

Anthropology (ANTH) 311 Final Exam Notes

Compiled by: Harley C, University of Calgary – Using material from *Primate Behavioral Ecology* by Karen B. Strier

Chapter 1 – Introduction to Primate Studies

	Muriqui	Savanna Baboon	Chimpanzee	Mountain Gorilla	Ringtailed Lemur
Group Composition	Multi-male, multi-female	Multi-male, multi-female	Multi-male, multi-female	Uni- or multi-male, multi-female	Multi-male, multi-female
Grouping Pattern:	Cohesive, fluid	Cohesive	Fluid	Cohesive	Cohesive
Natal group dispersal	Female-biased	Male-biased	Female-biased	Both sexes	Male-biased
Female relationships:	Indifferent	Matrilineal, hierarchical	Indifferent, weakly hierarchical	Indifferent, weakly hierarchical	Matrilineal, hierarchical
Male relationships:	Patrilineal, egalitarian	Hierarchical	Patrilineal, hierarchical	Hierarchical in multi-male groups	Hierarchical
Male-female relationships:	Egalitarian	Males dominate	Males dominate	Males dominate	Females dominate

- Primates as Study Subjects
 - Represent the boundary between humans and other animals
 - We trace our phylogenetic or evolutionary history through them.
 - Female chimpanzees at Gombe use twigs to fish for termites.
 - In Savanna Baboons, ranking between males can be the outcome of agonistic interactions between them.
- Primates as study subjects
 - Ground dwelling primates (Ex: Baboons) are more vulnerable to attacks from large carnivores. This may explain why they live in large coordinated groups.
 - The great apes are the most similar to human ancestors.
 - Energy minimizers devote substantial portions of their time to resting, and little time (and energy) to traveling. Rely mostly on foods such as leaves which are easy to find but have low energy content.
 - Energy maximizers devote more of their time to searching for and traveling between foods and patches. Rely on foods like fruits which are more dispersed, but are higher in easy-to-digest calories.
 - Most primates are either insectivore-frugivores or frugivores-folivores.
 - Some diets are strongly affected by seasonal changes.
 - The distance they travel each day is measured in day ranges or daily path lengths.
 - When food is available in concentrated clumps, primates can defend these resources from other groups.
 - Most primates are gregarious, living in social groups.
 - Primate group sizes can vary tremendously between habitats.
 - Groups also vary on cohesiveness
 - Chimpanzees live in fluid, fission-fusion societies.
 - Savanna Baboons tend to stay together as a cohesive troop.
- Social and Reproductive Units
 - Group composition is affected by two factors.
 - Dispersal
 - In macaque and most baboon societies, females are philopatric. Forming matrilineal societies composed of matrilineal females.
 - In Chimpanzee and Muriqui groups, males are patrilocal. Forming patrilineal societies.
 - Sociometric sex ratio. The ratio of females to males of reproductive age in the group. Has a profound effect on mating competition. Can influence the degree that male body sizes are different than female.
- Field and Captive Studies
 - Provisioned studies can stimulate primates to interact more frequently.
 - Japanese Macaques were provisioned with potatoes and wheat. They learned to wash the potatoes and sift sand out of the wheat forming local traditions.
- Evolutionary Models and Problem-Oriented Studies.
 - Behavioral Ecology is the study of evolutionary principles and adaptive advantages of behavior under different ecological conditions.
 - Not all behaviors are adaptive.
 - Long term studies are critical because primates have long life histories (life-span, delayed maturation, slow reproduction).
 - Characteristics of primate groups

- Size, Composition, Socioeconomic Sex Ratio, Operational Sex Ratio (time when females are actually breeding), Degree of cohesion (proportion of time group members are found together).
- Primates are a good indicator species for ecological disturbance.

