and 1 million years ago is that the vast majority of fossils are fragmentary. Jaws, crania, limb bones are rarely complete or sufficient in association to reveal information about just one whole individual, much less about a group or population. What actually can be said about a specific fossil or a collection is limited, and it is impossible to draw valid conclusions about mating patterns or a division of labor.

Three examples cited here derived from articles and cover stories from *Science* (1981, 2009) and *Nature* (2004), the leading science journals in the world, and the findings are picked up in the popular media. One might ask why such one-sided, androcentric articles on human evolution are given prominence.

### **Sociobiology, evolutionary psychology, and sexual selection**

Darwin emphasized the role of males and minimized the contribution of females, and this version of sexual selection is still widely applied. Campbell's edited book (1972) gave enough attention to female choice to counter the common assumption of female passivity, but this was a brief window. With the publication of *Sociobiology: The New Synthesis* (1975) Edward Wilson, an expert on social insects, put the "socio" into the "biology" and made sexual selection a centerpiece. As a theoretical framework, sociobiology perpetuates and expands the male role in reproduction (in acquiring mates and in copulating successfully) and in a male's, but not a female's, investment in the survival of "his" offspring. Unlike Darwin's emphasis on the organism, sociobiology, and its morph, evolutionary psychology, lose sight of the individual and reduce organisms to collections of genes and traits (for insightful, in-depth discussions on gender, sociobiology, and evolutionary psychology, see Bolger 2006:468–480 and Rose and Rose 2010).

Another incarnation of sexual selection – infant-killing by males as a reproductive strategy – derives from observations in primatology, initially on langur monkeys in India. Researchers noted that when a male aggressively takes over of a group of females and chases out the resident male, the in-coming male sometimes attacks and kills young infants, brings their mother into estrus, and mates with her, presumably producing his own infants (Hrdy 1977; Hausfater and Hrdy 1984). This interpretation demonstrates how sociobiologists privilege paternity and view male behavior in terms of male competition for access to and fertilization of females. Females are portrayed as passive victims of male aggression, having "counterstrategies" in response to male "strategies." Male infanticide has now become a dominating paradigm to account for the composition of primate social groups; with males around all the time, it is claimed that females reduce the risk that their infants will be killed by strange males (Van Schaik and Kappeler 1997). The only support for this hypothesis, however, appears to be an abundance of negative evidence.

While a lot of ink has been spilled debating the validity of sexual selection, there is only a paucity of data that addresses key questions of whether male-male fighting or killing infants actually affects that male's reproductive outcome over a lifetime. On the other hand, female choice of males has been well documented in a number of long-term studies, though what females are choosing and whether their choices of mates actually affect their reproductive capacity over the life course remain questions for research and discussion (Small 1993). In an alternative assessment, Michael Huffman (1992) concludes that lifetime reproductive outcome of Japanese macaque males is a result of a long life (i.e., more opportunities to sire offspring) and female choice (see also Fedigan 1997).

Sociobiological debates on reproduction are parallel to those on monogamy as an evolutionary anchor in most reconstructions of early human society, implying male control of female sexuality for the purpose of ensuring biology paternity (Zihlman 1995). By grounding arguments in the pair bond and in the ancient sexual division of labor, Lovejoy and others indicate that in the last analysis the real issue is male demand for certainty of offspring: paternity must be guaranteed so that males will not waste time and energy provisioning offspring who are not their biological kin. Underpinning these contemporary views of gathering and hunting is a refusal to acknowledge female choice and female investment in reproduction as important factors in human evolution, as they challenge the ideal of the nuclear family and male control of female sexuality.

## NEW INFORMATION, NEW POSSIBILITIES

I have come to appreciate the limitations of drawing conclusions about the distant past, particularly in assigning gender to fossil hominids millions of years old. On the other hand, the richness of recent data from primatology, archaeology, ethnography, and a life history framework presents new possibilities for incorporating gender into reconstructions of behavior at different stages of human evolution. The solution is not to eliminate discussions of gendered activities – which by default promote male centrality and render women invisible in evolutionary reconstructions – but to engage the debate. A major challenge in theorizing about the evolution of human behavior is to approach reproduction as part of whole lives and entire social groups, recognize flexibility, and avoid gender stereotyping.

