

Primate Characteristics

1. Pentadactylism (5 digits)
2. Flat nails (replace claws)
3. Prehensile hands and feet
4. Power and precision grip
5. Erect bodies
6. De-emphasis on smell (olfaction)
7. Improved vision (color, binocular, stereoscopic)
8. Lengthening of prenatal/postnatal cycles
9. Increasing behavior complexity
10. Teeth

Arboreal Theory

- 1) improved vision/ tactileness/eye-hand coordination
- 2) de-emphasis on smell
- 3) limbs for tree climbing

visual predation theory (Cartmill)

flowering plants (angiosperms) and insects

Vision

large eye sockets enclosed by a continuous postorbital bony enclosure (post-orbital closure)

eyes placed forward

1. cone type retina
2. overlapping visual fields: frontality of the orbits (orbital convergence)
3. incomplete decussation (crossing-over) of the optic nerve fibers.

retina cells: rods and cones

optic nerve

macula lutea and fovea

Hearing

Primate brains

greatly expanded cerebral (cerebrum) cortex for analysis and synthesis of sensory impressions and transforming them into appropriate (motor) behavior appropriate to the environment.

Occipital lobe: visual cortex (for analysis of visual images)

lunate or simian sulcus

Temporal lobe (auditory cortex, storage of visual and auditory memories, and the impulses from the other areas of the cortex; consciousness)

Frontal and parietal lobes

prefrontal lobe

motor and somatic sensory cortex (between frontal and parietal lobes)

association cortex: intracortical connections from three sensory areas of the brain (auditory, somatic and visual)

inferior posterior parietal region: one of the major speech areas

Mammalian Traits

1. constant body temperature
2. well formed and differentiated teeth
3. pectoral nipples
4. females give birth to live offspring by virtue of possessing a placenta.

Primate Characteristics

1. Fingernails
2. Opposable thumbs and/or big toes (power grip/precision grip)
3. Relatively and absolutely large brains
4. Characteristic dental specializations (incisor, canine, premolar and molar)
5. Stereoscopic vision (orbits enclosed with bone)
6. Color vision
7. Semi-erect, bipedal or quadrupedal posture
8. Prehensile hands or feet
9. Large clavicles

Evolutionary Trends of Orders (LeGros Clark, 1959:42)

1. Preservation of generalized limb structure, 5 digits on hand and foot, and retention of the clavicle.
2. Enhances digital mobility, especially the thumb and big toe.
3. Replacement of claws with nails.
4. Progressive abbreviation of snout.
5. Elaboration of visual apparatus, with binocular vision in most forms.
6. Reduction of sense of smell.
7. Modification of teeth, including development of a simple cusp pattern on molars.
8. Expansion and elaboration of brain, especially the cerebral cortex.
9. Improved gestational nourishment of the fetus.
10. Reduction of litter, longer period of learning.
11. Longer life expectancy.
12. Social grouping.

Features that Define the Primates (Martin, 1990)

1. The big toe on the foot is opposable, and hands are prehensile. The opposable big toe has been lost in humans.
2. There are flat nails on the hands and feet in most species, instead of claws, and there are sensitive tactile pads with "finger prints" on fingers and toes.
3. Locomotion is hindlimb dominated, and the center of gravity is nearer the hindlimb than forelimbs.
4. There is an unspecialized olfactory (smelling) apparatus that is reduced in diurnal primates.
5. The visual sense is highly developed. The eyes are large and moved forwards in the head, providing stereoscopic vision.
6. Females have similarities, and gestation and juvenile periods are longer than in other mammals of similar size.
7. The brain is large compared with the brains of similarly size mammals, and it has a number of unique anatomical features.
8. The molars are relatively unspecialized, and there is a maximum of 2 incisors, 1 canine, 3 premolars, and 3 molars each in half of the upper and lower jaw.
9. There are a number of other subtle anatomical characteristics that are useful to systematists but are hard to interpret functionally.

(Martin, R.D. 1990 *Primate Origins and Evolution: A Phylogenetic Analysis*. Princeton Univ. Press, Princeton, NJ)

Definition of a Primate

Unguiculate, clavicate, placental mammals, with orbits encircled by bone; three kinds of teeth, at least at one time of life; brain always with a posterior lobe and calcarine fissure; the innermost digit of at least one pair of extremities opposable; hallux with a flat nail or none; a well developed caecum; penis pendulous; testes scrotal; always two pectoral mammae. (Mivart 1873)

Unguiculate - possessing nails, hooves or claws

Clavicate - possessing a clavicle (collar bone)

Limb anatomy and locomotion

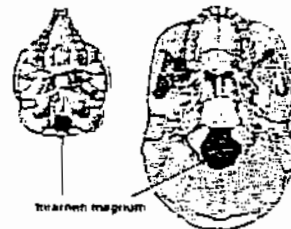
1. vertical clinger & leapers
2. quadrupedalism
3. brachiation e.g., gibbon
4. bipedalism

Other Features:

- well formed clavicles
- 5 digits (pentadactyl)
- universal ball and socket joint
- more stable elbow and knee joint
- a two-bone forearm and leg

Hands of Primates:

- Prehensility
- Opposability of the thumb (& big toe)
- Nails replace claws
- Plantar pads are ridged
- Rich supply of nerve endings
- Foot



Human Bipedalism

pelvic region has been realigned

skull balanced on the vertebral column (foramen magnum is at center of the base of the skull).

foot: specialized weight supporter