Chapter Seven Sexual Stimuli

Reproduction

Evolution is a dynamic process. In living organisms, it proceeds through the replication of a structure, which itself may be an aggregation of other structures. Reproduction is the essence of evolution. Many things may change, but the replication of structure remains an evolutionary constant.

Most organisms replicate their structure by means of asexual, or sexual reproduction. Asexual reproduction is relatively simple, as there is no element of combination which requires structural compatibility. However sexual reproduction is much more complex as it involves the development of separate male and female germ cells, which have to be combined during fertilisation to produce the replicated structure.

It seems probable that the early forms of sexual reproduction developed within asexual organisms as a result of a structural mutation. Normally, any mutation which produced two reproductive systems would have been disadvantageous to the individual concerned, as the energy demands of reproduction limit the rate of individual growth.

However, the advantages of sexual reproduction - in terms of the speed of genetic adaption to a changing environment, clearly outweighed the disadvantages of a dual reproductive system.

Sexual Reproduction

The evolution of sexual reproduction involved the division of the reproductive element of the individual organism into male and female, haploid germ cells. In hermaphrodite specie, these could be recombined within the specie individuals themselves.

However, the evolution of single sex species required the transportation of the male germ cells to the female cells, and their subsequent recombination within the female individual. Thereafter, the process was essentially asexual in character, with the replicated structure budding-off from the parent organism.

The development of single sex specie implied an inherent ability within the germ cells, to identify individuals of the appropriate sex - prior to recombination. Furthermore, it required a certain degree of synchronisation of breeding cycle, between the different sexes of the same specie. In addition, the fertilisation process demanded a high degree of structural compatibility - if the two germ cells were to recombine to form a single zygote.

Sexual Stimuli

In a competitive environment, these basic elements of reproduction would be refined through the development of various kinds of stimuli to identify; synchronise; and combine at precisely the right time and place.

In this context, if the evolution of life involved the simplest of replicating structures, then it is probable that the essential and peculiar characteristics of that structure would feature prominently in all of its descendants. However, it is also probable that the basic elements of such a structure would limit the variations of reproductive systems to those which appertain directly to the structure itself.

For example, if such a structure was atomic, molecular, and compound in composition; and bound by strong, weak, electromagnetic, and gravitational forces, then these features would form the basis of any chemical or radiation stimuli.

In the general context of mammals, the reproductive stimuli are usually either aural; oral; olfactory; tactile; or visual in nature. The behaviour is normally mediated by hormones, but the stimuli varies in its permanence and impact.

Visual Stimuli

In all visually-mating mammals there is a very specific visual stimuli, which seems to be present in all the major areas of presentation and sexual contact. This may imply that the stimuli concerned is a direct representation of the basic structure of life. (See Chapter 11 & Figure 9).

In this regard, a comprehensive survey of mammalian specie physiology shows that most organic characteristics are directly concerned with the basic dynamics of life, namely: the acquisition, storage and utilisation of energy. In addition, there are organs which are mainly, or solely concerned with reproduction.

However, there are some organic arrangements, or growths, which have no apparent structural or reproductive purpose, and these may be classified as secondary sexual characteristics

Most of the secondary sexual characteristics of mammal specie are obvious in the larger animals. For example, the tusks of the Elephant, Walrus or Boar; or the horns of the Ibex, Buffalo or Rhinoceros; or the antlers of Deer. These are relatively prominent, organic structures.

Less immediately obvious, are the variations in the skin and fur colouration found in many animals, and in particular the arrangements of spots and stripes, on the faces and bottoms of such specie. Furthermore, there are post-pubertal growths of hair - such as the beard of the male in the human specie, for example.

In addition, the faces of many specie show small variations of structure, which appear to serve no obvious purpose. For example, the small notch at the top of the nose of the adult Gorilla, or the rather similar dimple at the top of the nose of the Chimpanzee. Likewise, in these species, the protruding eyebrow ridges over the eye sockets.

Similarly, the individuals of many mammal specie have a tail, which appears to have little functional use - except as a fly swatter, or as an extra limb in some species of monkey. Furthermore, some of the teeth of some specie seem to be exceptionally long -- most notably the canines of many predator specie. These might appear to have evolved to meet the needs of predation, but such canine teeth are also found in purely vegetarian specie, such as Gorillas and Chinese Water Deer.

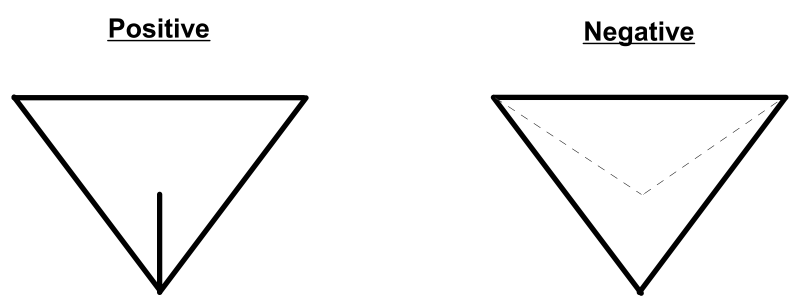
In this regard it is clear that there are some aspects of mammal physiology which require further explanation.

In this context, a more detailed, and perceptive survey of these various mammal characteristics shows a commonality of visual stimuli. Thus: the arrangement of tusks, horns, canines, stripes, spots and dimples etc. , invariably form an arrangement of lines -- within a triangle.

In this regard, the triangle is usually equilateral, and upside down. Thus it has three equal sides, with the base at the top and the point at the bottom. Furthermore, trisecting the triangle, are three converging lines which meet at Its centre to form a Y -- shape. However, not all of the lines are clearly visible. In addition, the lines vary according to the sex of the mammal, and the position of the triangle.

