PRIMATA

INTRODUCTION
Linnaeus chose the name Primates ("first ones"), and he had the courage to include humans. There are close to two hundred living species in the Order Primates. Representatives of this group can be found in most zoo collections. In fact, the statement could be made that every zoo has primates either in an exhibit, taking care of an exhibit, or visiting an exhibit.

There are three major types of non-human primates: prosimians, monkeys, and apes. An additional way primates are identified is by their nose type and geographical location, shown here by the two sub-orders:

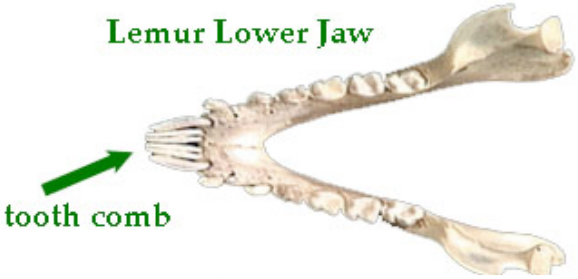
1. **Strepsirhini** (primates with nose leather, "wet-nosed") All species in this sub-order have a moist nose that is fused with the upper lip, which results in a face with a limited range of expression. All strepsirrhines are prosimians.
    - **Lemuriformes** (Madagascar prosimians – Old World): mouse lemurs, true lemurs, pro-lemurs, indris, aye aye, sifakas, and indris
    - **Lorisiformes** (non-Madagascar prosimians – Old World): Lorises, pottos, galagos
    -
2. **Haplorhini** (primates without nose leather, "dry-nosed")
    - **Tarsiiformes** (dry-nosed prosimian – Old World) tarsiers
    - **Platyrrhini** (broad-nosed monkeys – New World)
        - **Cebidae**: owl monkey, squirrel monkey, titis, sakis, howlers, spider monkey, and capuchins
        - **Callithricidae**: marmosets and tamarins
        - **Callimiconidae**: callimicos
    - **Catarrhini** (narrow nosed monkeys and apes – Old World)
        - **Cercopithecoidea** (tailed Old World monkeys)
            - **Cercopithecine**: macaques, baboons, mangabeys, guenons
            - **Colobine**: langurs, colobus, proboscis, guerezas
        - **Hominoidea** (human-like apes) gibbons, orangutans, gorilla, chimpanzee, human

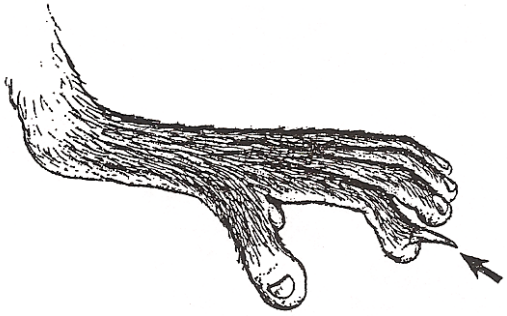
Characteristics Specific to the Type of Primates

PROSIMIANS
Prosimians means "before monkeys" and show many, but not all, of the characteristics of monkeys. Like monkeys, they have flat nails and fleshy pads on most digits. First fingers and toes are opposable. However, unlike monkeys, they have a claw (used for grooming) on the second toe, and their skulls have many characteristics like insectivores, such as pointed snouts. They have a more developed sense of smell than monkeys. A keen sense of smell is helpful to nocturnal terrestrial animals like prosimians, while a more developed sense of vision

is helpful to arboreal, diurnal animals like monkeys. They have prominent whiskers. Generally, they have definite breeding season. Their eyes, which are used for orientation and searching for food, are noticeably large (adapted for nocturnal vision); their sense of hearing is well developed. The tail is generally long and bushy. Most have a dental grooming comb. In behavior, there is a good deal of diversity. Most are good climbers and leapers. Females are dominant in all lemur species and have their own hierarchy within the group. There are six families of prosimians, and all are Old World primates.