Chapter 2 – Traits, Trends, and Taxonomy

- Distinguishing Traits
 - Large brain to body size ratio.
 - Brain size can be tied to metabolic rate.
 - Finding high energy food can require extra cognitive skills, thus, larger brain.
 - Ex: Gorillas (folivores) have smaller relative brain size than chimps (frugivorous).
 - Primates are born altricial or undeveloped compared to the precocial births of other animals.
 - Sexual Dimorphism in many primates.
 - Other morphological traits
 - Stereoscopic vision. Greater reliance on vision with corresponding reduced sense of smell. Stereoscopic vision makes depth perception possible.
 - Owl monkey is the only nocturnal anthropoid.
 - May have developed to leap from tree to tree, find small food items, catch bugs to eat.
 - Unique hands and feet. Opposable thumb. Precision Grip.
 - Not all primates have these features, but the majority does. Ex: No thumbs in new world spider monkeys.
 - Nails on hands and feet, not claws. Leaves a sensitive side to feel things.
 - Presence of a collarbone. Greater arm mobility.
 - Reduction in the number of teeth.
 - Dental Formula. Incisors-Canines-Premolars-Molars.
 - Humans share a dental formula with old world monkeys and apes.
- Classification
 - See chart on page 50
- Major Taxonomic Groups
 - Prosimians (Lemurs, Lorises, Galagos, Tarsiers)
 - Live in the Old World.
 - Lemurs and Lorises are the most ancient primates.
 - Most are nocturnal. All have a tapetum. Even the diurnal lemurs.
 - Can have up to 36 teeth.
 - Lemurs and Lorises have a dental comb, for grooming, and in some species, feeding on tree bark.
 - Nails and claws, less dexterous fingers.
 - Rely heavily on olfactory cues. Larger nasal cavities. Have scent marking glands.
 - Most are arboreal, using cling and leap for locomotion.
 - Tarsiers are great leapers, found only in Asia. Nocturnal, but lack tapetum.
 - Park their infants in secure places.
 - 34 teeth (three premolars, but only two lower incisors).
 - Anthropoids
 - Owl Monkey is the only nocturnal anthropoid.
 - More reliance on vision, diurnal lifestyle.
 - New World Monkeys (Platyrrhines)
 - Callitrichids
 - Marmosets & Tamarins
 - Rapid reproductive rates.
 - Only in South America.
 - 36 teeth, rather than 32 teeth found in other anthropoids.
 - Marmosets have special incisors and stomachs to eat gum.
 - All are arboreal. Smaller species are insectivores. Larger species are frugivorous-folivorous.
 - Atelidae
 - Possess prehensile tail.
 - Muriquis and Spider Monkeys are the only monkeys to use suspensory locomotion.
 - Howlers are the most folivorous new world monkeys.
 - Old World Monkeys, Apes and Humans (Catarrhines)
 - Have 32 teeth.
 - Colobines

- Sacculated stomachs. Able to eat toxic leaves.
- Shearing crested molars for slicing leaves.
- Narrow incisors.
- High cusps.
- Long legs and tail.
- Both sexes disperse.
- Cercopithecines
 - Baboons in Africa, Macaques in Asia. Guenons.
 - Have cheek pouches for carrying food. Good for feeding competition because they can stuff their faces. Saliva helps to break down toxins.
 - Broad incisors.
 - Low Cusps.
 - Similar length in arms and legs.
 - Male-biased dispersal.
- Apes (Hominoids = Apes and Humans)
 - Gibbons and Siamangs are the lesser apes.
 - Travel by suspensory locomotion. Considered to be the only true brachiators.
 - Orangutans use quadrumanous climbing.
 - Gorilla and Pan are knuckle-walkers.
- Systematics
 - Specialized traits, such as our own bipedalism, distinguish a species from its last common ancestor.
 - These traits are known as derived traits.
 - Different than primitive traits.
 - Distinguishing whether a trait is derived or primitive is systematics.
 - Five digits is an example of a primitive trait.
 - Parallel Evolution: Two species from a common ancestor develop similar traits.
 - Convergent evolution: Distantly related species converge to a similar solution to ecological pressures.
 - Ex: Trichromatic vision. Occurs in all catarrhines, but only in one new world monkey, the howler monkey.

Chapter 3 – Primates Past to Present

- See chart on page 73.
- Miocene Monkeys and Apes
 - Fossil record more complete for old world monkeys and apes. Forests of new world may not have been good for creating fossils.
 - Includes last common ancestor of African hominids
 - Change to a much drier climate.
 - Old world monkeys split into cercopithecines and colobines.
- Pliocene Highlights
 - African Savanna expanding
 - Colobines and Cercopithecines persisting.
 - Ancestors of modern gelada baboon (now only found in Ethiopia) became widespread.
 - First fossil evidence of bipedalism.
- Pleistocene Glaciations
 - Global cooling and glaciations.
 - Tropical forests shrink in size.
- Holocene
 - Anatomically modern humans had penetrated most corners of the world.
- Chart on page 80