In this context, it might be said that there are two triangles, namely: one positive; and one negative. (See Figure 2.). All visually-mating mammals have at least two triangles.
One on their face, and one in their genital region. In quadrupedal mammals, the tail partly obscures the latter.

Figure 2 - Sexual Triangles



Monkeys and Apes, which habitually sit upright, may have a further triangle on their chests. Baboons, Gorillas and Chimpanzees are examples of such species. The Human specie also has a chest triangle, and additionally, another triangle on the lower back.

The males of a visually-mating mammal specie have a positive triangle on their face, and a negative triangle in their genital region. This position is reversed in the female sex, which have a negative triangle on the face and a positive one in the genital region. (See Figure 5).

In most specie, the facial triangle is outlined by the ears and muzzle of the individual. In some specie, where the jaw is very long, the ears will be lengthened to compensate. In other specie, horns are used in place of the ears - as the outer markers of the triangle.

Flashing

In virtually all visually-mating mammal specie, the stimuli effect of the triangle can be enhanced, or reduced, either by obscuring, or emphasising the inner lines of the triangle; or by obscuring, or emphasising the vertices of the triangle.

In this context, the tail of most female quadrupedal mammals, almost permanently covers the positive line of the female's genital triangle. As a result, the action of lifting the female tail, in quadrupedal mammalian mating, creates a very strong sexual stimuli -- as well as removing the main organic impediment to successful copulation.

The sexual stimulant effect of these triangles, and their inner lines, are used by many social mammals to determine their hierarchical rankings. In this regard, the creation of a strong sexual stimuli typically reduces the aggression of an individual. and conversely increases its tolerance for other individuals.

Both the aggressive and tolerant behaviour are regulated by hormones, which are produced by the pituitary gland in the brain. This is stimulated by the hypothalamus, which is itself is subject to stimulation from the visual sensory systems.

Thus in social specie, the creation of a strong, highly visible triangle, with a prominent, positive line, can be used to intimidate competing individuals. This factor has led to the evolution of large triangular structures in many polygamous species, and variable triangle and line structures in most social specie - particularly where the visual sensory systems are important to the specie.

This is quite noticeable in many carnivorous mammals, such as the Lion and the Wolf. In both of these specie, the ears and the muzzle mark out the vertices of the facial triangle, but the vertical line of the positive triangle is not very obvious - providing the animal keeps its mouth shut.

However, if the mouth is opened wide, the sharp contrast of the bright pink tongue -- against the black gums and white teeth, create a very strong, and immediate stimuli. In this context, the long canine teeth serve to mark out the top and bottom of the positive line. Generally, when the male Lion or Wolf is displaying, it roars, or howls as appropriate, so there is an aural stimuli as well as a visual one.

It should be noted that the male Lion's mane, appears to be an example of pseudo--dimorphism, and not a secondary sexual characteristic The group behaviour of the Lion specie, requires that the dominant male should appear to be larger than the other males and females. However, the hot subtropical environment, coupled to the surface-to-volume ratio of the Lion, limits its size.

In this regard, as with most predators, the Lion's hunting activities produce a lot of heat -- particularly in the last sprint to the kill. As a result, if the Lion was much larger, it would die of overheating. As a result, the male has evolved a variable 'ruff' to make it appear much larger than it really is. Similar pseudo-dimorphic effects may also be seen in male Baboons.

In the human specie, the social ancestry of the hominoids Apes, together with the Apes' variable mating systems, have created an exceptionally broad range of triangles, and variable methods of enhancing, or obscuring, the triangles and lines.

The facial triangle of both male and female humans is marked out by the eyebrows, ears and chin. This arrangement is fairly normal for mammal specie which have binocular vision. The relative lack of visible body hair in humans, has reversed the normal hominoidal hair and colour contrasts. Thus, where the Apes have visible hair, the human specie tends to be devoid of visible hair; and where the Apes have very little visible hair, the human specie is often quite hirsute.

For example, neither the Chimpanzee or Gorilla species have any eyebrows, whereas the human specie normally has quite visible eyebrows. Likewise, the African apes tend to have relatively little hair under their arms, while the human specie tends to have relatively thick underarm hair.

The Positive Facial Triangle

The male facial triangle, in the human specie, is distinguished by the single positive line - typical of all positive triangles. The line starts in the centre of the triangle, just underneath the septum of the nose - forming a dimple in the upper lip. This may be matched by a similar dimple on the chin.

However, because the human specie is a sexual specie, the males and females commonly share such facial characteristics. This means that not all males have dimples on their chins, while some females may have them.

In order to avoid any confusion of the triangles, the male is able to grow a beard after puberty. The human beards take the form of a triangle, and the positive line is usually emphasised by the hair in the centre of the chin which normally grows more strongly than the hair either side of the centre. In some individuals, this situation is reversed, with virtually no hair on the centre line. (See Figure 3.).

The male beard tends to lose its triangular shape as the individual grows older. However, in the human specie, it is usual for the younger males to do most of the mating. As a result, the gradual loss of the beard stimuli with age, does not affect specie reproduction.

The Negative Facial Triangle

The female facial triangle is marked out in the same way as the male, but the lines are different. In common with other female mammals, the human female has a negative set of lines. These form the top 'Vee' part of the 'Y' which trisects the triangle.

It must be noted that the negative lines are different, in character, from the positive line. The latter is highly visible and prominent. By contrast, the negative lines are perceived by their apparent absence. They are really negative, (in a photographic sense). They are not seen, nor are they prominent. However, they are often enhanced by emphasising the parts of the face on either side of each line.