Prosimians are considered less complex than monkeys and apes and have characteristics that are primitive in comparison:





- Reduced brain size
- Olfactory lobes of the brain are larger than that in Haplorrhines, which shows a greater reliance on smell as a sense.
- They have a rightly cluster incisors and canines in the mandible, which form the "dental comb" used in grooming.
- Feet of prosimians have two distinct anatomical specializations (see photo):
    i. The big toe is widely separated from other toes, allowing for a secure grip during locomotion.
    ii. The second toe has a distinctive grooming claw. The other toes have nails. The exception is the aye-aye, which has claws on toes 2 through 5.
- Most prosimians have relatively large eyes, and on the back of the retina majorities have a high reflective layer called the **tapetum**. The tapetum acts to intensify light that comes into the eye at night. This is more common in the nocturnal prosimians, which make up about seventy five percent of Strepsirrhines.
- Reproduction with prosimians is unique compared with Haplorrhines.
    i. All prosimians have a breeding season rather than individual cycles.
    ii. Many have litters of offspring as well as multiple nipples (ruffed lemurs).

MONKEYS

Like prosimians, but unlike apes, monkeys have tails. They have flat nails on their digits, although in the marmosets and tamarins, the nails are claw-like. Opposition of thumbs and big toes is of varied degrees, but generally they are better graspers than prosimians and not quite as good as apes. Their limbs are of roughly equal length. Their shoulders do not rotate which means they are leapers, runners and climbers rather than brachiators. They have a more developed sense of vision than prosimians. Monkeys do not have the dental grooming comb of the prosimians. Their eyes face forward and are adapted to diurnal vision, their heads are rounded, and most have a short muzzle, as opposed to the prosimians. They do not have whiskers. Old world monkeys and lesser apes have **ischial callosities,** which are specialized tissue pads on their rumps otherwise known as "sitting pads". Virtually all live in social communities, while some prosimians are solitary. The females are more tolerant of each other than in prosimian groups. Groups are stable over generations, regardless of the deaths of individuals, while ape groups may break up upon a leader's death, or change composition at times. Generally, male monkeys must leave the group upon adulthood. There are four families of monkeys, two Old World families and two New World families.

APES

Unlike prosimians and monkeys, apes have no tail, and little or no ischial callosities. They have no claws, only flat nails, on their digits. Thumbs and big toes are very opposed. Forelimbs are longer than rear limbs. Noses are flat and they have no muzzle, although the jaw protrudes. Shoulders rotate for full brachiation, but overall the body is thicker and does not bend as much as monkeys'. Groups may not be stable over generations. Social organization is looser, probably because they have less need for group defense. There are two families of apes, both in the Old World.

EVOLUTION OF THE ORDER

The fossil record indicates that primates have been around for some 70 million years. The earliest primate diverged from a primitive form of insectivore at a time when many of the placental mammals were in their incipient stages of evolution. The taxonomy of the primates today includes several **grades** (a grade is composed of animals that share an evolutionary past and today share similarities in anatomy and behavior). The variety of living forms within the primate group actually reflects the different stages of primate evolution.

Although there have been numerous species extinctions along each line, there is at least one and usually many representative types of each grade still in existence today. The early lemur-like creatures provided the ancestral stock for the next grade of primate evolution, the tarsiers. Some forms of lemur, however, continued to evolve as lemurs. Once again, each grade in primate evolution provided the evolutionary foundation for the next while, at the same time, each grade also produced animals which continued to evolve within the grade each grade also produced animals which continued to evolve within the grade (Fig. 1). For us, one of the key advantages of displaying a variety of primates in a zoo collection is that they reflect the images of the past. This is an incredible asset when planning an education program for the public.