### Life history theory

A life history framework applied to gender and evolution offers a multi-layered approach to survival and reproduction, recognizes the variables that contribute to reproductive outcome, and shows appreciation for life's complexities. Life history theory follows the main framework of evolution by the process of natural selection over time, which, as Darwin noted, operates on the whole organism at all life stages from survival through maturity. An individual primate follows a developmental program as it passes from fetus to infant and juvenile, and finally reaches reproductive age. Life history approaches recognize the dependency of infants, the divergent behavior of female and male juveniles, and the dimensions involved in female and male reproduction over lifetimes (Morbeck et al. 1997). The average timing of each

stage, such as gestation length, age at weaning, age at first reproduction, or life span, constitutes a species profile, and these patterns can be compared across species.

Some life stages are associated with physical markers (e.g., dental eruption and bone fusion), so that comparative studies of growth and development of apes and humans can be extended to estimating life stages in fossil hominids (e.g., Bolter and Zihlman 2011; Kelley and Bolter in press). Shifts that occur in the life stages during the course of evolution (for example, in the length of infancy, which is intimately connected with female reproduction and life history), will have an impact on the social dynamics of the entire group. Therefore, attempts to reconstruct changes in life history, in timing of maturity, or in life span (to determine generational lengths), provide a perspective on gender and social bonds and interactions among all members. Examples of this are provided by recent studies of the emergence of a childhood or adolescent stage (e.g., Bogin 2006; Howell 2010); children's independence and involvement in subsistence (e.g., Crittenden et al. in press); the contribution of mother-child interactions in the evolution of language (Falk 2009); or with an extended life span the possible role of grandmothers as nurturers and teachers of younger members of the social group (e.g., Hawkes et al. 1998). Applying principles of life history encourages thinking in terms of timing and length of life stages, the connections between growth and development and female reproduction, adult survival while reproducing, and communities that consist of highly social individuals, not just a pair bond isolated from other members of the society.

### **Chimpanzee biology, behavior, and ecology**

The excitement generated by Jane Goodall's initial studies during the 1960s has not diminished in the intervening decades. On the contrary, new discoveries continue to amaze and challenge our preconceptions about chimpanzee capabilities, and here I present a few examples. Comparisons based on DNA firmly establish chimpanzees as our closest living relatives. We shared a common ancestor about 5 million years ago; gorillas split off about 7 million years ago and are distantly related to both (Kumar et al. 2005). Long-term field studies on chimpanzee populations from Tanzania, Uganda, the Congo, the Ivory Coast, and Senegal cover a variety of ecologies and report behaviors not previously seen. Tool use and manufacture, hunting, reproduction, and social behavior are grist for the mill of theories about gender in early hominids.

When Goodall showed the first films of Gombe chimpanzees fashioning stems and twigs to probe for termites, anthropologists had to reevaluate what had been assumed to be uniquely human. To Goodall it seemed that females with their offspring spent more time at the termite mounds than did males, and her impression turned out to be the case. Adult females engage in tool using activities more frequently than males, and in processing hard shells, adult females reach the highest level of skill, measured in hits per nut and nuts processed per minute (Boesch and Boesch-Achermann 2000). Social dimensions seem to be the difference: females are less distracted while cracking nuts than are males. At Gombe a developmental study of termiting showed that young females pay closer attention to their mothers' tool-using techniques than do males (Lonsdorf et al. 2004). Females are the carriers of traditions through time and space. Females but not males leave their natal community and transfer into another group taking their skills with them (Matsuzawa

2003). And, as models for the young to learn by observation, females pass on tool traditions to the next generation through their offspring.