In the case of modern human females, this is achieved by means of make-up. The female normally blanks out the 'male' positive line, by the application of creams and powders. Then she will apply lipstick to her lips. This is to create a strong horizontal line, to counteract the implicit positive line -- which is initiated by the dimple above the upper lip.

In addition, the female will apply eye make-up, and cheek blusher, to highlight the negative lines - which lie between the upper cheeks and the eyes. (See Figure 4)

In this regard, women with high cheekbones and slightly drawn cheeks, may be regarded as beautiful, simply because the light will create shadows on either side of the negative lines, within the facial triangle.

The Genital Triangles

The genital triangles in the human specie vary according to the sex of the individual. Thus, the female has a positive triangle, where the line of the vulva is coincident with the positive line of the triangle. In fact, the top of the vulva does not quite reach the centre of the triangle, and the line is carried up to the centre by an extra thick piece of pubic hair. This is rather similar in its effect -- to the central chin part of the male beard.

It should be noted that the vulva of the females of all visually-mating mammals always forms a slit-like structure. However, the vagina is a round tube - like the rectum; and there is no structural reason why the vulva should not be circular, like the anus. In this regard, the slit-like effect is an evolutionary adaption to the requirements of the positive triangle.

The human male has a negative triangle in the genital region. The existence of male genital hair is another example of the shared characteristics of sexual specie.

The Supplementary Triangles

In common with the apes, the next most important triangle in the human specie is the chest triangle. As stated previously, there is a reversal of hair growth between the ape and human species. Thus, the top of the chest triangle is marked out by the underarm hair, while the navel marks the bottom of the triangle. Both the male and female triangles are positive - as is normally the case with supplementary, mammal triangles.

In the case of the male, the line may be marked out either by a line of hair, which runs from the navel to the sternum; or alternatively, by a vertical line between the main stomach muscles of this region. Generally, ethnic groups with an equatorial ancestry have the latter condition, while the ethnic groups with a temperate ancestry have the former condition.

The triangle and the line can be 'flashed' (i.e., enhanced), by raising the arms - which will expose the underarm hair. At the same time, a frightened or aggressive male, will contract his stomach muscles, while the stomach hair tends to become raised. This creates a strong positive line.

In the case of the female, the underarm hair and the navel mark out the triangle, which can be flashed in the same way. But in addition, the female can vary her chest triangle - by lifting her hands in front of her shoulders, and squeezing her elbows into the sides of her chest. In this way, her forearms create the triangle - with the hands marking the top corners, while her elbows squeeze her breasts together to form a very strong positive line - created by her cleavage.

This is a fairly typical reflex action of females, in a state of sudden shock, or surprise. The females in modern human societies, may also use their chest triangles either directly -- (or indirectly with clothes), to attract males; or to intimidate other females.

The triangle on the lower back is formed by two dimples on either side of the lower spine, while the positive line is formed by the cleavage between the buttocks. This supplementary triangle appears to have evolved as an adaption to bipedalism.

There is one further triangle, which is common to members of the Canidae family of mammals (dogs etc.,), and to the Human specie. This is found on the forehead of the individuals of the specie, and is actuated by the frowning and furrowing of the facial muscles in this region. Unlike the other supplementary triangles, this combines positive and negative triangles.

Infant Facial Triangles

The young infants of visually-mating mammals, invariably have a negative triangle on their face - regardless of the sex of the infant. This effect is usually created by differences in the facial skin and fur colouring, in order to highlight the negative lines of this type of triangle.

In addition, the faces of the infants tend to be much flatter than those of the adults, and the jaws are often much foreshortened to achieve this result. This helps to cause the cheeks to bulge when the infant cries, which causes the negative lines to be highlighted -- and helps to create a strong negative stimulus.

In the human specie, the babies tend to have relatively fat, chubby faces, which creates the usual flattened effect. Furthermore, the blushing of the cheeks helps to highlight the negative lines, as does the bulging of the cheeks when the baby smiles. It should be noted that the negative stimulus tends to reduce adult aggression, and increase the level of tolerance.

This makes the infant attractive to all adults. The human baby can vary the degree of attraction and repulsion, by switching from a negative to a positive facial triangle. This is achieved by manipulation of the facial muscles and the tongue.

For example, when a baby smiles, it creates a powerful negative facial triangle, which attracts an adult. However, when the baby is upset, it may open its mouth and stick out its tongue. The combination of the open mouth, and the centre line of the tongue, create an equally powerful positive facial triangle - which repels adults.

All mammal infants need strong facial triangles to control the mother, and prevent attacks by the other adults.

The failure of stimuli

In this context, it should be noted that when adult male Lions are taking control of a pride -- by killing, or scaring-off the previous dominant male, the new dominant male will often kill any Lion cubs that are in the pride.

This happens because the Lion cubs do not create an attractive infantile stimuli, to reduce the dominant Lion's aggression In this regard, the stimuli of predator animals often requires substantial body movement, as well as facial changes -- because the eyes of predator specie are adapted for visual movement, rather than visual perception.

When Lion cubs are attacked by male Lions, they are killed because they do not move when charged by the dominant Lion. Instead, the cubs remain quite still, because this is normal for young infants when they are in a state of fear. This is a typical characteristic of nearly all young mammals and birds. It is meant to protect them from predation -- because most predators' eyes are adapted to spot movement, rather that colour delineation.

As a result, mammals like Lion cubs, are born with a degree of camouflage. The mottled coats of the Lion cubs generally prevent them from being perceived by predators, providing the cubs stay quite still. Unfortunately, this infantile reaction to fear is very counterproductive when a new dominant male Lion is trying to establish his dominance within the pride.

