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Competitive Exams: Evolution Time Scale: Miocene Period

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In the Miocene period we find a great expansion of the monkeys. These in turn enter the scene quite suddenly, and the authorities are reduced to uncertain and contradictory conjectures as to their origin. Some think that they develop not from the femurs, but along an independent line from the Insectivores, or other ancestors of the Primates. We will not linger over these early monkeys, nor engage upon the hopeless task of tracing their gradual ramification into the numerous families of the present age. It is clear only that they soon divided into two main streams, one of which spread into the monkeys of America and the other into the monkeys of the Old World. There are important anatomical differences between the two. The monkeys remained in Central and Southern Europe until near the end of the Tertiary. Gradually we perceive that the advancing cold is driving them further south, and the monkeys of Gibraltar to-day are the diminished remnant of the great family that had previously wandered as far as Britain and France.

A third wave, also spreading in the Miocene, equally obscure in its connection with the preceding, introduces the man-like apes to the geologist. Primitive gibbons (*Pliopithecus* and *Pliobylobates*), primitive chimpanzees (*Palaeopithecus*), and other early anthropoid apes (*Oreopithecus*, *Dryopithecus*, etc.) lived in the trees of Southern Europe in the second part of the Tertiary Era. They are clearly disconnected individuals of a large and flourishing family, but from the half-dozen specimens we have yet discovered no conclusion can be drawn, except that the family is already branching into the types of anthropoid apes which are familiar to us.

Of man himself we have no certain and indisputable trace in the Tertiary Era. Some remains found in Java of an ape-man (*Pithecanthropus*), which we will study later, are now generally believed, after a special investigation on the spot, to belong to the Pleistocene period. Yet no authority on the subject doubts that the human species was evolved in the Tertiary Era, and very many, if not most, of the authorities believe that we have definite proof of his presence. The early story of mankind is gathered, not so much from the few fragments of human remains we have, but from the stone implements which were shaped by his primitive intelligence and remain, almost imperishable, in the soil over which he wandered. The more primitive man was, the

more ambiguous would be the traces of his shaping of these stone implements, and the earliest specimens are bound to be a matter of controversy. It is claimed by many distinguished authorities that flints slightly touched by the hand of man, or at least used as implements by man, are found in abundance in England, France, and Germany, and belong to the Pliocene period. Continental authorities even refer some of them to the Miocene and the last part of the Oligocene.

Evolution of Human

The question whether an implement-using animal, which nearly all would agree to regard as in some degree human, wandered over what is now the South of England (Kent, Essex, Dorsetshire, etc.) as many hundred thousand years ago as this claim would imply, is certainly one of great interest. But there would be little use in discussing here the question of the "Eoliths," as these disputed implements are called. A very keen controversy is still being conducted in regard to them, and some of the highest authorities in England, France, and Germany deny that they show any trace of human workmanship or usage. Although they have the support of such high authorities as Sir J. Prestwich, Sir E. Ray Lankester, Lord Avebury, Dr. Keane, Dr. Blackmore, Professor Schwartz, etc. they are one of those controverted testimonies on which it would be ill-advised to rely in such a work as this.

We must say, then, that we have no undisputed traces of man in the Tertiary Era. The Tertiary implements which have been at various times claimed in France, Italy, and Portugal are equally disputed; the remains which were some years ago claimed as Tertiary in the United States are generally disallowed; and the recent claims from South America are under discussion. Yet it is the general feeling of anthropologists that man was evolved in the Tertiary Era. On the one hand, the anthropoid apes were highly developed by the Miocene period, and it would be almost incredible that the future human stock should linger hundreds of thousands of years behind them. On the other hand, when we find the first traces of man in the Pleistocene, this development has already proceeded so far that its earlier phase evidently goes back into the Tertiary. Let us pass beyond the Tertiary Era for a moment, and examine the earliest and most primitive remains we have of human or semi-human beings.

The first appearance of man in the chronicle of terrestrial life is a matter of great importance and interest. Even the least scientific of readers stands, so to say, on tiptoe to catch a first glimpse of the earliest known representative of our race, and half a century of discussion of evolution has engendered a very wide interest in the early history of man. *

Patriarchal Bones

Fortunately, although these patriarchal bones are very scanty--two teeth, a thigh-bone, and the skull-cap--we are now in a position to form some idea of the nature of their living owner. They have been subjected to so searching a scrutiny and discussion since they were found in Java in 1891 and 1892 that there is now a general agreement as to

their nature. At first some of the experts thought that they were the remains of an abnormally low man, and others that they belonged to an abnormally high ape. The majority held from the start that they belonged to a member of a race almost midway between the highest family of apes and the lowest known tribe of men, and therefore fully merited the name of "Ape-Man" (Pithecanthropus) . This is now the general view of anthropologists.