Males more often than females have been observed killing and eating monkeys and other mammals. However, at the Fongoli site in Senegal, females, to a much greater extent than males, were observed fashioning twigs into little spears with sharp points to stab small bush babies that sleep in the hollows of trees (Pruetz and Bertolani 2007); a similar behavior was observed in a female chimpanzee at Mahale in Tanzania (Huffman and Kalunde 1993). At Lui Kotale in Congo females are active and successful hunters, catching and eating monkeys and other prey items (Hohmann and Fruth 2007; Surbeck and Hohmann 2008). In a savanna region of Tanzania, chimpanzees have left evidence of tools used to dig up roots, but without direct observations it is not established whether females or males or both were responsible. The authors, however, do note that exploitation of similar resources could have been within the ability of our earliest ancestors (Hernandez-Aguilar et al. 2007). This is one example that shows the renewed interest in roots and tubers in human diet which have implications for reconstructing diets in the past (e.g., Laden and Wrangham 2004; Eisenstein 2010).

In individual personality and in social relationships there is no single pattern. Goodall's observations on male personalities highlighted variation: some strived for alpha male status and were willing to fight; others avoided conflict with other males, and were satisfied with middle rank and being preferred as mating partners; and still others were reclusive or relatively unsocial. Adult females also vary: in some populations they are more gregarious, in others, less so. The two species of chimpanzees share much in common, but differ in male behavior. A *Pan paniscus* male stays close to his mother until she dies and does not bond with other males until later in life, whereas *Pan troglodytes* males bond, patrol their territorial boundaries, and sometimes kill their neighbors (Goodall 1986; Kano 1992).

## Archaeology

Recent archaeological discoveries broaden our conceptions about hominid diets and associated activities in the ancient past. New excavations at Koobi Fora in Kenya dated to nearly 2 million years ago challenge the traditional focus on eating meat of terrestrial mammals estimated from animal bones in association with stone tools (Braun et al. 2010). The findings reveal a broader range of food items than previously appreciated. Early members of the genus *Homo* incorporated various aquatic animals into the diet, including turtle, crocodiles, and fish, as well as terrestrial mammals. Shellfish and marine resources uncovered at coastal sites in Africa may have been crucial for the survival of early *Homo sapiens* populations more than 160,000 years ago as they expanded their home ranges along the coasts of Africa, out of Africa, along the Indian coasts and into Australia by 50,000 years ago (Wells 2002; Marean 2010).

Shellfish may have been an important dietary item for tens of thousands of years for people living near the sea. Along the northern coast of Australia shellfish constitute a major portion of the diet and is contributed by women. They collect after the tide is out to expose the beds, thereby safely taking their small children with them (Meehan 1977a, 1977b).

Renewed interest in looking for evidence of plant foods in the archaeological record indicates that the diet of Neanderthals included more than just animals (Henry 2011).



Starch grains from wild plants on the surfaces of grinding tools show that hominids in Europe 30,000 years ago were processing vegetal foods, and possibly producing flour (Revedin et al. 2010). The association among contemporary women with seafood and plant foods, combined with remains from archaeological sites, provides a means for bringing gender into discussions about survival of these populations and the contributions made by women.

Finally, the Kalahari hunter-gatherers continue to be a focus of study (Howell 2010). Their DNA reveals them to be the oldest *Homo sapiens* lineage in Africa, which has been confirmed by analysis of their click language (Tishkoff et al. 2007). The traditional way of life that Thomas (2006) describes as “the Old Way” provides a glimpse into the past, going back more than 150,000 years.

## CLOSING COMMENTS

My research on gender in human evolution focuses on the early stage of evolution, when hominids were bipedal but retained small chimpanzee-sized brains and before stone tools were preserved in an archaeological context. At this stage chimpanzee abilities can act as a benchmark for assessing the presumably smarter hominids. Later stages of human evolution yield artifacts and other evidence of human activities, along with the physical remains of the individuals with brain size two-thirds of *Homo sapiens* but with fewer guideposts to assess behavior. In thinking about past lives and ways of life, we must keep in mind that numerous species of hominids lived and expanded throughout the globe. Behavioral studies on primates and people, along with archaeological evidence, demonstrate the adaptability and innovative nature of the human lineage. Although we can only speculate about gender roles in the past, we establish continuities through time and across space. Ancient human societies of whatever species, time period, or environment, consisted of both sexes and all ages and more than likely survived for more than two generations. Our challenge is to think beyond our own culture, utilize the information on traditions and cultural variation, and at the same time keep gender at the forefront of the discussion of ancient human societies.

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