Mammal Perception

It appears that the successful, long term evolutionary replication of any visually-mating mammal specie, demands that the equilateral triangle is inviolate - in the perception of the mammal. Thus, if there is an evolutionary demand to change the shape of the skull in order to feed more efficiently, there must be some compensation in the mammal's visual perception -- to ensure that the resulting facial triangle is always perceived to be equilateral in shape.

In this context, the sexual triangles of some mammals do not always appear in the form of an equilateral triangle. For example, horses have relatively narrow isosceles triangles. In the case of this specie, the jaw has lengthened to improve grazing, but the specie has no horns, or antlers, to compensate the facial triangle. So it has changed its visual perception instead.

In this regard, the eyes of the horse reduce the vertical dimension of everything it sees. Thus if a horse looks at a square, it will actually perceive a flattened rectangle. As a result, when a horse looks at another horse, it perceives the other horse's facial triangle as a flattened isosceles triangle -- i.e., as an equilateral triangle.

The mane of a horse does not appear to be a secondary sexual characteristic. Instead, it seems to have evolved as a defence against predation. In this regard, most predators of such a herbivore, kill their prey by biting through the herbivore's neck vertebrae.

The predators normally attack their prey from above, and the stiff manes of Wild Horses, Zebras and Giraffes, fool the predator into thinking the neck is higher than it really is. A predator's eyes are adapted to perceive movement rather than visual depth. In this context, the floppy mane of the domestic horse is the result of selective breeding, and is analogous to the floppy ears of pet dogs.

Ape Facial Triangles

In the hominoidal specie, like the Chimpanzee and Gorilla, where the eyes are very important, any changes in jaw structure must be compensated by changes in the structure of the skull. This is to ensure that the facial triangle remains equilateral when viewed by other individuals of the same specie. Thus in general, the greater the protuberance of the jaws, the greater will be the size, and forward projection, of the eyebrow ridges.

The Chimpanzee has a small, inner facial triangle, formed by its eyebrow ridges and the base of its nose. The positive line is formed by the septum of the nose, and is carried to the centre of the triangle, by a dimple on top of the nose. The Chimpanzee has a second, larger triangle, marked out by its ears and chin. As with most social animals, the positive line is obscured - until the Chimpanzee opens its mouth. (See Figure 5).

The Gorilla has a similar, inner facial triangle to that of the Chimpanzee. However, the Gorilla has rather small ears, and this renders the larger facial triangle virtually invisible. The reason for the lack of the larger facial triangle appears to relate to the Gorilla's mating system, which is not very dependent upon visual stimuli. Thus, it does not need a highly visible facial triangle, like that of the Chimpanzee. However, the dominant male Gorilla can make up for this with a very substantial chest triangle.

The Evolution of Hominid Facial Triangles

In the context of hominid evolution, the hominid fossils show a gradual change in the skull structure, with the development of a distinct forehead, and a foreshortening of the jaw in Homo sapiens Sapiens. In this regard, once the face had flattened, there would be no need for any projecting eyebrow ridges.

It should be noted that the current artistic impressions of the early hominids are probably rather inaccurate. For example, the downward-facing nostrils would have developed quite early; and the mid-term, fully bipedal hominids would have been virtually devoid of body hair - like the modern hunter-gatherer tribes. In addition, the bipedal hominids would have had short, frizzy hair like most present day, hot-adapted people.

The perception of an equilateral facial triangle by visually-mating mammals, is vital to successful reproduction; and this probably accounts for the variations in skull shape of different ethnic groups - within the human specie.

Cold Adapted Humans

For example, the inhabitants of polar regions, such as the Eskimos and Aleuts, exhibit many morphological and behavioural adaptations to their polar environment.

It is necessary for such people to minimise their surface-to-volume ratio, in order to reduce the loss of heat from their bodies. Thus, they tend to have relatively short arms and legs, and their faces contain the very minimum of contours. In addition, their ears tend to be small to reduce heat losses still further.

The hair of such people tends to be relatively thick and straight. This prevents it from being blown away from their ears in the windy conditions of the polar regions. The ears tend to dissipate body heat, so the hair which covers the ears helps to prevent this heat loss.

These people tend to move in a slow, deliberate manner - to prevent any perspiration. This is partly to avoid any latent cooling, which comes with the evaporation of perspiration; and partly to conserve water, which is scarce in polar regions.

When the ancestors of these people first adapted to the polar environment, the covering of their ears by hair would tend to alter the facial triangle. As a result, the face would appear relatively long, because the ears would no longer be visible as the top markers of the equilateral triangle. This would create a reproductive anomaly, which could be resolved by a gradual change in the structure of the skull.

Thus, in these cold-adapted people, the skull has been widened, while its front-to-back depth has been foreshortened. This maintains the equilateral nature of the triangle, even when the ears are covered.

However, the need to reduce the facial contours, coupled with this morphological change, has brought the eye sockets and cheekbones forward. This change, together with the reduction in the contours of the nose, has led to the 'Mongoloid' eye-flap -- which creates the slit-eye effect.

Other cold-adapted people, have evolved a different variation to maintain the facial triangle when the ears are covered by hair. In such cases, the beard has been eliminated by the males, and the nose has tilted upwards.

This develops the small upper, facial triangle - rather in the manner of the Gorilla specie. Like the Gorilla, the positive line uses the septum of the nose, but in this case the line is carried downwards to the top of the upper lip, by the dimple under the septum.

