

U3A

THE HISTORY OF POLITICAL POWER
THE HUMAN FAMILY

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THE HUMAN FAMILY

Rationale

A wide variety of differing social and political views depend on a particular view of what human nature is, or even a denial that such a thing as "human nature" exists. Frequently these views have recourse to the behaviour of "the apes" to justify their conclusions. The course will examine the results of research into the lives and behaviour of the upper primates (Orang-utans, Gorillas, Chimpanzees and Bonobos) and recent research into early human evolution in order to examine the question of "human nature" and the relevance of such findings to contemporary social and political problems.

Course-notes are available for downloading from the web-site, or can be purchased from the office, and should (hopefully) be read before the commencement of the course

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BACKGROUND READING

NOTE: The books and articles listed below may be available in the public library system. For some topics, such as human behaviour and evolution, there are many other titles; in general, anything published more than ten years ago can be regarded as out-of-date. (Unfortunately, our public libraries don't consistently run out and buy the very latest publications on these subjects, especially when their existing holdings are big, expensive books.) In addition, the public libraries have a number of informative wildlife DVDs available for loan. *New Scientist* and *Scientific American* sometimes have updates on the latest research and *National Geographic* and *Australian Geographic* occasionally have more popular-style articles. Newspaper accounts of these matters are to be distrusted, but Internet sources are good *if they emanate from a reputable university*. Some Internet sites, such as *PLos* and *The Conversation* are often very good value and always on the cutting edge of their subjects. Always read *critically*!

General:

Tiger, L., & Fox, R., *The Imperial Animal*, 1971.

Orang-utans:

Kaplan, G., & Rogers, L., *Orang-utans in Borneo*, 1994.

Galdikas, B., *Reflections of Eden: my years with the orangutans*, 1995.

Russon, A.E., *Orangutans*, 2000.

Gorillas:

Cousins, D., *The Magnificent Gorilla*, 1990.

Chimpanzees:

Goodall, J., *The Chimpanzees of Gombe; patterns of behaviour*, 1986.

Scientific American, June, 1985, p. 102.

National Geographic, December, 1995.

Bonobos:

DeWaal, F., & Lanting, F., *The Forgotten Ape*.

National Geographic, March, 1992, p. 46.

Scientific American, March, 1995, p. 82.

Human Evolution:

Stringer, Chris, *The Origin of Our Species*, 2012

Shreeve, J., *The Neanderthal Enigma*, 1995.

Pitts, M., & Roberts, M., *Fairweather Eden*, 1997.

Foley, R., *Humans Before Humanity*, 1997.

Palmer, D., *Neanderthal*, 2000.

Sykes, B., *The Seven Daughters of Eve*, 2001.

Mallory, J.P., *The Tarim Mummies: Ancient China and the Mystery of the Earliest Peoples From the West*, Thames & Hudson, London, 2000.

Barber, E.W., *The Mummies of Ürümchi*, London, MacMillan, 1999.

Papagianni, D., & Morse, M.A., *The Neanderthals Rediscovered*, Thames & Hudson, London, 2013

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INTRODUCTION

Generally, political thinkers have based their ideas on particular views of human nature. Plato felt that humans were rational: that, having been shown, by means of logical argument, that something is good, or true, a person will act accordingly; this view of human nature was perhaps a little over-optimistic. Aristotle claimed that man is, by nature, an animal which lives in a political community: that is, that the humankind is a social animal, not to be understood by reference to the individual person. St. Augustine of Hippo seems to have felt that humans were, naturally, criminally insane, a state from which they could only be saved by Christianity: this view of human nature is perhaps a little over-pessimistic. There are two prominent strands in Liberal thought about human nature, one which assumes that humans are naturally good but often corrupted by unsatisfactory social systems, the other denies the existence of a "human nature", asserting that a new-born child is a *tabula rasa*, a blank slate on which anything may be written: both of these ideas deny the importance of hereditary in accounting for aspects of human behaviour, both of these ideas view humans as autonomous individuals rather than social beings, both are based upon an acceptance of the Judæo-Christian creation myth, and both, therefore, like all the ideologies emanating from Christian Europe, because they draw on the claim to universality of Christianity, claim to have universal applicability to all human societies. A more Conservative view would have it that children are wild animals at birth, and need to be "tamed" by their upbringing in order to become acceptable members of society: as with animals, breeding (that is, hereditary) is considered to be very important.

Before the mid-nineteenth century, a number of theories of evolution had been promulgated to explain the variation in life on earth, but had failed to satisfy the condition of providing a convincing mechanism for evolution to occur. Charles Darwin was able to demonstrate that the range of individual variation in the offspring of sexual reproduction was such a mechanism, and evolution was shown to be no mere theory, but a fact. All other things being equal, from the range of variations in type produced by a population, some will survive long enough to reproduce themselves in further generations, whilst those individuals best adapted to current conditions will produce more offspring which survive to reproduce than less-well-adapted individuals. Darwin's *Origin of the Species* implied that humans were descended (or had ascended) from animals by means of a mechanism described (not by Darwin) as the

"survival of the fittest", a notion that, whilst being well in accord with the prevailing liberal-capitalist ideology of competition, served to distance people from the biological world. However, Darwin's "fittest" is a strictly biological term which refers to success in breeding, in passing one's genetic material along to successive generations. The inane perversion of this concept to apply to individual socio-economic success is called "Social Darwinism", and is one of the reasons why evolutionary science is generally held in disfavour by social scientists: the Social Darwinists failed to appreciate that, in evolutionary terms, the poverty-stricken uneducated "masses" were obviously more successful than the wealthy and educated minority. The Social-Darwinian view of human nature was one of competitive individualism, and was to serve as a justification for the excesses of nineteenth-century and later capitalism, and as a justification of racist views which placed north-western Europeans at the summit of creation and far removed from animality. An important point, often overlooked in discussions of evolution, was (and is) that behaviour is subject to the same evolutionary pressures as physical form.

All these views, separately or in combination, underpin the moral attitudes which inform our legal systems and influence the outcomes of debates on public policy and other political matters. The various political ideologies are based on one view or another of human nature. Research into "the nature of human nature" is ongoing, and new data is published almost on a daily basis.

Throughout this century psychologists and medical researchers have used animals in their investigations, on the premise that the so-called "simpler organisms" might provide clues as to the mental and physical processes of humans. In the wake of World War II, Konrad Lorenz, a German ethologist, asserted that aggression was a primary and fundamental facet of human nature which needed to be controlled if the human species was not to destroy itself, an idea that gained wide currency.

Commentators (mostly male at this time), representing a wide variety of viewpoints and disciplines, focused on the presence in the animal world of the recurrent phenomena of territoriality and apparent male dominance and their connection with sexuality in order to reach an understanding of human behaviour; like Social Darwinism, these studies tended to justify right-wing and authoritarian political notions about human nature and society, and generally further alienated social scientists from taking evolutionary studies seriously. Many

of these commentators projected an ethnocentric view of human nature, based on what they perceived to be the norms of their own societies, onto the animals which they studied as well as humanity as a whole, a procedure which has resulted in some laughable errors.

Louis Leaky, whose palæontological work had begun to turn up the remains of early hominids, conceived the idea of conducting field studies of the upper primates in order to derive clues about the behaviour of early man. It had been well-understood for some time that the closest biological relatives to humans were the Orang-utan, the Gorilla, and the Chimpanzee. In the early 1960's Jane Goodall began her study of the Common Chimpanzee (*Pan troglodytes*) in Tanzania, followed a few years later by the start of Dianne Fossey's study of the Mountain Gorilla (*Gorilla gorilla*) in Rwanda and, in the early '70's, by Birut Galdikas' work on the Orang-utan (*Pongo pygmaeus*) in Borneo. These studies, amongst others, have contributed immensely to our knowledge of the upper primates and offered some challenging perspectives on human nature.