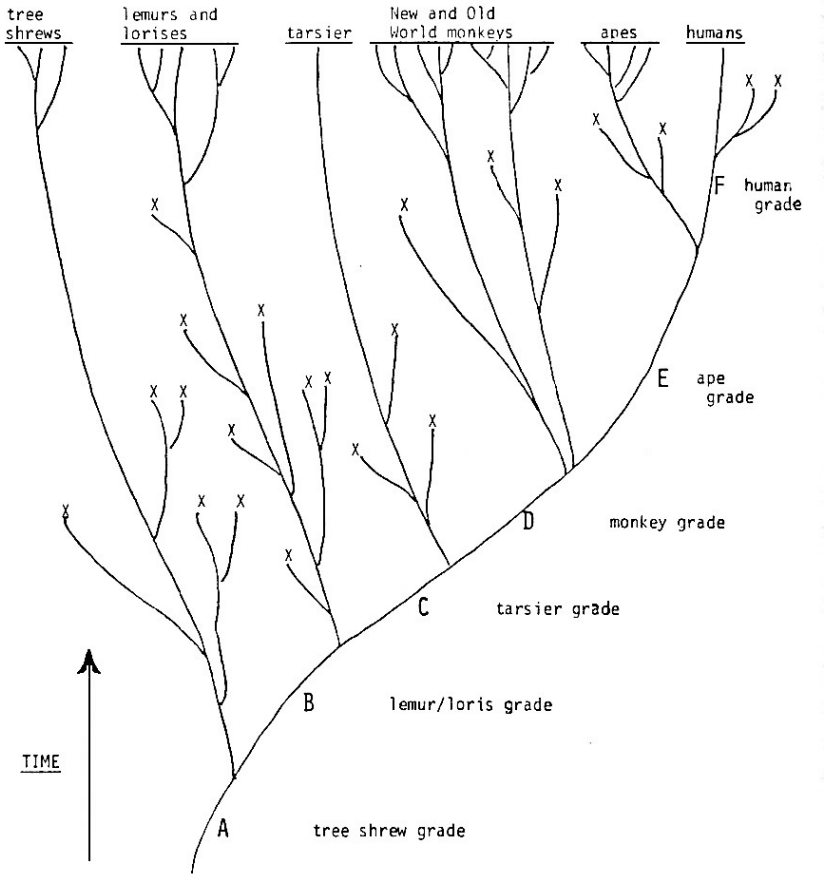


Figure 1: the evolution of the modern primates. The designations A, B, C, etc., refer to grades. A grade is typically composed of many species, which share a common origin. The members of a grade are usually similar in general appearance and behavior.

EVOLUTIONARY GRADES OF THE ORDER PRIMATA

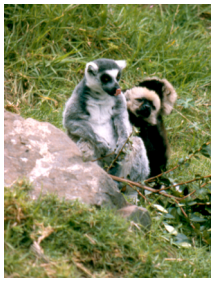
Tree Shrews

The tree shrews of Southeast Asia may be similar to some of the very earliest primates after the divergence from the insectivore group. The tree shrew is a small, arboreal creature with a long snout, claws on the digits, and eyes on the side of the head. The overall physical appearance of the animal is not what you would expect for a primate. Some scientists, however, have suggested that they be included in the Order based on a few internal anatomical similarities. Regardless (as one author put it, the tree shrew doesn't care), this small Asian animal presents in physical appearance, behavior, and interaction with the environment a very good image of what the original primate was like.

Lemurs & Lorises

From the original primate group there evolved a large number of primates of the next grade, (lemurs & lorises). During the Eocene, 40 to 50 million years ago, there was a temporary reversal in the cooling trend, which had contributed to the large number of reptilian extinctions in the Mesozoic allowed the tropical forest to once again expand. Early primates among other life forms radiated to fill many of the arboreal niches. There were many more species of lemur and Loris during the Eocene than presently exist. Most of these forms ended in extinction while others continued to evolve to the present time.



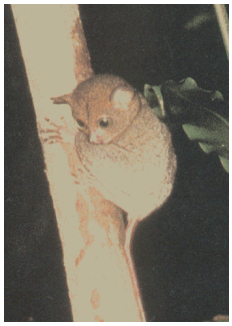
The ancestral stock of modern day lemurs came to live on the island of Madagascar off the African coast. The competition in an island ecosystem is often less intense as there are fewer types of animals trying to make a living. In this case, the lemurs diversified to fill a number of niches. Some are nocturnal while others are diurnal. Some are highly social while others are solitary. Some are arboreal in their habits while others spend more time on the ground. Most are relatively small, but a recent extinct form of lemur may have weighed more than 100 pounds. The diversity displayed by the lemurs does not take away from their basic nature as primates.

Closely related to the lemurs are the lorises. Today they are located in the forests of Africa and the Far East. They all are nocturnal, thus avoiding much of the competition for food and space by diurnal forest dwellers. The lorises, like the lemurs, display a number of primate qualities such as a good grasping hand, nails on some of the digits, and relatively good depth perception. All of these qualities serve the lemurs and lorises well today, just as they did 50 million years ago in Eocene forests.

Each grade possesses qualities that define it as a primate thus creating a common bond. In addition, each line evolving within a grade has developed points of distinction as it has been fine tuned by natural selection to its environmental niche. In the end, each of the primate

species can be dissected and defined as a primate overall while remaining a unique species unto itself.

Tarsiers



The next grade in primate evolution is occupied by the tarsier. This small animal lives in several island communities in Southeast Asia. While consisting of a single genus today, in the Eocene there were more than 30 genera ranging from North America, Asia and Europe. The tarsier evolved from an early member of the lemur / loris group and shared a similar arboreal position during the heyday of these prosimian primates. Qualities of the teeth, large size of the ears, and rather simple social behavior link the lemur, loris, and tarsier together as a suborder within the primates.