Hot Adapted Humans

The people of the equatorial, semi-equatorial and subtropical regions, also have morphological adaptations to their environments. In common with the cold-adapted people, these people also tend to move in a slow, deliberate manner -- to reduce the degree of internal heating, and prevent the loss of water. The heat of these climates, requires a relatively large surface-to-volume ratio - to maximise the dissipation of body heat. This has lead to the development of relatively long legs and arms.

The skull shape of such people is similar to that of the cold-adapted people. However, in hot climates, it is necessary to minimise solar heating - while maximising heat dissipation from the head. Thus, such people tend to have short, curly, or frizzy hair, which deflects the radiant energy of the sun -- while being very permeable to the flow of air over the scalp.

In addition, the frizzy hair prevents the ears from being covered, which can therefore help to dissipate body heat. However, the ears are often folded back -- close to the skull to minimise possible distortions of the facial triangle.

The dark skin of such people, creates a relative lack of any colour contrast, between the lips and the facial skin. This has created problems for the females -- who need to obviate the positive line of the facial triangle. This has been achieved by the development of thicker and more protuberant lips, which help to create a strong, structural horizontal line. This does not disadvantage the males, because they can grow a beard.

The various ethnic groups, in the temperate regions, generally have much finer hair than that of the hot-adapted, or cold-adapted peoples. This allows a maximum variation of ear covering, which is necessary in the very variable climates of these regions.

The variations of hair colour of temperate peoples, seems to relate to latitudinal, or altitudinal requirements, and tends to be similar to the colour of the fur of prey or predator animals, in these regions.

Polygynous Mating

Some of these people have relatively long faces, due to an lengthening of the top-to-bottom dimensions of the skull. This seems to be the result of a polygynous mating system. In such systems, there tends to be a substantial dimorphic effect, (i.e., one sex is much larger than the other).

In a prehistoric polygynous society, as the male looked down, the plane of the female face would be at a slight angle. Similarly, as the female looked up to the male the plane of the male face would be at a slight angle. This would tend to create the illusion of a relatively wide, facial triangle in the perception of both sexes.

This would be remedied by an evolutionary adaption which lengthened the height of the skull. In addition, the development of a hawk, or hook nose, would create the impression of a lower centre point within the facial triangle.

Female Initiation

Sexual reproduction in mammal specie, requires that specie individuals find, identify and select, either one partner, or several partners, to mate. In most mammal specie, it appears to be the female which initiates the mating process.

When the female breeding cycle begins, the hypothalamus in the brain stimulates the pituitary gland to produce hormones. These chemical stimuli affect the female gonads, which stimulate the ovaries to start the development of the eggs. In addition, the gonads produce sex hormones which create organic and behavioural mating stimuli.

The organic stimuli may include the production of scents; which can be released into the air, or dissolved in the female urine. In this context, many mammal specie use urine-based scent to mark out their territories. When the males of such specie smell the sexual scents, their olfactory systems mediate with their hypothalamus, which then stimulates the pituitary/gonad systems - to initiate the male mating cycle.

The females of other specie of mammals may use vocal, or visual stimuli to initiate the process, but the effect on the male and female reproductive systems is the same.

The reciprocal stimulation of both sexes, creates a dynamic process of alternating attraction, and repulsion. This is designed to ensure that when copulation begins, the male sperms can meet the female egg - at precisely the right time and place.

In physiological terms, neither the egg, nor the sperm seem to have evolved very much in respect of their overall organic structure. In particular, the sperm's relative lack of mobility tends to restrict the total distance it can travel, prior to fertilisation.

The female egg is propelled by cilia on the lining of the oviduct, while the male sperms are moved by contractions in the uterus and oviducts. Although the sperms have small tails which enable them to swim to the site of fertilisation, their energy reserves are limited.

Only one sperm is actually involved in the fertilisation of the female egg, but this can only take place after thousands of other sperms have chemically neutralised the outer membrane of the egg. Thus successful fertilisation requires a high concentration of sperms. Due to these reproductive limitations, the size of the male penis varies according to the pelvic structure of the female, and the effect this has on the species' mating positions. The location of the testes, varies with environmental temperature conditions and specie physiology.

It is proposed that the relatively large size of the human penis is an evolutionary adaption to the structural effects of female bipedalism. The gradual evolution of the female hominid pelvis and related hip structure, together with the development of relatively bulbous buttocks, required copulatory adaptations by the male.

In this regard, whether mating was achieved in the dorsal-dorsal position, or the dorsal-ventral position, the female structural changes would necessitate a much longer male penis. For physiological reasons, the male penis of all kinds of mammal specie, must maintain a degree of structural constancy. As a result, an increased length of penis leads to a consequential increase in its width.

In common with other mammals, the scrotum is structured to allow a differential in temperature between the testis and the body. This is necessary for the maturation of the sperms.

Scientific studies on the relative size of the penis and testes in hominoids, have suggested that the ratio of the size of these organs varies with the amount of copulation. This seems to be true as far as the size of the testes are concerned.

In this context, it will be recalled that the social mating systems of the Rat (see Chapter 2. ibid.), involved several intromissions prior to ejaculation. In the Rat specie, the dominant males mounted the females more often -- and ejaculated more often, than the subordinate males.

However, the studies on hominoidal reproductive systems, suggested that no conclusions could be drawn concerning the evolution of the sex organs; without relating the organic evolution to the development of associated mating systems.

Evolution of Hominid Mating Systems

In this regard, comparative studies of the mating behaviour of hominoids, seals, rats and doves, allows the deduction of a possible proposition on the evolution of mammal mating systems. If this is applied to the evolutionary history of the monkeys and apes, it may yield an explanation for the evolution of hominid mating systems.