In 1967, Desmond Morris, an ethologist with a sound research record, published his *The Naked Ape*, a popular work which purported to examine the evolution of the behaviour of the human animal by the same methodology as was used to study other animals. Probably the most important point Morris made was that humans had not merely descended (or ascended) from animals at all: humans *are* animals, and as such cannot escape their biological nature. During the so-called "sexual revolution" of the late '60's, Morris' contention that humans are the most sexually-oriented of primates generated a great deal of confused response: conservatives attacked his intellectual credentials and challenged his data; feminists attacked his male-centred view of both human evolution and human sexual behaviour; advocates of sexual freedom sought justification for their views in Morris's work; and many scholars decried his approach as "unscientific", particularly with respect to their own, presumably more "scientific", disciplines. Regardless of the correctness or otherwise of Morris' views, a shift in focus had taken place: humans were now seated firmly in the animal world, rather than separated off in a different category.

Our sense of identity as humans, as distinct from other animals, has come increasingly under pressure as various studies have decreased the differences, physical, behavioural, and mental, between humans and other animals. The discovery of the fossil remains of creatures even more anatomically-closely-related to ourselves than the living upper primates raises the

questions of *other* kinds of human, and, “what is a ‘human’?”. Blood serum and DNA analyses have concluded that we share 96% of our genetic structure with the Orang-utan, 97% with the Gorilla, 98% with the Common Chimpanzee, and 98.5% with the Bonobo, or Pygmy Chimpanzee (*Pan paniscus*) - at least - some results put the relationships even closer. Recent DNA work has indicated that our own species only evolved some 120,000 years ago. Can we regard the Neandertals and other hominids as "human"?

Physical and behavioural studies of the upper primates, including humans, continue both in the field and under controlled conditions, and new results and perspectives are constantly before us. For example, studies into human twins over the 20th century have revealed that the greater part of our psychological makeup is inherited: how that psychology is expressed is heavily influenced by environmental factors. It is improbable that there can be more than temporary conclusions reached on the subjects that the course will scrutinize.

Amongst the problems which face students of "natural" behaviour is the question of behavioural modification resulting from environmental change. At its most extreme, this factor may be seen in zoo animals which often exhibit behavioural elaborations never observed in the wild. Human modification of the wild environment, for example, by land clearance for agriculture or road-building, affects the modification of the behaviours of animals in the wild, as does the presence of observers in the field. However, the results of long-term field studies of animals in the wild give us the surest view of the essentials of their natural behaviour, their "nature".

The behavioural elaborations often exhibited by animals which have been domesticated or confined to zoos, that is, have had their social environments drastically modified by humans, may give us other clues.

This course will look, in a general way, at the social behaviour of the Orang-utan, the Gorilla, the Common Chimpanzee, and the Bonobo, as revealed by field studies, in order to point out the behavioural attributes which appear to be common to the human family. A brief survey of human evolution will follow, highlighting aspects which appear to throw some light on social behaviour. The course will conclude with some observations on modern human society and some questions about "human nature".

THE ORANG-UTAN

The Orang-utan is one of the least understood of the upper primates. This is partly because of the inaccessibility of its environment, and partly because of its highly arboreal existence within that environment. The Orang-utan lives in the primary rainforests of Borneo and Sumatra, estimated to be the world's oldest rainforests. Close proximity to the Equator means that the terrain is usually sodden, ranging from swamps at low altitudes to slippery, rugged hillsides at higher altitudes. To these difficulties for the human observer is added the dense vegetation and the fact that the Orang-utans spend most of their time quite high in the canopy, factors which make observation difficult even when the animals are in close proximity. Adjusting to the high ambient temperatures and humidity is a further problem for European researchers. Further, the basic food-supply of the Orang-utan is scattered throughout the forest; the difficulty of following the animals in order to observe their daily round cannot be exaggerated. Orang-utans being highly solitary, the social interactions that can be observed are few, although the Sumatran species appears to be more gregarious than the Bornean species. Funding for research which yields a very low return over very long periods is hard to come by. Human impact on the environment, from tourism, logging, the encroachment of agricultural cultivation, hunting and the elimination of major predators, as well as the circumstance of being observed by researchers, affects Orang-utan behaviour in various ways.

There are two species of Orang -utan, the Sumatran (*Pongo abelii*) and the Bornean (*Pongo pygmaeus*). The Bornean species consists of three distinct populations which have subspecific status. DNA research indicates that Orang-utans are the least closely related to humans of the upper primates, having become separated from the hominid evolutionary line about 11 million years ago. However, humans share a number of physical and behavioural features with the Orang-utan (the way in which tooth enamel is laid down, for instance) which they do not share with the apparently more closely related Gorilla, Chimpanzee, and Bonobo. The specialists who are engaged in DNA research tell us that the Orang-utan has evolved more slowly than the African apes [including us] and are not all in agreement with each other on the relationships between the various populations of Orang-utans.

Orang-utans are the most solitary of the upper primates, having evolved to exist in the resource-poor equatorial forest, which cannot support numbers of large mammals in close proximity. This factor underlines a basic truism of ecology: the most serious competitor of

any individual is another member of its own species, which has exactly the same basic requirements. Sumatran Orang-utans are a little more gregarious than their Bornean equivalents, possibly due to less-dispersed food sources. Female Orang-utans appear to have smaller ranges than males, and may come together to feed when a fruit tree, especially their favourite Durian sp., is bearing. Male ranges include the ranges of a number of females. Orang-utans are omnivorous, and include a large amount of animal protein in their diet, especially in the form of insects; bird and turtle eggs are taken and the capture and consumption of animals has been occasionally observed. There are some indications that, in the absence of disturbance by humans or other large predators such as tigers, Orang-utans may be less arboreal; even nests have been occasionally discovered at ground level.

The male Orang-utan bears the generally-accepted hallmarks of a polygynous animal: a body-weight 50% greater than the females and extremely small testicles. Orang-utans lead essentially solitary lives, and mature males do not tolerate the close physical presence of other mature or adolescent males. One sign of male maturity is the growth of the distinctive facial flanges. The “long calls” of the flanged males allow them to space themselves out in the forest and avoid the close physical presence of other males, which often results in violent conflict; experienced males do not, if possible, risk injury and probable death by fighting. The “long calls” are also thought to suppress the physical size and the development of flanges in resident young males. Orang-utans do not appear to be territorial animals: rather, they range through a section of forest as they feed, and their individual ranges crisscross and overlap. The periodic disappearance of males from study areas for long periods suggests that they may be migratory, having more than one ranging-area. When a resident mature (flanged) male disappears from its range or dies, one of the young males will very rapidly increase in size and develop the typical facial flanges of a dominant male.

The focus of Orang-utan society is the female. A study area may contain a number of females with overlapping, or crisscrossing, ranges; these animals may, occasionally, congregate to feed in a particularly fruitful tree amicably enough, although some signs of a dominance hierarchy have been observed: a refusal to tolerate the close proximity of a particular individual by a more dominant individual. The young are typically finally weaned shortly before the birth of the next infant, at about 6 or 7 years of age. Increasing independence sees the adolescents coping with life on their own within a few months. This period of adolescence is the only time in an Orang-utan's life when some sociability is

evidenced, when they may travel and feed together in small groups. The long period of the dependency of the young on their mothers means that a female may give birth only three or four times in her life-time of perhaps 40 years.

Females appear to be generally "faithful" to a particular male, who may have a number of consorts. As the females generally hide upon the approach of a male, and because of their lighter build they can generally escape to the upper canopy where the much larger males cannot follow, mating only takes place when she is willing. A consortship lasts for up to a few weeks, sometimes longer; there are no external signs of œstrous; copulation is face-to-face in a variety of positions and takes between 5 minutes and half-an-hour, similarly to humans and in contrast with the majority of other primates. Females typically utter loud characteristic screams during intercourse. Rape-attacks by groups of young males on adult females have been frequently reported; females emit a characteristic grunting sound at these times. It has been asserted that about half of Orang-utan pregnancies result from these rape-interactions, but this may well be a function of the observations having taken place in captive-rehabilitation areas, where the normal distribution of age-sex ratios is distorted. The sexual and parturition cycles are similar to those of humans.