The tarsier does however reveal some interesting traits, which makes it a good transitional grade between the prosimians and the higher anthropoid primates (monkeys, apes and humans). Included in this list are: a larger brain size (relative to body size) than the lemur / loris group, eye orbits completely enclosed by bone and positioned to the front of the skull, absence of a moist rhinariun (nose), and a bony ear canal more reflective of monkeys than lemurs. This small nocturnal primate with its large eyes and quick jumping movements from branch to branch creates for us the impression of an abundant group of primates from the distant past. Out of the tarsier grade, about 30 million years ago, evolved the earliest members of the monkey group.

Monkeys

The monkeys comprise approximately 75% of the living species of primates. They are found living in tropical and subtropical areas around the world. Taxonomically, there are two super-families, the New World monkeys (Ceboidea) and the Old World monkeys (Cercopithecoidea). Many scientists have come to the opinion that the two super-families evolved from a common monkey ancestor in Africa. The stock for the New World monkeys, soon thereafter, made its way by island hopping and rafting to South America region. (Remember that Africa and South America were once connected, slowly drifted apart, and were closer to one another 30 million years ago than at present.

Once in place, the ancestral groups for the New World and Old World monkeys evolved down through time in isolation from one another. Although remaining within the monkey grade of organization, the two groups evolved some distinguishing differences including the number of teeth, shape of the nose, and the configuration of the bones of the skull.

The sixty-four species of New World monkeys are all arboreal in their habits. Leaves, shoots, bark, fruit, eggs, insects, and other forest items contribute to their diets. Most move quadrupedally on the branches, while some species frequently use their arms for branch swinging (brachiating) and even their tail as a grasping (prehensile) fifth limb. The social groupings vary from species to species, but overall the intensity of social organization,

maternal care, peer-group play by the young, and group cohesiveness are all more significant than in most prosimian primates.

The Old World monkeys live in a wider range of climatic conditions than any other primate, except humans. (Our wider distribution is more a function of cultural adaptation than any other factor). The taxonomic family of Old World monkeys is subdivided into two sub-families: Cercopithecinae and Colobinae. Each subfamily has representative species in Africa, India and the Far East. The colobine forms are often referred to as leaf-eating monkeys. They have evolved a specialized diet of high cellulose leaves and associated traits such as high-crowned molars, a sacculated, and an elongated intestinal tract to process the food.

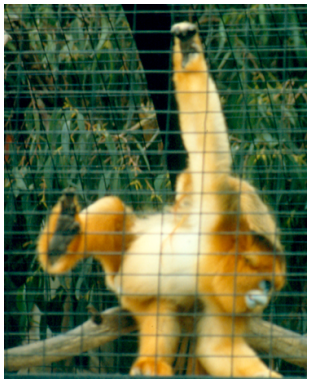


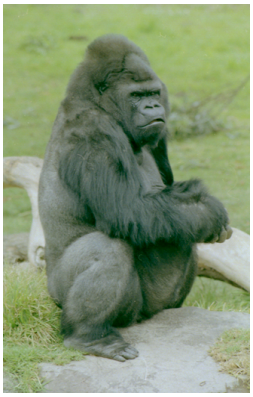

In comparison, the cercopithecine monkeys are more generalized omnivores. The species which make up this subfamily exploit a wider range of ecosystems than colobine monkeys. In Africa and Asia they can be found on the forest floor or in the tree canopy, on the savanna grassland, in semiarid desert, or on a northerly, snow covered Japanese island. Cercopithecidae also have notable visual acuity. In fact, the mangabeys may have better color vision than humans. An accompanying characteristic is a variety of colorations including reddening of female genital areas, red faces, red chest patches, blue buttocks and scrota, blue faces and distinctive infantile skin and fur colorings. Their varied anatomical specializations and their highly successful social life make the cercopithecine monkeys a good model for the type of animal gave rise to the next primate grade, the apes.

Apes

The fossils record an African origin for the ape line. In retrospect, the original ape group diverged from their monkey ancestors primarily because they came to exploit more intensively one particular forest food resource, fruit. There were also changes in dentition because of the change in diet. As a consequence, a fossil hunter can distinguish the molar tooth of a monkey from that of an ape.