The hominoidal research suggests that the mating systems are food related, while the seal research suggests that such systems are predator related. These are both environmental constraints. However, research into Rats and Ping Doves, shows that hormonal stimulation may also play a role in the structuring of these mating systems.

Female Management

By combining this research data on the organic, behavioural and environmental stimuli, it appears that in mammal specie the organic replication of structure requires that the female should initiate, and generally manage the whole process of replication.

Thus, the mammal female must find, attract, and stimulate the male -- to complete the act of mating. In addition, the female must acquire sufficient food during the gestation period, to ensure the birth of a healthy brood of young. Finally, the female must continue to feed her young until they are weaned, and provide protection for them until they reach sexual maturity -- so that they can repeat the cycle.

By contrast, the male is required to survive to adulthood, then be attracted by the female, and mate with her. Thereafter, it would be in the best interest of the female and her young, if the male died - to reduce the competition for food. In the long term, the only evolutionary advantage of the continued survival of the male would be in terms of direct, or indirect protection of the female, or her young. In this regard, if the female has a choice of males, it would appear likely that her selection would be made on that basis.

In this regard, an example of indirect protection for the young is the phenomena of old age. Thus, if a predator has to choose between an old individual and an infant, it will normally choose the former - because it presents a larger potential meal.

If the onus of sexual reproduction lies with the mammal females, then it is evident that the mammal mating systems must also be determined by the females. In this context, an examination of the overall reproductive requirements within the female life cycle, may help to illustrate this conclusion.

Thus, between the end of the weaning stage of the young female infant, and her subsequent sexual maturity, the female must secure a sufficiently large territory to feed herself. If there is too much competition in her home territory, the female will have to fight; or move; or die.

After sexual maturity, the female must increase her territory by an amount which is sufficient to allow her to mate and reproduce successfully. Furthermore after the birth of her young, she may require an even larger territory, unless she can induce other individuals to help feed her young.

Finally, the female must protect her young against predation. This may be done without assistance; but if she requires group protection, this may demand a degree of social interdependence. In the latter case, the females involved will usually have some degree of hierarchical structure, and the dominant female will largely determine the type of mating system.

The balance of evolution appears to demand that the male's role in female or infantile protection, must clearly outweigh any potential male/female competition for food. This would appear to imply that the female must always be able to manipulate the male -- to ensure that the appropriate balance of food competition and protection is maintained.

Old World Monkeys

This general proposition, on the organic replication requirements of life, may now be applied to the evolution of primate mating systems -- starting with the forest-canopy dwelling monkeys of the Old World.

Every population of every species of monkey, shows a considerable variation in individual size and temperament. Each specie is limited by its organic structure and ecological niche, but within these constraints there are always variations of an individual character. As a result, some individuals are more dominant that others; and in any community of monkeys there is always a degree of stratification. This manifests itself either horizontally - in terms of a hierarchy, or vertically in terms of territory.

The territorial motivations of male and female monkeys are not quite identical. Thus, the dominant males simply want the territory with the best food resources; while the dominant females want the territory with the best combination of food resources -- and protection against predation. This situation is relative, as the dominant males will also be concerned about the possible predation risks of any territory. However, the dominant females will always seek an even safer territory than that of the dominant males.

The competition for food means that the dominant males will continually contest their territorial positions against competing males, and this noisy fighting will tend to attract the regular attention of predators. In the case of canopy-dwelling monkeys, this generally means large birds of prey.

Therefore the dominant females will tend to avoid these territories, and accept a reduction in food resources in order to gain greater security. As a result, a dominant female's territory will be concurrently occupied by a subordinate male, rather than a dominant male.

The dominant female can use a combination of her visual and vocal stimuli to reduce the subordinate male's aggression: and conversely increase its level of tolerance for the female. As the male is a subordinate, rather than a dominant male, its tolerance level will be relatively high, and this makes it easier for the dominant female to control the male.

The female will use her high pitched vocal stimuli for long distance control, while the negative facial triangle will be used for the maintenance of this control when the male is close to the female. Thus, the subordinate male will tolerate the dominant female in his territory, although he will still chase away any other similar, or lesser ranking males.

The dominant female will likewise defend her territory against the other females, using her vocal and visual stimuli in an aggressive way. This is normally achieved by a lowering of the pitch of the voice, coupled with a simultaneous increase in its amplitude. Similarly, the negative facial triangle is changed into a positive one by opening the jaws really wide, to project a tall and narrow '0' shape. The effect of both the lowered pitch of the voice, and the positive facial triangle is to induce fear - and drive away the competing females.

In the monkey community, there might be other females which were larger than the dominant female, but their greater size would require more food than the best female territory could provide. Thus the dominant female in the best combination of feeding and predation-free environments, would be of medium size - but of above average aggression.

This dominant female would then mate with the subordinate male. After the birth of her young, the dominant female could control the male by variations in her visual and vocal stimuli. This would create an apparent pair-bond, which would enable the female to rear her young with maximum efficiency and security.

As the subordinate male would only be of average size, the monkey community's most successful females would have male progeny of similar average size. Hence, monogamous pairs would show no difference between the size of the male and female.

The females who mated with the more dominant males would be subject to greater predation than average, and their young would be reared in an environment of continual fear and aggravation. This rearing environment would produce relatively abnormal infants, which would be uncompetitive as adults.

As a result, the dominant male's characteristics -- in terms of increased body size, would not become an accrued specie characteristic. Likewise, the subordinate, or very tolerant females, would have insufficient food resources in their territories, so their characteristic -- in terms of reduced body size, would not become a specie characteristic.