Apart from the building of nests and rain-shelters, Orang-utans were not known to make and use tools in the wild until recent research was published, yet in captivity their mechanical ability exceeds that of the other apes, and the sheer speed with which they learn is notorious. This learning-speed has been connected with their solitary existence. A young Orang-utan may have one opportunity, and one only, to learn some particular thing before becoming independent of its mother at the age of about seven years. The forest trees which provide an important proportion of the Orang-utan's diet fruit irregularly rather than seasonally, and do not always produce heavily; a young Orang-utan may only have one or two opportunities to learn the location of a particular food-source. When food-tree is bearing a heavy crop, the Orang-utans whose ranges include that particular tree will congregate there to feed; it is only on these very rare occasions that an infant will meet the other members of its community and observe, learn from, and take part in the social relationships between individuals. A young Orang-utan will only observe sexual behaviour during its mother's consortship during which she conceives the offspring which will supplant the young adolescent. Childbirth and subsequent infant-care are, again, observed only briefly before the adolescent becomes independent.

As the young adolescents become independent of their mothers they increasingly travel alone or in small groups which may be of mixed sex. There is little sexual activity between adolescents. One observation revealed a young female being raped by her male traveling companion; despite her obvious distress at the time, her subsequent behaviour towards the young male appeared to be unchanged. When adolescent females evidence sexual interest, it is in the fully-matured males, whom they actively solicit; the females' immaturity under these circumstances is shown by their display of the characteristic juvenile "play face" during intercourse rather than adult behaviour.

It is risky to draw conclusions from such scanty data, but we can construct a much generalized model of Orang-utan society which encompasses the known facts, subject to modification as more details become available. Orang-utan society appears to be based on the typically mammalian related-female group: in the Orang-utan the individuals in the group commonly have an extreme spatial dispersion. Due to the long-term bond between a female and a particular male, the male does not have to exercise constant supervision over his widely-dispersed harem, and years may elapse between consortships; it is entirely possible that a mature male may maintain more than one harem. Adolescent females remain in the general area of their natal group and eventually replace the previous generation. Adolescent males are pushed to the periphery of the group and lead a precarious existence until they are sufficiently mature to replace an older male in his range, usually not within the natal area. Incest is unlikely. Logging of the rainforest and the rehabilitation of captive and orphaned animals to the very circumscribed remnants of the "wild" has resulted in gross overcrowding in some areas, especially of mature males, and some distortion of Orang-utan behaviour in consequence.

THE GORILLA

There are currently recognised two species of Gorilla, each with two subspecies: the Mountain Gorilla (*Gorilla beringei beringei*) which lives on the slopes of the Virunga volcanoes in the conjunction of Rwanda, Uganda, and the Congo, the Bwindi population may soon be classified as a separate subspecies, the Eastern Lowland Gorilla (*Gorilla beringei graueri*), the Western Lowland Gorilla (*Gorilla gorilla gorilla*) which lives in the western Congo Basin, the Cross River Gorilla (*Gorilla gorilla diehli*) which occupies a fragmented territory on the border of Cameroon and Nigeria. In addition, a little-known population in the Ebo Forest of Cameroon may be a separate subspecies, perhaps a new species. It is entirely

likely that DNA analysis will show the existence of more species or subspecies than are presently recognized. The Virunga gorillas have been the most closely studied population, but they have been so reduced in numbers, and their environment has been so degraded and circumscribed by human encroachment that they are grossly overcrowded; the physical signs of inbreeding are common; it is doubtful whether their behaviour can be accepted as "natural" in any meaningful sense. Some of the larger concentrations of Lowland Gorillas appear to be a response to human activity on the environment and may therefore also be untypical. As there are still large areas of tropical rainforest sparsely-inhabited by humans in Africa, it is possible that some Gorillas exist outside the currently-accepted range, and even that there are other species/subspecies yet to be described. Large populations of Gorillas have recently been found to exist in the Congo Basin in areas infrequently traversed by humans: in contrast to previously-observed behaviour, numbers of family groups have been observed here to congregate peaceably in particular feeding-areas.

DNA research indicates that the Gorilla became separated from the direct hominid line only about 5-to-6 million years ago. This very close biological relationship - evidenced by the fact that gorillas are subject to nearly all the diseases that affect humans - has raised questions about the relevance of Gorilla behaviour to the study of human behaviour. The obvious gross physical differences between Gorillas and humans hide a very close behavioural relationship. Some sections of Gorilla DNA have been reported to be more similar to the equivalent parts of human DNA than either are to the corresponding parts of Chimpanzee DNA.

The lowland subspecies live in rainforest environments superficially similar to that of the Orang-utan, creating the same difficulties for researchers. The African rainforests which are the habitat of the Lowland Gorillas differ in one important aspect from the Indonesian rainforests where the Orang-utans live: the most productive fruit-bearing plants are not primary rainforest giants, but the result of secondary growth. Secondary growth occurs when a giant rainforest tree dies and crashes to the ground, bringing other trees with it and tearing a hole in the forest canopy, admitting direct sunlight to the forest floor and permitting the growth of light-hungry plants. Similar vegetation is found on the banks of waterways and the verges of wetlands. Secondary growth also occurs as a result of human activity in the felling trees. The concentration of Gorillas in large groups is often co-incident with, and a result of, human attacks on the forest. Recently wetlands have been shown to be important feeding grounds simultaneously used by numbers of family groups.

In the primary rainforest Gorillas range in very small groups, consisting of a mature male, one or two females - rarely more - and their offspring, and often an attendant younger male. The small size of these typical groups is, like the solitariness of the Orang-utan, a function of the poverty of food-resources for large animals in the equatorial forest. Gorilla groups can however, number (very rarely) as many as fifty individuals. All-male groups have been observed. Recently it has been discovered that quite large concentrations of Gorillas can congregate around productive food-sources. Gorillas are largely ground dwellers, although even the largest males are excellent climbers at need. Gorillas will enter open ground to utilize a particular food-source, but generally prefer to remain in thick cover; there are indications that Gorillas are less shy of open spaces in areas devoid of human habitation. Nests are usually constructed at or near ground level. Gorillas are omnivorous and, like the Orang-utan, include a large amount of animal protein, mainly in the form of insects and birds' eggs, in their diet. Vegetable food includes a high proportion of succulent leaves and stems.

The male Gorilla is approximately the same height as the male Orang-utan, at about 5'6"-5'8" and similarly, bears the generally-accepted hallmarks of a polygynous animal: a body-weight 50% greater than the females and extremely small (smaller even than in the Orang-utan) testicles. Males do not have to reach full maturity to be sexually active, and males as young as six years have been known to sire offspring. On reaching full maturity, usually at twelve-to-fifteen-years of age, Gorilla males develop a distinctive saddle of silver hair and are known as silverbacks. Silverbacks defend their territories and harems against other mature males. When Gorilla groups come into contact, the interactions between the silverbacks can range from peacefully ignoring each other's presence, through tension, to outright aggression. The spectacular aggressive displays of the males may result in violent conflict, particularly if one is relatively inexperienced: experienced males use their terrifying displays to avoid coming to blows, a circumstance likely to result in injury and death. Gorillas are particularly vulnerable to stress, and death can result from such an encounter even if physical injuries are not sustained. The silverback may, however, tolerate the presence of a younger male follower - so long as he does not get *too* close - who acts as scout or rearguard for the group. If the sexually-mature females of the group include daughters of the silverback, the follower may be allowed to copulate with them. Such a younger male will not become a silverback until the older male dies or otherwise leaves the group. The physical

presence of a silverback appears to suppress full maturity in young males. The silverback defends his family against external attacks and, if it is necessary to flee danger, the follower will act as rearguard. Silverbacks frequently play gently with their offspring. Unlike the male Orang-utan, the silverback is definitely a family man.