Many other diagnostic features of the early ape group can be related to a specifically ape-like form of locomotion. Swinging with the arms under the branches rather than walking on top with all four limbs became for the apes a very effective means of acquiring fruit on the outer ‘reaches’ of the tree. In contrast to other primates, the apes, like humans, have a mobile shoulder ball-and-socket joint, which permits them to do this hand-over-hand swinging, also known as **brachiation**.



Today, there are 13 species in four genera of contemporary apes. The gorilla and chimpanzee lines evolved in the forest of Africa. The ancestors of the Asian apes migrated out of Africa million of years ago. They became the stock from which the orangutans and gibbons of today are derived. Since the origin of the early apes, each genus has diverged along its own separate course of evolution. For example, as the primates adapted to their own niches, the modification of their arms played an important part in the diversity of their locomotion. All the apes have arms that are relatively longer than those of either humans or monkeys, in comparison with the length of their body. The apes' arms are by no means similar to other species. If one visualizes the animal standing erect in the human manner, the result is as shown here:

Species	Fingers reach to:	Usual mode of movement
Gibbon	Ground	Free aerial brachiation
Orangutan	Ankles	Deliberate brachiation
Chimpanzee	Calves	Arboreal and terrestrial, quadrupedal
Gorilla	Knees	Arboreal and terrestrial, quadrupedal
Humans	Mid-thighs	Terrestrial, bipedal

Note: the animals with the longer arms also have shorter legs and vice versa.

The apes of ten million years ago were well adapted forest specialist. They concentrated on one type of food resource and moved through the trees in quite a unique way for primates. They were no doubt, more intelligent than the monkeys, which shared their ecosystem. They were better at solving problems and maybe even exploited the advantages of imitation learning in teaching their young and symbolic thinking in ordering their world (extrapolations based upon behavioral studies of living apes).

The chimpanzee, gorilla, orangutan, and gibbon each occupy a rather unique spot in the zoo collection. As with the humans in past centuries, the uninitiated zoo visitor appreciates quite intuitively that these animals are somewhat different from the rest. There is a kindred spirit, a commonality, which may reach out from a facial expression, from awareness of the mother infant bond, or by observing the manipulation of the physical environment. We have reached the link and now can appreciate what people have been trying to appreciate for a long time. Although the modern apes are different from those of 10 million year ago, the message still comes through. The fossils and the living faces both tell us that we share a very close bond with these animals, both generally and socially.

Humans

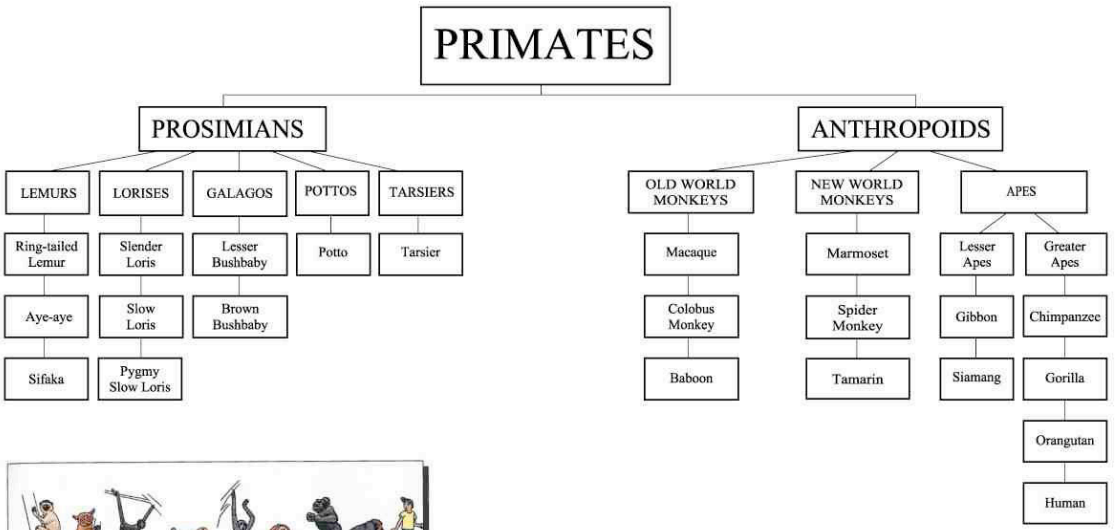
Approximately 10 million years ago in Africa one type of ape began to do things differently. Living more on the ground, exploiting a wider range of dietary items, and moving from the forests to the open grasslands, this ape became the precursor to a new line in primate evolution. The human line retained the ape-like trunk and long arms, but developed a new and unique form of locomotion called bipedalism. There was also a gradual reduction in the size of the ape dentition as well as a progressive threefold increase in the size of the brain.