Thus the equality of size of the male and female individuals in monogamous mating specie, is due to the fact that the most successful, dominant females mate with medium size, subordinate males.

The Hominoids

When the hominoid ancestors evolved their ability to brachiate, the relatively small, canopy-dwelling Gibbon occupied a similar ecological niche to the canopy-dwelling monkeys, and developed a similar monogamous mating system.

The Orang-utan dominant female is only semi-monogamous, as its larger size means that its young are less subject to aerial predation, and their increased food requirements reduce the degree of possible territorial overlap. The Orang-utan females can still find and mate with the males, but when the young start to grow: and predation risks decline -- the Orang-utan pair will separate.

As the dominant female Orang-utan chooses the male, she will be seeking protection against predators. Thus, she will choose a dominant male. However, as the female must rear her young on her own for most of the brood period, she must be small enough to share the available food with her infant. Hence, the Orang-utan female is always smaller than the male.

Polygynous Mating

When the biosphere entered a cold stage about 16 million years B. P. , it is proposed that the hominoidal ancestors of the Australopithecines were forced to develop a greater degree of terrestrial sustenance than the Gibbon or Orang-utan specie; and this changed the food-resource/predation balance of their environment.

In this regard, the respective variations of male and female territorial motivation were still the same. The dominant males still wanted the best food resources, while the dominant females still wanted the best combination of food resource and freedom from infantile predation.

However, the mixed terrestrial and arboreal environments increased the degree of potential predation. As a result, while the canopy-dwelling monkeys were only subject to aerial and arboreal predation, the Australopithecine ancestors would be subject to terrestrial predation as well.

This increase of potential predation level would tend to favour females of below average size, but above average aggression. This is because there are advantages in sharing the risks of predation with other females. Thus any potential predator, which is faced with the choice of two females, can only catch one of them at a time. In addition, while one female is feeding, the other female can watch out for predators -- thus doubling the warning frequency.

In such an terrestrial environment, it is proposed that the dominant female would select a very small, subordinate female -- and create a joint territory. This joint female territory would be arranged to overlap that of a dominant male. As a result, the overall territory of the male and females would be sufficient to feed all three individuals. As in the case of the canopy-dwelling monkeys, the dominant female would chase out any other females, while the dominant male would keep out any other males.

The dominant male would then mate each of the females, when they came into oestrus. In this way, the dominant female would gain group protection, by coexisting with the subordinate female, and both of the females would gain the protection of the dominant male.

If the subordinate female came into oestrus at the same time as the dominant female, this would create a high degree of potential competition for the young of the dominant female. As a result, the dominant female would drive out any subordinate female, which had a breeding cycle similar to her own. In such a situation, the dominant female would then select another subordinate female with whom to share the joint territory.

As in the case of the Orang-utan, the females would have to share their food with their young, so they would tend to be smaller than the dominant male. If food became very scarce, the dominant female would drive the subordinate female out of the joint territory -- to secure sufficient food for her young.

Thus the initial mating system of the ancestors of the Australopithecines would alternate between monogamy and polygyny.

If there was an increase in the amount of potential food resource, the dominant female could gain an increase in security by sharing the more productive territory with several, relatively small, subordinate females. The subordinate females would be selected on the basis of group harmony: in terms of a hierarchy -- in which each individual would display an increased degree of tolerance, and a similar harmonious spacing of each individual's breeding cycle.

This joint territory would be overlapped with that of a dominant male, in the usual way. This male would then mate with all of the females, as they came into oestrus. The average size of the females, in such a joint territory, would be relatively small - because most of the females would be smaller, and more subordinate, than average.

The dominant male, by contrast, would be as large as the food resource would allow. This would result in the development of dimorphism, where the males would be of normal size, but the females would be much smaller than normal.

The relatively large size of the females' joint territory, could probably support several males, in addition to the dominant male. However, such males would compete with the females for food -- and this would be disadvantageous to the females and their young.

To eliminate such male competition the dominant female could sexually stimulate the dominant male, with a 'false' oestrous. The resultant initiation of the male breeding cycle, would release male sex hormones into the dominant male's bloodstream -- with the effect of sharply increasing his level of aggression. As a result, the dominant male would drive any other males out of the joint territory. In this way, the dominant female could regulate the total number of individuals within the joint territory.

This polygynous mating system is clearly far more complex than the monogamous system. Furthermore, in view of its possible relevance to the hominid specie evolution, it may be advantageous to reconsider its basic causes and effects.

Therefore, it is generally proposed that : as the total number of the adult females in a joint territory increases - the average size of the adult female decreases - relative to the adult male. Furthermore, the size of the female hierarchy is dependent upon the total food resource, and the potential risk of predation. In addition, as the subordinate females are more tolerant than average, whenever the total number of females in a joint territory increases - there will be a proportionate increase in the average level of individual female tolerance.

It is further proposed that the dominant male will not normally tolerate any subordinate adult males, but a dominant male may tolerate another dominant male of equal status. However, if any of the females comes into oestrous, the dominant male will become more aggressive than normal - and will even prevent dominant males of equal status from entering the territory. If none of the females are in oestrous, a single, dominant male of equal status will be able to enter and share the territory.

Furthermore, if one of the females subsequently comes into oestrous, both of the males will be similarly affected by the sexual stimulation - so there will be no difference in their relative levels of aggression. Therefore, the incoming male will be tolerated by the dominant male.

In any specie which was evolving a polygamous system of mating, there would be a gradual reduction in the proportion of males involved in mating activities. Thus any genetic mutation which decreased the relative number of male progeny, would tend to become a specie characteristic. In addition, any decrease in the surplus male population, would reduce the frequency of male/male confrontations, and help to eliminate the risks of alerting predators -- to the existence of the specie communities.