The focus of Gorilla society is the silverback. The death or defeat of the silverback usually results in another male taking over the harem. Some scholars assert that, on acquiring a new harem, a silverback may kill any infants, presumably in order to bring the females into oestrous so that he may father his own offspring, but this infanticide may be a result of the males' heightened tension and stress-levels at the time of taking over a group: offspring that survive the initial disruption of regime-change seem to be tolerated by their "step-fathers". A dominance hierarchy exists, and the offspring of dominant females are generally healthier and more successful than their less-fortunate half-siblings. Gorilla females, unless they are from the same mother, do not generally tolerate the close proximity of other females, and aggressive interactions are not uncommon. Females reach sexual maturity at around age six, but a two-year period of adolescent infertility follows: the first parturition is normally at around age ten. Females solicit sexual attention from the male when they are ready to mate; there are no external signs of oestrous; copulation is from behind, as with the majority of mammals, and very brief. The sexual and parturition cycles are a little shorter than those of humans. Even low-ranking females, when heavily pregnant, have been observed to mount (that is, express dominance over) higher-ranking females and even young males. That is to say, pregnancy confers high status, even to low-ranking females. Rank is expressed by physical proximity to the silverback, and high-ranking females attempt to keep lower-ranking females away from him. Further evidence of the essentially small size of typical Gorilla groups is displayed by the sheer lack of social interaction between individuals within even the large groups: each adult female with her offspring forms a unit which has minimal contact with the others, although the offspring often play together or with the silverback. All-male groups are known, and some same-sex interactions have been observed in such groups; forced sexual intercourse has been observed when a female strays into the orbit of such an all-male group.

Until recent research was published, apart from nest building, Gorillas were not known to make or use tools in the wild, but it is now known that they use sticks to probe hidden surfaces and as walking-sticks. Young adolescents play extensively with their younger

siblings and with each other. Sexual play may be discouraged by the silverback as the young males mature. As they grow older, adolescent males are forced to the periphery of the family by the silverback, and may become a follower or, alternatively, strike out alone or join an all-male group until such time as they fully mature and are able to acquire a harem of their own. An adolescent female will usually stay with the family, unless the silverback is her father and the follower is her full brother; in such a case she will transfer to a lone silverback or another family. Protection from leopards and other predators makes group living, and the company of large males, a necessity. Both males and females have been observed to transfer between groups.

The model for gorilla society therefore approximates to the common mammalian female group: in the Gorilla this group is typically very small, perhaps consisting of only one individual, together with any offspring. Female offspring usually (but not always) remain with the group, whilst adolescent males are usually (but not always) forced out of the group. After some time, usually a considerable period, ranging as a solitary or in a gang with other males, a young male may obtain his own harem. Mature males are, usually, intolerant of other males, so that the Gorilla group is, effectively, a one-male family. The Gorilla appears to be a more adaptable animal than the Orang-utan: where the food supply is adequate, and in areas where suitable environments are restricted, the typical "nuclear" family can swell to large numbers, and environments other than the primary rainforest are exploited.

THE COMMON CHIMPANZEE

There are four recognized subspecies of Common Chimpanzee distributed through the tropics of Central and West Africa in twenty-two countries; work currently being undertaken may result in some subspecies being given full specific status. Unlike the Orang-utan and the Gorilla, which are adapted to the primary rainforest, the Chimpanzee - although also a forest animal - is very adaptable in its habitat use, ranging from the deep forest to more open country and, in some places, even penetrating the savannah. Jane Goodall's pioneering success in mounting the longest-term continuous wild primate study on the Chimpanzees at Gombe has prompted a small number of other studies of wild Chimpanzee behaviour in other parts of Africa, making the wild populations of Common Chimpanzee the best known of the upper primates. Because Chimpanzees are highly social animals with a rich behavioural repertoire, once a group has been habituated to the presence of human observers, the volume of information yielded is very high, compared to Orang-utans or Gorillas, making them more

attractive objects for study and funding for research easier to come by, despite the usual difficulties of observation in the dense forest environment.

DNA research indicates that the Chimpanzee became separated from the direct hominid line about 4.5 million years ago. Its genetic relationship to humans is about the same as its genetic relationship to the Gorilla. The finding that we share 98% (99% by some counts) of our DNA with Chimpanzees raises some obvious problems in the light of the gross physical differences which are obviously apparent. Recent DNA findings claim that there has been some genetic interaction between Common Chimpanzees and Bonobos in the remote past.

The habitat of the Chimpanzee includes savanna, primary forest, the forest fringes and the secondary growth, including areas favoured by the Gorilla: where the two species come into conflict over a food source, the superior numbers, frenetic activity, and volume of noise of the Chimpanzee group usually prevails. Both species utilize much the same plant foods, with the Chimpanzee exploiting a greater range of fruits and a smaller range of the pith of plant stems than the Gorilla, an adaptation which permits them to share the same environment.

Chimpanzees are territorial animals which live in quite large communities of twenty to thirty individuals. The groups disperse into small units to forage for food, coming together to exploit a major food-source and to socialize. This is called a fission-fusion society. When wandering individuals or small groups re-join the main community, great excitement ensues and the individuals must re-establish their position within the group hierarchy. Skill in managing social relationships, in manipulating the social environment, (politics) is rewarded by improved ranking. Rank within the groups' dominance hierarchies is expressed through grooming activity: low-ranking individuals receive the least attention from others; high-ranking individuals hold centre-stage: to put it another way, the individuals that are able to hold centre-stage are high-ranking. Nests are constructed both for resting in the heat of the day and for sleeping at night. Chimpanzees exploit a rather wider range of food-sources than Gorillas; they are omnivorous, eating fruit, nuts and insects, and actively hunt for meat: their prey includes baboons, monkeys, and young antelope and warthog. Unlike other foods, meat is often shared.

In a reversal of the usual mammalian pattern, the basis of Chimpanzee society is the male group. Although females pay little attention to each other, a dominance hierarchy does exist amongst females, and the male offspring of a dominant female is much more likely to achieve

a high position in the male dominance hierarchy than the son of a sub-dominant mother. Females exhibit prominent pink sexual swellings at œstrus; copulation is from behind, as with the majority of mammals, and very brief. The sexual and parturition cycles are a little shorter than those of humans. Chimpanzees are highly promiscuous, and a female in œstrus is likely to be the centre of a frantic "gang-bang": "sex-appeal" is, however, variable, and some females are forced to solicit sexual attention from the males. Sometimes a male succeeds in persuading a female in œstrus (or about to become so) to accompany him to a part of the group's territory which is seldom used for the duration of œstrus: this private sexual interlude is called a "consortship". Also, a female in œstrus may go to "hang-out" close to another group's territory in order to mate with the males of that group. Due to the configuration of the sexual organs, rape is probably impossible, but females "present" in the face of male aggression. Adolescent females wander off and eventually join a new group. Should an adolescent female come into œstrus at this transitional time, and encounter a lone male, they may form a consortship in a brief and rare period of "monogamy".

The male Chimpanzee is considerably smaller at about 5'2" than the Gorilla or Orang-utan male; whilst the male is considerably larger than the female Chimpanzee (about 4'8") sexual dimorphism is considerably less than in the larger apes. The male Chimpanzee possesses extremely large testicles, a hallmark of a promiscuous animal. The male group patrols the group territory, particularly on the boundaries, alert to drive off intruders; stealthy incursions are sometimes made into the territories of other groups; a strong group will sometimes repeatedly enter the territory of a weaker group, hunting down and killing the males one by one, eventually appropriating both the territory and its females.

Hunting for meat is largely a male activity, a fad which can be sparked by a chance capture and gains momentum with success or loses momentum with increasing failure; observers differ in their conclusions about the amount of co-operation involved, with some asserting that a high degree of co-operation takes place, whilst others insist that the hunt is a number of uncoordinated individual attacks. The success-rates for hunts seems to be about 50%-to-85%. The prey, once captured, is torn apart and begging behaviour by unsuccessful individuals results in some food-sharing, the only circumstance in which Chimpanzees share food. Males display by screaming, shaking foliage, breaking off branches and dragging them whilst charging through the group. The alpha male is the male whose displays create the most fear and disruption in the community. These displays are the most overt manifestations of the continual jockeying for status that takes place between males, a process that encompasses a

wide range of complex behaviours. Males may cultivate “friendships” with other males, who may then support them in antagonistic interactions with other males: a valuable “political” resource for the upwardly-mobile individual.