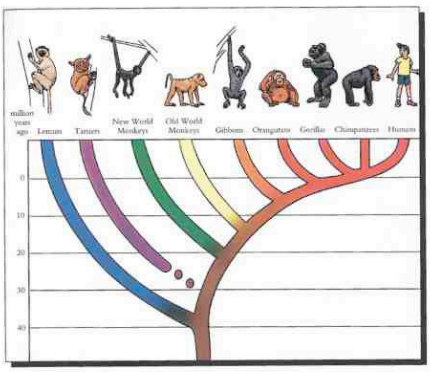



All primate grades show distinctive evolutionary characteristics: Lemurs have a dental comb; spider monkeys make good use of a prehensile tail while gibbons have a graceful swing. In this respect the human grade is no exception, for example we have inherited from earlier members of the human grade the unique ability to communicate with spoken language.

Although we are distinct, the qualities, which link the primates together as an order still shine through. We fortunately have been given the added human distinction of being able to truly appreciate the significance of our commonality, our bond with our past and present relatives.

Primate Evolution





The primate family includes lemurs, monkeys, apes and humans. Primates share certain traits, but over millions of years primates have adapted and evolved into the various forms you see today.

Duke LEMUR CENTER
Studying & Caring for Lemurs

TRENDS IN PRIMATE EVOLUTION

Primates lack any major specializations that would set them clearly apart from other animals. To define the Order Primates, we must rely on a series of trends, which display a progressive elaboration through the different grades of primate evolution. These trends were initiated by the adaptations to their arboreal lifestyle. These three factors provided both the opportunity and the ability to learn as you grew. Primates depend on learning for survival more than any other group of animals.

1. **Locomotion in the trees**:
    a. Retention of the basic mammalian limb pattern of four limbs with five digits on each.
    b. Expanded flexibility of the digits to facilitate a strong prehensile grip.
    c. Opposition of the large digit to the other digits for grasping power.
    d. Replacement of the mammalian claw with a flattened nail, in order to expand the terminal tactile surface for a better sense of touch.
2. **Senses in the trees**:
    a. Gradual reduction in the sensitivity of the sense of smell with a corresponding reduction in the size of the nasal region.
    b. Reduction in the brain's discriminatory power for olfaction while expanding the power for vision.
    c. Movement of the eyes to the eyes to the front of the skull to increase the field of binocular vision and, as a result, depth perception.
    e. Development of color vision to aid visual discrimination in low light forest condition.
3. **Flexibility in behavior**:
    a. Expansion in the size and complexity of the brain, especially learning areas.
    b. Lengthening of the various life periods, especially the infant and juvenile stages.
    c. More emphasis on the survival of each primate offspring; growth within the security provided by a social group.

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General Characteristics of the Order Primata

Physical Adaptations

This order is so large and has radiated into many habitats and niches. Their adaptability results from a generalized skeleton and the flexibility to adopt very specialized behavior.

Primates are adapted to life in the trees. Only humans (and maybe the gelada, *Theropithecus gelada*) have abandoned this way of life. Many primate adaptations are related to arboreal life and are also related to hand-eye coordination, which is a unifying characteristic of primates.

Skeleton and other structural adaptations

Most primates have five digits on each hand and foot. In every primate species, the thumb or the big toe, and in many cases both can be rotated to give some useful grasping opposition to the other digits, although the degree of this opposition varies among the species. This is important for most members of the order because it allows the animal to climb by grasping rather than by sinking claws into bark. In humans, the thumb is very effective, while our big toe is the least completely opposed and has essentially no grasping function. All other primates grasp better with their big toes than their thumbs. (Tree shrews have poorly opposed digits, which may be a reason they are excluded from the order.). Opposable digits allow primates to

be adept at picking up small things, which facilitates grooming skills, an important social behavior in the order.

Only primates have flat nails on toes and/or fingers, a crucial factor in their method of climbing trees by grasping: the non yielding nail maintains the force in the grasp. Nails also contribute to primates' dexterity by allowing a delicate, pincer grip. Primates thus have a very highly developed sense of touch (which includes the underside of many prehensile tails).

Adaptations work together. For example, the grasping hand or foot is enhanced by the flat nail, and both make precision hand-work possible, which in turn is linked to the well developed hand-eye coordination (see binocular vision under "Sense Organs," below).