African Ape Specie

If this general proposition is applied to the African ape specie, it suggests that the ancestors of the Gorilla enjoyed a more productive food source than the ancestors of the Chimpanzee. This accounts for the larger size of the Gorilla. However, the ancestors of the Gorilla, appear to have been subject to greater predation risks -- and this has led to the Gorilla's polygynous mating system. The differential proportion of female to male births, is three to one in the Gorilla specie, and the dominant males behave as predicted.

The Chimpanzee's habitat is much more variable, but the dominant females still create a joint territory with other subordinate females. As the food resources are more limited, the Chimpanzee is smaller than the Gorilla. However, its smaller size and weight, allows it to climb higher into the trees, and this reduces the risk of predation. Thus the total number of females in a typical Chimpanzee joint territory, can be much smaller than the total number of females in a typical Gorilla joint territory.

The female Chimpanzee hierarchy allows a similar male hierarchy to share their territory. However, the dominant female Chimpanzee manipulates the dominant male to prevent potentially damaging male/male confrontations. For example, the dominant female will move away from the main group, when she comes into oestrous. As a result, the increased aggression of the dominant male -- due to sexual stimulation, does not lead to any reduction in the total male complement within the joint territory.

This allows the dominant female to minimise her predation risks. However, if the males become too competitive for fond, she can simulate a 'false' oestrous - to increase the aggressiveness of the males, and thus reduce the number of males in the joint female territory. Likewise, the dominant female will drive out any adult females who threaten the overall food supply, or whose breeding cycle is similar to that of the dominant female. This produces the female trait of exogamy.

When a group of Chimpanzees forage for food, they may find a food source which exceeds the requirements of the foraging party itself. In such situations, the members of the foraging party will alert the other members of the Chimpanzee community by loud shouts, or screams.

It is proposed that this apparently 'altruistic' behaviour is a learned characteristic, which was originally initiated by nursing females. The female motivation for such behaviour would be to reduce the risks of predation - by increasing the number of individuals at the feeding site. This behaviour would eventually be copied by their young, and would thus become a general specie characteristic.

When the Chimpanzee female comes into oestrous, its bottom becomes more bulbous, and assumes a bright pink colour. As a result, the Chimpanzee males can perceive an oestrous female from some distance. If the female is immature, she will have no experience of this sexual state -- and will be unaware of its effect on the Chimpanzee males.

In such circumstances, the dominant Chimpanzee male, and the rest of the male hierarchy, will chase after such a female. The effect of the sexual stimuli upon the males will increase their general level of aggression. By contrast, the effect of the female breeding cycle on the female will increase her general level of tolerance.

In such circumstances, the dominant male will charge at the immature female -- in a state of high aggression, while the female will tend to turn her back to the male, or try to run away. This will increase the sexual stimuli, and consequently the degree of male aggression. After the dominant male has caught and mated the immature female, she will remain quite still -- paralysed with fear. Then, the other high ranking males will mate the female -- in order of hierarchy.

The number of males able to mate in this way, depends upon two factors, namely: the speed of each male's intromission and ejaculation, and the length of the dominant male's period of quiescence following his ejaculation. In this quiescent period, the male aggression is reduced by the hormonal changes which accompany the replenishment of the testes.

Thus, during this period, the tolerance of the dominant male increases and he will not interfere with the other males - while they are mating the female. Due to their increased degree of aggression, the high-ranking males will chase away any low-ranking males.

This short resume of the hominoidal mating systems - and their relationship to the general proposition on reproduction, is indicative of the sort of mating evolution which probably developed in the hominid species.

Hominid Mating

In this context, it is proposed that, initially, the proto-hominid specie would occupy an ecological niche which was similar to that of the present-day Chimpanzee specie. This reflects upon the initial transfer from the equatorial rain forest to the semi-equatorial forest. The move to a cooler, drier climate, would favour a general reduction in body size, so the proto-hominids would be similar in size to current Chimpanzee specie. In addition, they would have a similar 'fission-fusion' community structure, and a similarly variable, mating system.

When the hominid ancestor specie was forced into the subtropical region, the resultant evolution of the helpless baby would increase the perceived predation risk. This would tend to lead to a more polygynous type of mating system. As a result, the females would become smaller, and the degree of dimorphism would increase proportionately.

The transition to a more polygynous mating system would encourage the reduction of the hominid females' highly prominent, visual sexual stimuli. However, as the hominid female breasts started to evolve, the dominant female would be able to create a more subtle, 'false' oestrous by the simulation of a visual sexual stimuli, using her chest triangle.

Thus, the control of male aggression could be varied more efficiently. Furthermore, the balance of males and females, in the joint territory, could be optimised to suit any variations in environmental conditions.

The exact structural size, and degree of dimorphism in the hominid species, would vary with the quantity and quality of the food resource. Whenever the climate became warmer, the more temperate conditions would tend to increase the food resource, and this would lead to a proportionate increase in dimorphism. Paradoxically, the larger and stronger hominid communities, would tend to develop a reduced potential for adaptive adjustability.

This is because the polygynous mating systems tend to produce a more specialised structure and behaviour pattern. By contrast, the Chimpanzee-type of variable diet and mating system, would tend to maximise the organic and behavioural variability of the hominids. This is why the hominid 'advances' in evolution, always tend to come from the smaller and slighter, hominid variant specie.

The evolution of the hominid specie's helpless babies led to yet further variations in the specie mating systems. These are related in the following chapter.