The momentous discovery, by Jane Goodall, of tool-making and tool-use amongst Chimpanzees raised important questions about the distinction between humans and animals: for many years an accepted definition of humanity had been the capacity to make and use tools. It is now clear that Chimpanzees in different areas have what can only be called different cultures, making and using a particular range of tools according to a tradition which is passed down through the generations, largely by the females. Whilst all Chimpanzees build nests (a genetically-programmed behaviour), Ugandan Chimpanzees strip twigs for use in fishing for termites, Cameroon Chimpanzees use hammer-stones and anvils for cracking nuts, and savannah Chimpanzees may strip twigs from branches to manufacture weapons to use against predators. The full importance of the Chimpanzees' ability in the wild to manipulate objects in the environment, as learned, rather than genetically-programmed behaviour, has yet to be fully assessed.

The model for Chimpanzee society is therefore a male group: this group is quite large, consisting of perhaps a dozen related males who share access to the females and the other resources of their territory. Adolescent females leave their families to become part of another group. The females within the community are therefore unrelated and have minimal interaction. The individual members of a Chimpanzee group are bound together by intense social interaction, manifested by long grooming sessions. The Chimpanzee appears to be a more adaptable animal than the Gorilla, inhabiting a wider range of environments, and seems to be predisposed to developing ways in which to manipulate the environment.

THE BONOBO

The Bonobo, once referred to as the "Pygmy Chimpanzee", was discovered from a museum specimen in the late 1920's, when examination of a skull revealed that the specimen was not that of a juvenile Common Chimpanzee, but an adult of a completely different species. The Bonobo is actually well within the normal height-range of the Common Chimpanzee, but is much more lightly built. A possibly rare animal from the Lukuru district of the Democratic Republic of the Congo, it is only recently that the Bonobo has been studied in the wild: much remains to be revealed about its habits, and the interpretation of the results so far gained is the subject of considerable debate. Reports of other possible populations of Bonobos are as yet

unconfirmed. Whereas Gorillas and Chimpanzees are to be found on the northern side of the Congo River basin, Bonobos inhabit the southern side. It was thought until quite recently that the Bonobo was an animal of the deep forest, but it is now known that they utilize a wide range of environments, ranging from swampy forest to upland forest, to areas of regrowth (particularly abandoned plantations), and grassland, in a climate characterized by distinct wet-and-dry seasons. Despite the usual difficulties of observation, the highly social nature of these animals and their rich behavioural repertoire is likely to lead to a very high yield of information when selected communities are sufficiently habituated to the presence of human observers, although they have so far proved to be much shyer of humans than Chimpanzees, largely (perhaps) because they are hunted for “bush meat”. Reports on Bonobo behaviour emanating from studies of a zoo population in Germany during the 1950's were cloaked in Latin terminology, besides being written in German, and received little international attention. The first reports of Bonobo behaviour in the wild were initially greeted with a scepticism which asserted that these activities (if at all true!) must apply only to an aberrant and atypical isolated group; it was some time before there was any general acceptance that the Bonobo behaviours were characteristic of the species.

DNA research indicates that the ancestral stock which evolved into the Common Chimpanzee and Bonobo diverged from the direct hominid line about 4.5 million years ago, whilst the Bonobo and Chimpanzee lines separated some 2 million years ago. DNA research has recently indicated that there has been some genetic interaction between Bonobos and Common Chimpanzees in the remote past. The finding that we share 98.5% (99.5% by some counts) of our genetic makeup with the Bonobo makes this animal our closest biological relative.

The Bonobos live in Equatorial Africa to the south of the Congo River complex of waterways, (Gorillas and Chimpanzees are found to the north of this river system) and exploit a wide variety of environments in search of a range of plant foods which embraces both the fruits favoured by the Common Chimpanzee and the pith of plant stems favoured by the Gorilla.

It does not seem to be clear if the Bonobo is a territorial animal, but it is known to live in surprisingly large communities of up to 100 individuals. The fission-fusion society of the Bonobo communities disperses into smaller groups to forage for food, coming together to

exploit a major food-source and to socialize, similarly to the Common Chimpanzee. The high levels of tension and feverish excitement which characterize many of the social interactions of the Common Chimpanzee are not nearly so apparent in the more relaxed community of the Bonobo. Bonobo society is hierarchical, with skill in managing social relationships being rewarded by improvement in status. Both day and night nests are constructed, as in the other upper primates. Utilizing a variety of plant foods which is wider than that exploited by either the Gorilla or the Common Chimpanzee, the Bonobo is omnivorous, including insects in its diet; meat is known to be taken, although the systematic hunting behaviour of the Common Chimpanzee has not yet been reported in the Bonobo. Unlike any other upper primate, the Bonobo will share even vegetable foods with its compatriots.

Similarly to the Common Chimpanzee, the basis of Bonobo society is the male group. But unlike the Chimpanzee, the females also form a tightly-bonded group, and unlike any of the other upper primates, the females are generally dominant over the males; males only dominate lower-ranking females: the community is led by an alpha female. Over-aggressive males are disciplined, sometimes to the point of severe injury, by groups of females. Males do not cooperate aggressively against females. As is usual, the male offspring of a high-ranking female is more likely to achieve a high position in the male hierarchy than the son of a sub-dominant mother; in fact, mothers actively support their sons' drive for dominance. Females exhibit prominent pink sexual swellings when they are sexually receptive; the period of receptivity is much longer than in the Common Chimpanzee; copulation can be face-to-face as well as from behind, in a variety of positions. Females are almost continually sexually active and attractive to males, even during lactation. The sexual and parturition cycles are a little shorter than those of humans. Females reach adolescence at about seven years and typically give birth for the first time at about 13 or 14 years of age; they have one infant at intervals of about five or six years and can live for over forty years. Bonobos are highly promiscuous, but there sometimes appears to be a slight preference for a particular reproductive partner. Due to the configuration of the sexual organs, rape is probably impossible. Adolescent females wander off and eventually join another community.

The male Bonobo possesses the large testicles typical of a promiscuous animal, and sexual dimorphism is even less than that of the Common Chimpanzee: males typically weigh seven-or-eight kilograms more than females. Males display in much the same ways as in the Common Chimpanzee, as part of the continual jockeying for status within the hierarchy, but

the violence of the displays is much muted by the activities of the females. Males remain socially dependent on their mothers' support for as long as this is available.

There have been recent reports that Bonobos make and use tools (unspecified) in the wild. One of the distinctive features of Bonobo society is the life-long bonds between females, who are, as incomers to the community, generally unrelated: thus the community consists of a closely-bonded group of related males and a no-less-closely-bonded group of unrelated females; the bonds within the groups and between the groups are established and reinforced by an unusually high variety and frequency of sexual activity. Much of this activity is associated with feeding. On approaching a food-source, females interact sexually with each other, and males interact sexually with each other; the frequency of heterosexual activity is very high after feeding. Food-sharing is often associated with sex, as individuals attempt to give gifts of food to prospective partners or offer sex in exchange for food. Individuals, including infants, exhibiting stress from fear, anxiety, injury, or frustration are likely to be sexually comforted by any available partner of any age or gender. When an adolescent female joins a community, her acceptance into the female group is affirmed by intercourse with the higher-ranking females. Sexual contact frequently includes oral and anal intercourse, amongst other sexual acts. Less it should be thought that Bonobos are hopelessly depraved, it should be pointed out that sexual acts have a usual duration of about 30 seconds, and such activity does not occupy a disproportionate amount of any individual's time. Sexual activity appears to be an extension and intensification of the mutual grooming behaviour of the Common Chimpanzee, and to some extent takes the place of hugging, stroking, and other gestures of comfort, reassurance, and friendship. Because males are not significantly larger than females, any two or three females can defeat a male in conflict situations; females gang-up on disruptive males and by this means enforce harmony within the community. Bonobo communities appear to enjoy peaceful relationships with each other: gatherings of several communities, to a total of two-to-three hundred individuals have been recorded. Bonobos appear to be more sensitive than Common Chimpanzees: during a World War II bombing raid, the population of Bonobos in a German zoo all died of fright, whilst the Common Chimpanzees were apparently unaffected.