Primates have clavicles (collar bones) that help support their arms, aiding climbing in trees. The middle ear of primates is protected inside a bony structure. Pelage varies in texture, arrangement and coloration. Tails vary from non-existent to quite long. The most noteworthy are the prehensile tails of some New World monkeys. Although all non-human primates are quadrupedal, many of the higher forms spend much of their time more or less seated. Ischial callosities ease this posture for most Old World monkeys and for gibbons.

Most primates have a single pair of mammary glands in the female and a pendulous penis in the males. The typical female reproductive cycle is menstrual, not a "heat," but climatological conditions may produce a breeding season. Males generally will mate at any time, not just in a specific breeding season (prosimians are often exceptions). In some species, females exhibit sexual swellings that indicate readiness to mate (often in species whose females compete for males).

Primates exhibit increasing development of the cerebral hemispheres of the brain, particularly the areas concerned with sight. Brain development supports the excellent hand-eye coordination that is characteristic of primates. Primates generally have large braincases in rounded skulls.

Dentition

Primates have at least 3 types of teeth. Even the earliest known primates appear to have had an omnivorous diet and their dentition is very similar to the Insectivora. Most of the living families are consistent in their dental formulas, which almost always are 2 incisors, 1 canine (fang-like in the males of some species), 2 or 3 premolars, and 2 or 3 molars in each quadrant of the jaw, for totals of either 32 or 36. (Tree shrews have three incisors per quadrant, another reason for excluding them from the order.)

Although this dental formula allows all primates to be omnivores, many are not. Small primates usually live on insects, but with increasing size they cannot obtain enough energy from catching insects, so diets are frugivorous and/or herbivorous. Some primates, notably the colobi, have developed digestive systems that can break down the cellulose of leaves, which then make up most of their diet.

Sense organs

Primates have binocular vision. Eyes are located in the front of the head, producing a large area of overlapping vision that gives excellent depth perception. This is very important to arboreal animals that move rapidly through trees. Along with the forward facing eyes, primates evolved a reduced muzzle (in the apes and humans, the sense of smell is in the most rudimentary state of any living terrestrial placental mammal). Lemurs and most prosimians

have a protruding muzzle that interferes with forward vision, so their eyes' axis of vision is somewhat tilted upward to achieve binocular vision. Most primates also have color vision, which is a trait shared with Aves, some Arthropodia, and probably some Carnivora. Color vision helps animals detect motionless objects, such as prey or predators by their color contrast. Contrasting colors on the body, such as the mandrill's face and rear, can serve as signals and ways to recognize individuals. Primate eyes are also large in comparison with those of the Insectivora. Primates hold their heads upright, for seeing, not down, for sniffing the ground.

Behavioral Adaptations of the Order

Socialization

Many prosimian and one monkey species are nocturnal. Most primate species are diurnal. Generally, primates are highly social with hierarchies. They are territorial, and do mark and defend their territory. In many species, a female, her mature female offspring, and their infants form the basic unit of social organization. Grooming behavior is important in primate societies because reinforces the bonds between the animals, and helps them stay clean and free of parasites.

As brain size increases, instinctive behavior decreases and behavior is increasingly directed by experience and conscious decision. As it result, primate young, with their large brains, have long periods of dependency during which they learn much of what they will need to know as adults.

Locomotion

For most primate species, locomotion in the trees is by slow four-footed progress, sometimes hanging, or quick running and leaping. However, there are variations, such as the very slow, hand-overhand movement of the slow loris. Only the apes can brachiate. Terrestrial forms such as baboons walk quadrupedally, hands flat; great apes are predominantly terrestrial and knuckle-walk. Some primates are good swimmers.

Communication and Other Behavior

Generally, primates are very expressive, with a fairly large vocabulary of body language and vocalizations. In the forest, vocal communication is more important than visual; in social groupings, many primates also communicate by facial expressions.

Courtship and Young

The courtship behaviors of the different primate species vary widely and will be discussed further in the fact sheets. Primates usually give birth to single offspring that have full fur (the hair on humans is different from fur not in amount - we have the same number per square centimeter as a chimp-but in being shorter, finer, and lighter), open eyes, and grasping reflex. There is a close mother-infant relationship that lasts longer than most other species. The prolonged infancy and adolescence is needed for learning by experience. Weaning in primates ranges from 2 months to 4 years. Newborns usually have some distinctive coloration, and while they have it, are treated with indulgence and rarely disciplined.