The Ape-Man of Java was in every respect entitled to that name. The teeth suggest a lower part of the face in which the teeth and lips projected more than in the most ape-like types of Central Africa. The skull-cap has very heavy ridges over the eyes and a low receding forehead, far less human than in any previously known prehistoric skull. The thigh-bone is very much heavier than any known human femur of the same length, and so appreciably curved that the owner was evidently in a condition of transition from the semi-quadrupedal crouch of the ape to the erect attitude of man. The Ape-Man, in other words, was a heavy, squat, powerful, bestial-looking animal; of small stature, but above the pygmy standard; erect in posture, but with clear traces of the proneness of his ancestor; far removed from the highest ape in brainpower, but almost equally far removed from the lowest savage that is known to us. We shall see later that there is some recent criticism, by weighty authorities, of the earlier statements in regard to the brain of primitive man. This does not apply to the Ape-Man of Java. The average cranial capacity (the amount of brain-matter the skull may contain) of the chimpanzees, the highest apes, is about 600 cubic centimetres. The average cranial capacity of the lowest races of men, of moderate stature, is about 1200. And the cranial capacity of Ape-Man was about 900

It is immaterial whether or no these bones belong to the same individual. If they do not, we have remains of two or three individuals of the same intermediate species. Nor does it matter whether or no this early race is a direct ancestor of the later races of men, or an extinct offshoot from the advancing human stock. It is, in either case, an illustration of the intermediate phase between the ape and man. The more important tasks are to trace the relationship of this early human stock to the apes, and to discover the causes of its superior evolution.

Relationship to the Anthropoid Apes

The first question has a predominantly technical interest, and the authorities are not agreed in replying to it. We saw that, on the blood-test, man showed a very close relationship to the anthropoid apes, a less close affinity to the Old World monkeys, a more remote affinity to the American monkeys, and a very faint and distant affinity to the lemurs. A comparison of their structures suggests the same conclusion. It is, therefore, generally believed that the anthropoid apes and man had a common ancestor in the early Miocene or Oligocene, that this group was closely related to the ancestral group of the Old World monkeys, and that all originally sprang from a primitive and generalised lemur-group. In other words, a branch of the earliest lemur-like forms diverges, before the specific lemur-characters are fixed, in the direction of the monkey;

in this still vague and patriarchal group a branch diverges, before the monkey-features are fixed, in the direction of the anthropoids; and this group in turn spreads into a number of types, some of which are the extinct apes of the Miocene, four become the gorilla, chimpanzee, orang, and gibbon of to-day, and one is the group that will become man. To put it still more precisely, if we found a whole series of remains of man's ancestors during the Tertiary, we should probably class them, broadly, as femur-remains in the Eocene, monkey-remains in the Oligocene, and ape-remains in the Miocene. In that sense only man "descends from a monkey."

The far more important question is: How did this one particular group of anthropoid animals of the Miocene come to surpass all its cousins, and all the rest of the mammals, in brain-development? Let us first rid the question of its supposed elements of mystery and make of it a simple problem. Some imagine that a sudden and mysterious rise in intelligence lifted the progenitor of man above its fellows. The facts very quickly dispel this illusion. We may at least assume that the ancestor of man was on a level with the anthropoid ape in the Miocene period, and we know from their skulls that the apes were as advanced then as they are now. But from the early Miocene to the Pleistocene is a stretch of about a million years on the very lowest estimate. In other words, man occupied about a million years in travelling from the level of the chimpanzee to a level below that of the crudest savage ever discovered. If we set aside the Java man, as a possible survivor of an earlier phase, we should still have to say that, much more than a million years after his departure from the chimpanzee level, man had merely advanced far enough to chip stone implements; because we find no other trace whatever of intelligence than this until near the close of the Palaeolithic period. If there is any mystery, it is in the slowness of man's development.

Let us further recollect that it is a common occurrence in the calendar of life for a particular organ to be especially developed in one member of a particular group more than in the others. The trunk of the elephant, the neck of the giraffe, the limbs of the horse or deer, the canines of the satire-toothed tiger, the wings of the bat, the colouring of the tiger, the horns of the deer, are so many examples in the mammal world alone. The brain is a useful organ like any other, and it is easy to conceive that the circumstances of one group may select it just as the environment of another group may lead to the selection of speed, weapons, or colouring. In fact, as we saw, there was so great and general an evolution of brain in the Tertiary Era that our modern mammals quite commonly have many times the brain of their Tertiary ancestors. Can we suggest any reasons why brain should be especially developed in the apes, and more particularly still in the ancestors of man?