The model for Bonobo society is therefore a community containing both a tightly-integrated male group and a tightly-integrated female group; young females are exchanged between communities. Relationships between communities are friendly rather than hostile.

Bonobo communities seem to be able to exploit a wider range of environments than particular Gorilla or Common Chimpanzee groups, and utilize a wider range of food-sources. This factor poses the question: why are they not more common, rather than rarer, than Common Chimpanzees and Gorillas?

HUMAN EVOLUTION

About 4.5 million years ago (various scholars give dates that can differ by several millions of years) geological forces in Africa opened up the Rift Valley and split the upper primate population: Gorillas, Common Chimpanzees and Bonobos evolved to the west of the Rift, in the wet forests, and hominids, including the ancestors of modern humans, evolved to the east, which climate-change began to dry out. Probably the ranges of early hominids were concentrated on the remaining woodland areas, along watercourses and lake edges and the seacoast, ranging out into open country when necessary. Perhaps the addition of roots to the diet, following the example of Baboons, facilitated this adaptation to the new environment. These australopithecines, comprising a number of species dated to up to 4.1 million years ago, were usually quite small animals, about three-to-four feet tall. Whereas Orang-utans, Gorillas, Common Chimpanzees and Bonobos can all maintain, and walk in, an upright position (the Bonobo most frequently) they are basically quadrupedal animals: skeletal remains demonstrate that the australopithecines were bipedal, possibly an adaptation to long-distance travel in open country, although their bone-structure betrays a continuing reliance on the ability to climb trees. Fossil footprints indicate that they lacked the free stride of the modern human. The brain of the australopithecines was slightly larger than that of a Chimpanzee, which is itself about half the size of the brain of a one-year-old human child.

By 2 million years ago, a large number of hominid forms had evolved: amongst them was *Homo habilis*, the earliest known member of the genus *Homo* (although some scholars deny this genetic affiliation). These early hominids still possessed the long arms of a tree-climbing animal and exhibited reduced sexual dimorphism. *Homo habilis* possessed a brain which was nearly double the size of that of the early australopithecines and made stone tools. Whilst modern upper primates in captivity have been taught to make stone tools, it has been asserted that these productions lack the sophistication of even the crude early *habilis* tools (called Oldowan) which are said to demonstrate a visualization of the finished product before the stone was worked. And the stone from which the tools were made had been carried to the find-site from as much as 9 miles away. These stone tools were used to cut up meat, often

from large animals; it is not clear whether the meat was hunted or scavenged, but probably both strategies were employed to supplement a diet heavily biased towards fruit and roots. Meat is a very efficient food-source, with a much higher nourishment/weight ratio than vegetable foods, and the African savannahs produce a lot of meat. The manufacture and use of stone tools is a hominid adaptation to an increase in the proportion of meat in the diet. The social organization of *Homo habilis* is not known.

Homo erectus is believed to have evolved from *Homo habilis*. By about 1.6 million years ago, *erectus* had discovered the use of fire and had moved out of Africa and was to be found throughout Eurasia. Some scholars now assert that the original African population is a distinct species which they designate *Homo ergastus*, and that *Homo erectus* evolved subsequent to the migration out of Africa. Climate-change had turned the deserts of North Africa into grasslands, and *erectus* followed its major food source, the great herds of grazing animals, as they followed the grass into Eurasia. Meat had now become the primary food-source of *erectus*, as it takes several generations to learn the culinary possibilities of a new botanical ecology: it is simpler to eat the plant-eaters than to risk poisoning by eating unknown plants. Cooking is a process which effectively partially pre-digests food, permitting the ingestion of much more nourishment than is the case with uncooked food, as well as eliminating many toxins and parasites and thus increasing the range of possible food-sources. The change from *habilis* to *ergastus* and then to *erectus* was accompanied by an increase in brain-size (to 1,000 c.c. and over), a further reduction in sexual dimorphism, an increase in height to the height-range of modern humans, and improved adaptations to bipedalism. Meat-eating seems to have become increasingly important, and some skeletal remains reveal dietary imbalance problems caused by an over-reliance on meat or particular parts of carcasses.

The distinctive stone-tool-kit of the African and European *erectus* populations is called Acheulian whilst, in East Asia, choppers were used in a distribution which coincides with the natural distribution of bamboo; presumably many tools were made of perishable materials of this kind. These standardized tool-kits persisted until c. 160,000 years ago (for roughly 1½ million years). Early studies on the Acheulian tool-kit assumed that the cruder forms were the precursors of the finely-finished "hand-axes" which appear to have been mainly used for butchering meat. New research into the geological contexts of the finds has indicated that many of the crude specimens are of later date than the fine-quality examples, suggesting that

they were manufactured by peripheral populations which had no access to good quality stone. Acheulian tools are found in great abundance, and appear to have been used only once before being discarded. Wooden spears dating from about 500,000 years ago have been found. A picture emerges of a hominid hunter adapted to environments which contained suitable stone for tool-making, with the actual manufacture of these standardized tools being an evolved behaviour which was a part of the meat-eating sequence of behaviours, or perhaps such an important part of social interaction that they were made afresh on each occasion that they were required.

Homo heidelbergensis evolved, presumably from *H. erectus* populations, and appears to have been distributed widely in both Europe and North Africa, on both sides of the Mediterranean. *Homo (sapiens) neanderthalensis* had evolved in Europe by 115,000 years ago, presumably from *Homo heidelbergensis* populations which had evolved from *H. erectus*, and was extremely powerfully-built with adaptations to the cold of the recurring glaciations. Physically the Neandertals were distinguished by massive bones, large faces, and a brain larger than that of modern humans. The more extremely adapted populations are those from North-Western Europe, with more gracile populations being found in the warmer Middle East. Recent DNA work indicates that the Neandertal line separated from the modern human line about 600,000 years ago. The Neandertal tool-kit is called "Mousterian" and, while the stone sometimes originates up to 60 miles from where the tools were found, most was obtained within a distance of 12 miles, indicating a fairly localized existence. Neanderthals utilized rock shelters and caves for habitation sites: it has been suggested that the shelters themselves were occupied by the females and infants, whilst an outer, occasionally-occupied zone was used by the males. The small number of large animal bones found at such occupation sites may indicate that the male hunters rarely brought back the kill to the females and offspring, who appear to have suffered from chronic malnutrition. On the other hand, meat may have been boned before being taken to the living-site, or the female group may have travelled to kill-sites to eat. Alternatively, the females and infants may have travelled to the kill-sites and eaten what was left there when the males had finished. Neandertal skeletons, despite their robustness, show signs of multiple injuries, indicating a high-stress lifestyle: life-spans appear to have been short, into the early forties. They sometimes buried their dead, indicating a new kind of hominid cultural dimension. It is not known whether they were capable of speech. Some interbreeding between Neandertals and modern humans is now known (from DNA) to have taken place, but not much: indicating that they differed greatly

from modern humans either in appearance or behaviourally or both: alternatively or as well, most offspring may have been infertile. The Neandertal DNA which survives in modern humans is very fragmentary, and the fragments differ over the various samplings. There does appear to have been some non-antagonistic contact: early modern humans in the Near East used the same tool-kit as their Neandertal neighbours, and late Neandertal artefacts appear to be attempts to copy the productions of modern humans, indicating that there may have been some peaceful association between modern humans and Neandertals.