OVERVIEW OF PRIMATE TRAITS

In addition to being mammals and possessing all the characteristics of mammals primates share the following traits:

- 5 digits on each hand and foot
- Flat nails on toes/fingers, some species posses a modified claw on paired digits
- At least one opposable pair of digits (except colobines - no thumb)
- Large Clavicle
- Eyes surrounded completely by bone and generally face more forward to facilitate stereoscopic vision
- Color vision to some degree
- Confined to-the tropical-latitudes with -2 exceptions:
    - Japanese Macaque
    - Barbary Macaque on the island of Gibraltar
- Paired mammary glands, usually in the chest (in Aye-Aye located on the lower abdomen)
- Testes in a naked or thinly haired scrotum, a suspended penis often with a baculum (bone)
- Well developed cecum, reduced to the appendix in humans
- General increase in size and complexity of the brain's cerebral hemispheres
- Most give birth to a single live offspring
- Trend toward longer period of parental care
- Trend towards longer gestation periods and longer lifespans

Non-Human Primates – prosimians, monkeys and apes

- Highly diverse, intelligent, mostly social mammals
- Possess various degrees of opposable thumb
- Eyes face forward with color and binocular vision
- Many species show cultural evolution with changes passed on by learning
- Precocial young with various rates of development; extended care of young of varying length
- Most species spend their lives in social groups or communities of various size and hierarchies

PROSIMIANS - lemurs

- Prosimian species found only on island of Madagascar
- Pre-monkey or more primitive primate
- Dog-like, pointed muzzles, smell is important scent
- Flat nails with grooming claw on 2nd toe
- Mainly arboreal, but some species more terrestrial
- We have 5 species of lemur and have aye-aye

MONKEYS

- Species defined by geography as either Old World or New World
- Have binocular vision
- Most have opposable thumbs with 5 digits on each limb
- Varied dentition, many species with large, sharp canine teeth
- All species have tails that vary in length
- Species either herbivorous or omnivorous
- Some species have digestive systems adapted to high fiber diets

Old World Monkeys

- Found in Africa, southern and eastern Asia and India
- Have forward or downward facing nostrils
- Nails on all digits, opposable thumbs
- Non-prehensile tails
- Ischial callosities which enable the monkeys to sleep sitting upright on thin branches, beyond reach of predators, without falling
- Most are larger than New World species; largest monkey is the mandrill
- Both arboreal and terrestrial species
- SFZoo has: Black and White Colobus, Francois Langur, Patas, Lion - Tailed Macaque and Mandrills

New World Monkeys

- Found only in Central and South America
- All species are arboreal, typically found in tropical forests
- Generally smaller than Old World species, generally thought to be more primitive than Old World species
- Some have prehensile tails adapted to life in forest canopy
- Nostrils point sideways
- SFZoo has: Emperor Tamarins, Pied Tamarins, Black Howlers and Squirrel Monkeys

APES

- Large, tailless primates in two families – gibbons and great apes
- Very intelligent with large brains
- Complex social structures with extended care of young
- Most critically endangered of primates
- Found in Africa and Asia
- Of all primates, these are most closely related to humans
- SFZoo has: Siamang (gibbons), Chimpanzees and Western Lowland Gorillas (great apes)
- Various methods of locomotion, including aerial brachiation (siamang), quadrupedal knuckle walking (great apes), related to arboreal or terrestrial/arboreal life style

STATUS AND CONSERVATION

All primates, except humans, are listed as endangered, usually due to habitat destruction but in some cases to direct human predation. 75% of primates live in Brazil, Zaire, Cameroon, Madagascar, and Indonesia. If the rainforests in the countries are destroyed, most primates face extinction (Joel Parrott, Knowland Park Oakland Zoo newsletter, Fall 1986).

Firearms have greatly increased the success of hunters and have led to elimination of large populations of primates. Earlier methods of hunting did not have as much impact. Other threats to primates are medical research (the close relationship of humans to other primate species assures the validity of experimental results) and capture for the pet trade.

CONSERVATION EFFORTS

Many primates do well in zoos, but tarsiers and many colobus do not. The San Francisco Zoo is involved with the Madagascar Fauna Group. In 1998, a group of five captive-raised black and white ruffed lemurs were released back into the wild on Madagascar. This effort was coordinated with Duke University as well as the Malagasy people. At least one of the males mated with a wild female and had offspring, a positive step.

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