The Primate group generally is a race of tree-climbers. The appearance of fruit on early Tertiary trees and the multiplication of carnivores explain this. The Primate is, except in a few robust cases, a particularly defenceless animal. When its earliest ancestors came in contact with fruit and nut-bearing trees, they developed climbing power and other means of defence and offense were sacrificed. Keeness of scent and range of hearing

would now be of less moment, but sight would be stimulated, especially when soft-footed climbing carnivores came on the scene. There is, however, a much deeper significance in the adoption of climbing, and we must borrow a page from the modern physiology of the brain to understand it.

The stress laid in the modern education of young children on the use of the hands is not merely due to a feeling that they should handle objects as well as read about them. It is partly due to the belief of many distinguished physiologists that the training of the hands has a direct stimulating effect on the thought-centres in the brain. The centre in the cerebrum which controls the use of the hands is on the fringe of the region which seems to be concerned in mental operations. For reasons which will appear presently, we may add that the centres for controlling the muscles of the face and head are in the same region. Any finer training or the use of the hands will develop the centre for the fore limbs, and, on the principles, may react on the more important region of the cortex. Hence in turning the fore foot into a hand, for climbing and grasping purposes, the primitive Primate entered upon the path of brain-development. Even the earliest Primates show large brains in comparison with the small brains of their contemporaries.

Adaptation

It is a familiar fact in the animal world that when a certain group enters upon a particular path of evolution, some members of the group advance only a little way along it, some go farther, and some outstrip all the others. The development of social life among the bees will illustrate this. Hence we need not be puzzled by the fact that the lemurs have remained at one mental level, the monkeys at another, and the apes at a third. It is the common experience of life; and it is especially clear among the various races of men. A group becomes fitted to its environment, and, as long as its surroundings do not change, it does not advance. A related group, in a different environment, receives a particular stimulation, and advances. If, moreover, a group remains unstimulated for ages, it may become so rigid in its type that it loses the capacity to advance. It is generally believed that the lowest races of men, and even some of the higher races like the Australian aboriginals, are in this condition. We may expect this "unteachability" in a far more stubborn degree in the anthropoid apes, which have been adapted to an unchanging environment for a million years.

All that we need further suppose is--and it is one of the commonest episodes in terrestrial life--that one branch of the Miocene anthropoids, which were spread over a large part of the earth, received some stimulus to change which its cousins did not experience. It is sometimes suggested that social life was the great advantage which led to the superior development of mind in man. But such evidence as there is would lead us to suppose that primitive man was solitary, not social. The anthropoid apes are not social, but live in families, and are very unprogressive. On the other hand, the earliest remains of prehistoric man give no indication of social life. Fire-places, workshops, caves, etc. enter the story in a later phase. Some authorities on prehistoric man hold

very strongly that during the greater part of the Old Stone Age (two-thirds, at least, of the human period) man wandered only in the company of his mate and children.

We seem to have the most plausible explanation of the divergence of man from his anthropoid cousins in the fact that he left the trees of his and their ancestors. This theory has the advantage of being a fact--for the Ape-Man race of Java has already left the trees--and providing a strong ground for brain-advance. A dozen reasons might be imagined for his quitting the trees--migration, for instance, to a region in which food was more abundant, and carnivores less formidable, on the ground-level--but we will be content with the fact that he did. Such a change would lead to a more consistent adoption of the upright attitude, which is partly found in the anthropoid apes, especially the gibbons. The fore limb would be no longer a support of the body; the hand would be used more for grasping; and the hand-centre in the brain would be proportionately stimulated. The adoption of the erect attitude would further lead to a special development of the muscles of the head and face, the centre for which is in the same important region in the cortex. There would also be a direct stimulation of the brain, as, having neither weapons nor speed, the animal would rely all the more on sight and mind. If we further suppose that this primitive being extended the range of his hunting, from insects and small or dead birds to small land-animals, the stimulation would be all the greater. In a word, the very fact of a change from the trees to the ground suggests a line of brain-development which may plausibly be conceived, in the course of a million years, to evolve an Ape-Man out of a man-like ape. And we are not introducing any imaginary factor in this view of human origins.

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