The period between 2 million and 100,000 years ago in Africa was a time of considerable climatic fluctuation. It is thought that the *erectus* and, later, *heidelbergensis* populations were many times alternatively isolated, perhaps for many generations, and brought back into contact where gene-flow was possible, resulting in a wide range of genetic variation and the evolution of modern humans. Many populations, perhaps most, were wiped out, leaving human evolution to proceed from the surviving remnants. Some specialists in human evolution assert that *erectus* populations throughout Africa and Eurasia evolved into modern humans more-or-less simultaneously, giving us the early-modern distribution of “races”, with enough gene-flow between regions to prevent speciation; these specialists support their contentions with reference to skeletal characteristics which they say show gradual evolution from *erectus* to modern humans: this is called the "candelabra theory". Against this view, the DNA specialists claimed, until 2011, that their findings show that modern humans evolved in Africa quite recently and spread throughout the globe, replacing all *erectus* and *erectus*-derived populations without hybridization: similarities between pre-modern and modern skeletal characteristics can be put down to the action of the environment effecting the evolution of essentially similar animals. Today, however, some small interbreeding with “other” human groups has been accepted to have taken place: the Denisovans (from the Altai mountains in Western Mongolia) and at least one other (unknown) group are now thought to have joined the Neandertals in contributing (slightly) to modern human DNA from outside Africa.

The very small admixture of Neandertal DNA found in the modern human genome is apparently very fragmented, with some modern individuals having inherited some bits of Neandertal DNA whilst others have inherited quite different fragments of Neandertal DNA. This circumstance is a very good indicator that Neandertals were a different species to modern humans, and that the resulting hybrids were, initially, infertile or only partially fertile with modern humans. Male hybrids, we are told, were infertile according to current analyses.

In an interesting, and yet to be explained, separate issue, a group of hominids excavated from a Spanish site, dating from well before the advent of modern humans, has been shown to be closely related to, if not the same as, the Denisovans.

Modern humans outside Africa are claimed to have very close genetic similarities, whilst Africa contains the most genetically diverse human populations, indicating that only a very small population made the initial crossing into Eurasia. DNA research indicates that modern humans evolved a mere 220,000-120,000 years ago, a factor which is calling the validity of DNA findings into question: many scholars assume that the necessary evolutionary changes would have taken considerably longer. Amongst the physical marks of the modern human are the presence of a chin, the shape of the cranium, and leg bones adapted for a striding walk over long distances. Despite the reconstructions frequently illustrated in texts, we have little idea of the physical appearance of pre-modern hominids: such details as body-hair and the shape and size of purely fleshy body-parts such as buttocks, penises and breasts are unknown. Some scientists doubt whether the term "human" can be legitimately applied to populations of pre-modern hominids, a proposition which leads back to the perennial question of how to define "human".

The earliest fully-modern human remains have been discovered at the Klasies River Mouth on the very tip of southern Africa and have been dated to between 105,000 and 90,000 B.P. where the people subsisted on shellfish, seals and eland, but not fish; some of the stone tools are very elegant and quite unique in design. Other finds in Palestine are dated to 100,000 B.P., where the people apparently co-existed with Neanderthals and used the same tool-kit. A startling find at Katanda, in north-east Zaire, revealed bone tools and harpoons, otherwise unknown before the full recent glacial period of around 26,000 B.P., which are dated to 82,000 B.P.: these tools indicate an increased reliance on fish in the diet at this place. The most recent glacial period began at about this time, an environmental change which lowered temperatures, built glaciers, and dropped sea-levels on a world-wide scale, a situation which was exacerbated by the eruption of the volcano Toba on Sumatra in 75,000 B.P., which precipitated a "volcanic winter" that lasted for some six-to-ten years, with a cooling period of perhaps a thousand years. Some of the DNA specialists suggest that as a result the modern human population dropped to less than 10,000 breeding individuals worldwide. This catastrophe may well have been the catalyst for the future extinction of the Neanderthals. Howieson's Poort, in South Africa, was the home of fully-modern humans (with chins) who used imported stone to make a range of "upper Palaeolithic" tools and may have practiced

fire-farming at around 70,000 B.P. Trends in human adaptation appear to have paid off in evolutionary terms by 60,000 B.P. in Eurasia, when DNA work indicates that substantial population increases were followed by a creative explosion in technology: in the frozen environment, where only small groups could survive within a given area, and a bad season could mean extinction, co-operative interaction with other groups over a wide geographic area enhanced the survival success of groups. Without the cold-adaptations of the Neanderthal, these early-modern peoples responded to the environmental question with a social answer, rather than physical evolution. The technology of clothing-production – tailoring - and other cold-climate equipment was also crucial. And whereas the Neandertals appear to have been confined to small territories of about 12 miles in radius whilst subsisting on localized game, the free-striding early-modern peoples ranged widely to exploit the great migratory herds. It has been suggested that the Neandertals were adapted to close-quarters ambush-hunting in cover, whilst modern humans were adapted to the forest-free environment which had become the norm as increasing quantities of the world's water was locked-up in the polar ice-caps. Bone analysis suggests that modern humans exploited a much wider range of foods than Neandertals. Gene-flow over wide geographic areas would have been promoted by the modern human's mobility. Stone for tool-making was carried for hundreds of miles. The world-wide extinction of much of the mega-fauna is also believed to have begun at around this period, and may have been, at least partly, a consequence of human activity. This adaptability in the face of very marginal cold-climate conditions is in contrast to the Neanderthal's restriction to comparatively "warm" pockets of sheltered places within cold-climate zones and the restricted range of Neandertal groups. Co-operation between groups of modern humans was selective, not universal: the use by one Balkans community of stone which originated 300 miles away when there was perfectly good stone available locally is explained by the suggestion that another, hostile, group controlled the local resource. By 43,000 B.P., the dominant stone-tool industry is called Aurinacian; it is certain that by this time the shapes, or styles, of things such as tools had become important: such factors transmit important social messages to strangers. It is hypothesized that by this period language had become increasingly complex, the concept of time had been recognized, and ritual had begun to develop. Falling sea-levels enhanced migratory opportunities, and the current consensus about the earliest human occupation of Australia is c. 50,000 B.P. Sites in Czechoslovakia have revealed an apparent commitment of resources to spiritual matters: kilns were built, and figurines - carefully manufactured so that they would explode on being heated - were baked

in them, and this at about 26,000 B.P., perhaps 16,000 years before the first known use of pottery for making vessels; the purpose of this, almost certainly ritual, behaviour is conjectural. The European glacial maximum occurred between 25,000 and 18,000 years ago: outside the tropics the human population was compressed by the fierce cold into southern France and Spain and isolated from the populations of the Central Asian steppes; societies in Europe appear to have become more closed, to have turned to more consistently-reliable food-sources such as fish - especially salmon - against large mammals and to have asserted their spiritual life with cave art. It is at this time, or a little later, that humans entered the Americas.

The retreat of the glaciers engendered far-reaching climatic change, and the desiccation of the Near East caused widespread deforestation, resulting in the spread of erstwhile forest grasses such as wheat in the now-open country. As populations grew, and the numbers of human groups swelled, the proportion of vegetable foods in human diets began to increase, and the stage was set for the development of agriculture and the rise of civilization.

Modern humans exhibit the least sexual dimorphism by size of any of the upper primates, males being only 3% larger than females within most populations. Although the testicles are a little small, this factor is not sufficiently pronounced to lead to the conclusion that human males are polygamous, in the sense that Orang-utans and Gorillas have harems. On the other hand, the penis is proportionately very large - an average length of 6" against 1" in the Orang-utan and Gorilla and 3" in the Chimpanzee - a circumstance that, having no primate parallels, cannot be used as a basis to assume any particular norms of sexual behaviour. A possible hypothesis might assert heightened male dependence on ready access to females. A more recent study has posited the influence of female choice. Males in some populations may possess facial and body hair, and baldness on the head commonly accompanies maturity. Females are more different in appearance from the males than is usual in mammals generally. Subcutaneous fat (unknown in other primates) is present in both sexes, but to a much greater extent in females. Wide hips (which may be partially an evolutionary adaptation to reconcile the demands of parturition with bipedalism), enlarged buttocks, and breasts, give the sexually-mature human female an appearance which is startlingly different from the appearance of males. Neither sex looks very like our assumptions about the appearance of our early ancestors, which probably looked like miniature, upright Bonobos.

HUMAN NATURE

Ignoring the solitary nature of the Orang-utan, the model of Orang-utan society, where a group of competitive females live in a community and are visited at long and irregular intervals by males, each of whom has a sexual relationship with a number of the females, each of whom is more or less faithful to "her" male, has occasional parallels in contemporary human society, particularly in depressed areas of high male unemployment; the adolescent "gangs" formed by young Orang-utans are normal human behaviour wherever the mores of a particular society permit.

The model of Gorilla society, where a group of competitive females live in an exclusive sexual relationship with a male who may be supported by an adolescent male "follower" is a rather commoner human social arrangement. The Orang-utan and Gorilla social systems do not display the cooperation and social bonding of males within male groups which is characteristic of human society, nor the co-operation and social bonding of females within female groups which is characteristic of human society.

The Chimpanzee male group, in its promiscuous relationship with an assortment of unrelated rival females who are "group property", is a phenomenon which sometimes appears on the periphery of socially-stable communities within groups such as criminal gangs, but does not appear to be a normal, stable human social arrangement in itself. Leaving aside rape situations, the "gang bang" aspect of sexuality is, in humans, a rare expression of an unusual state of society, or the occasional individual woman's particular sexual psychology. The permanent state of hostility with other groups exhibited by Chimpanzees has obvious human parallels, but does not include the human characteristic of friendly relationships between groups or between individuals of different groups.

Bonobo communities are too little understood for firm conclusions, but the male group/female group composition of the community begins to look human-like, as does the wide variety of sexual expression, food-sharing, and the apparent peaceful relationships with neighbouring communities. The dominant position of the females within the community is unusual in mammalian societies generally.

The social arrangement posited for Neandertals, where females and offspring live separately from the males, is replicated in some societies of modern humans. Interaction

between Neandertal groups, whether friendly or otherwise, is unknown, but there must have been some interaction.

Because all of these upper-primate societies possess elements which have echoes, however faint, in human society, we can reasonably suggest that "human nature" is based within a very general primate genetic program. The fact that all upper primates are now known to be tool-users reinforces this conclusion. But all these primate communities lack an essential quality which is a human norm: each primate community can be regarded as a single family, based on a group composed of sisters and half-sisters in the case of Orang-utans and Gorillas, and a group comprised of closely-related males (brothers, half-brothers and close cousins) in the case of Chimpanzees and Bonobos. A human community is typically composed of a number of separate families living co-operatively, bound together by assumed blood relationships; most communities include incomers of both sexes. Furthermore, human communities frequently live in co-operative relationships as *groups of communities*, a relationship reinforced by occasional exchanges of (usually young) members. Humans invented in-laws. The overall population of humans worldwide has been consistently expansionary in numbers, geographic spread, and environmental distribution from earliest times, and this success can in good part be related to the human capacity for co-operation. Humans co-operate, as individuals, as groups, and as communities. Human society, sometimes based on a male group and sometimes based on a female group, is characterized by relationships which are remembered between generations and over long periods of time, and which are often formally ritualized. The preservation, as active members of the community, of individuals who are past their breeding life, is a characteristic of human society to which humans are to some extent physically adapted: females have menopause, which is a relief from the strains of childbearing and childbirth for bodies which are aging, whilst a large proportion of women lose interest in sexual intercourse after the "childbearing years", which has the same effect; one result is the extension and preservation of group memory. Another result is the husbanding of resources for the benefit of the offspring of younger, fitter mothers. The ready and successful adoption of orphaned infants, in marked contrast to the usual death of such unfortunates in other primate societies, contributes to human breeding success and population growth and is another example of co-operation.

Human communities which live the hunter-gatherer lifestyle for which humans evolved can exhibit both territorial and ranging behaviour. Males defend the community and its territory

or core areas of the range. Mature males typically form a closely-bonded group within the community which excludes women, adolescent males, and young men. Adolescent males commonly form gangs, and function as advance scouts for any danger which may threaten the community. Young men usually form an organized sub-group of the larger male group and are the community's first line of defence in the face of threats by animals or other communities; during this period of their lives they demonstrate their fitness to become breeding males. Fully-adult males are the breeders, and tend to monopolize the sexual services of the women. Adolescence, the end of adolescence, and the achievement of full manhood, usually in the early 30's, are commonly celebrated with some form of ritual.

Females, on the other hand, frequently pass seamlessly from childhood to womanhood without fanfare, possibly because their biological stages of life are fairly obvious, although some communities do celebrate menarche, which may occur at as young as 10 years but may be delayed by dietary and other factors until the late teens. Females appear to be generally faithful to a particular male or group of males, although males are more likely to be polygamous, and true promiscuity is usually restricted to adolescence, although there is a high proportion (over 24%) of "illegitimacy". There are no external signs of oestrous. Copulation may be face-to-face or from behind in a variety of positions; a variety of non-reproductive sexual activities are commonly practiced; sexuality is heavily influenced by cultural factors, and few, if any, communities openly tolerate a full range of sexual expression, whatever is willingly performed in private. Young and fully-adult males commonly treat adolescent males as females for sexual purposes. A tendency of adolescent females to seek mates from without the community is formalized by the exchange of females between lineage-groups and sometimes communities, but sometimes it is males who move to the women's community. "Marriage" and other forms of controlling the sexual behaviour of individuals is a human social norm: humans are animals that make rules about sex. Humans also routinely break these cultural taboos. The adventurousness of young males sometimes results in their adoption into another community. Individuals of either sex who move into another family commonly retain the relationships, obligations, and rights of their natal group as well as gaining those pertaining to their new set of relations, resulting in extended networks and often conflicts of interests. Warfare and raiding commonly results in the capture of females: a factor which, like out-marriage and casual sex with strangers, contributes to gene-flow within the species.

One clue to the extremely variability of human society is found in the Gorilla: an increase in the sustained availability of food-sources can result in the basic Gorilla family expanding to a very large group comprising one dominant mature male, many more than the usual two-to-four females, plus offspring, and often two or more sub-dominant male "followers". Different environments change the form of the society. Another clue lies in the differing "cultures" of Common Chimpanzees. "Culture" is the acquisition of behaviours and outlooks which are learned rather than genetically-programmed, and can be passed down from generation to generation. Systematic research may demonstrate that the forms of human society are influenced by the environment, whilst the formation of purely localized cultures is well-known.

The first undeniable appearance of culture in the modern human line is the rare finely-wrought stone tools from the Klasies River Mouth: artefacts such as these make a statement about the identity and capacity of both the individual who carries them and the community to which he or she belongs. Such identification by artefact has been a feature of human society ever since. Another facet of human culture is language. Tests have demonstrated that all the Upper Primates have the intellectual capacity to use verbal communication, but only modern humans have the undoubted physical capacity to speak - the possibility of language-use by Neandertals is still a highly controversial matter - and humanity has been shaped by the ability to communicate verbally. Human infants learn to speak with great ease, and are capable of learning a number of languages simultaneously; this capacity begins to diminish at about the age of 8 years, more rapidly in males than in females. Speech permits individual humans to interact with a much larger number of other individuals than the "touch-and-smell" social interactions which are characteristic of other upper primates.

A third factor in the development of humanity is neotony: the retention of some infantile characteristics into adulthood. The curiosity and capacity to learn typical of all the upper primates is, in humans prolonged into adulthood, and is commonly amplified by the stimulation of new situations and experiences. Humans appear to have evolved during a period of extreme climatic fluctuation, where the capacity to learn to cope with new situations had an adaptive significance. Because there are a number of possible solutions to most problems, human groups adapted to similar situations at different times and places in different ways. These differing behaviours and social adaptations have resulted in a wide variety of cultures and languages. The cultural wisdom of a community is transmitted by

means of language in the form of systems of knowledge which are often ritualized and preserved in the memories of the older people.

Despite the fact that human populations have become mixed, there are some indications that particular family structures were at one time associated with particular environments. Culture, the transmission of behaviour across generations, associated with the verbal transmission of information, and the capacity to learn to survive and, by means of co-operation, even prosper in a wide variety of environments are human norms.

Co-operation between families, between groups, between communities, and even between groups of communities, involving status, mate-exchange, gift-exchange, decisions about the best way to solve social problems, in short, politics, are a significant aspect of human nature. Aristotle was right: man is a political animal.