Chapter 4 – Evolution and Social Behavior

- Genetic versus Environmental Influences
 - Harry Harlow's studies of Rhesus Macaques with wire and cloth surrogate mothers.
 - Infanticide in Hanuman Langurs. Uni-male multi-female groups where males have to fight their way into a group. Once in the group, male may turn on the infants of the group.
 - Infanticide has also been observed in lemurs, howlers, colobus, gorillas and chimpanzees.
- Evaluating the Role of Ecological Pressures
 - Different hunting styles of chimpanzees at Gombe Stream National Park, Tanzania and Tai National Park, Ivory Coast. Tai chimps join forces to hunt red colobus monkeys.
- Kin Selection and Reciprocal Altruism
 - Altruistic behavior is selected for by group selection, not individual selection.

- Selfish benefits of helping kin.
 - Kin selection.
 - Inclusive fitness measures both the direct and indirect fitness of one's actions.
- See Hamilton's Rule
- Ex: Japanese Macaque females spend more time together.
- Vervet monkeys respond more quickly for distress calls from kin.
- Hamadryas Baboons may tolerate sons in their group to help them fend off takeover attempts from other males.
- Benefits of helping nonkin
 - Reciprocal Altruism
 - Coalitions. Ex: Two mid-ranking males could join forces to oust a high-ranking male.
 - A primate, who gives aid, may receive aid at a later time.
- Individual Strategies and Social Organizations
 - Group size and dispersal tactics are dynamic. A group has an optimal size.
 - Coalitions are only good as long as they are helping the survival/fitness of those involved.

Chapter 5 – Evolution and Sex

- When males and females are the same sizes, competition between them tends to be more egalitarian.
- Sexual Selection
 - Sexual selection acts on the secondary sexual characteristics that are needed for intrasexual competition.
 - Females are more choosy about who they mate with because their reproductive potential is much more limited.
 - The operational sex ratio takes into account the availability of ovulating females as well as the number of breeding females and males in the group.
- Sexual Dimorphism
 - There are ecological constraints on sexual dimorphism. Canines can't be too big to eat. Bodies can't be so large that metabolic rates can't support them. Loss of agility.
 - Male diets sometimes differ from female ones in predictable ways to support larger bodies.
 - Sexual dimorphism is more pronounced in terrestrial species.
 - Fantastic coloring in some males. Genital coloring, muzzle coloring.
- Mating Patterns
 - Pure monogamy gives the male more paternity certainty. (Gibbons, Siamangs)?
 - All monogamous primates are sexually monomorphic.
 - Polygyny is widespread across primates. Usually occurs when a male joins a female group, or succeeds in attracting dispersing females into a new group.
 - Ex: Orangutans. Transient males may even force copulations.
 - Polyandry
 - Rare. Ex: Tamarins (maybe other callitrichids), living alongside monogamous groups. These males might cooperate to care for offspring.
 - Polygamy
 - Males might rely on sperm competition.
 - Mating Patterns When Females Live in Groups
 - Reproductive synchrony makes it hard for the male to keep track of multiple estrous females at once.
 - Reproductive seasonality.
 - Dominance hierarchy among males if there is more than one living with the female group.
 - Extra-group copulations.
 - Patas Monkeys: uni-male, multi-female groups.
 - Reproductive seasonality makes extra-group copulations more of a problem for resident males. Ex: Lemurs.
 - Female hamadryas baboons and mountain gorillas are indifferent to one another.
- Female mating strategies.
 - Mating with multiple males can provide insurance against missed fertilizations.
 - Males can help females have food and safety.
 - Males can be good allies in a female's aggressive encounter with another female.
 - Males may invest in parental care, particularly when they are the father.
 - Sexual swellings. Smells. Enticing actions. All to get males to mate with them.
- Male Rank and Reproductive Success
 - Higher ranking males probably have higher access to females.
 - Males will fight harder for higher quality females.

- Coalitions of low-ranking males can work together to gain access to females. While one distracts the leading male, the other one might have an opportunity to mate. Ex: Baboons.
- Chimpanzees might get females to accompany them on safaris.
- Often older males are favored over younger ones.
- Males can cultivate female friends, and the females might prefer to mate with these males.

Chapter 6 – Food and Females

- Food is incredibly important to females, especially when they might be carrying or caring for an infant.
 - Producing milk is very energetically costly.
 - Female reproductive success is linked to nutrition.
 - Healthier offspring, shorter interbirth intervals, live longer, begin at a younger age.
 - Three key variables.
 - Food quality
 - Food distribution
 - Food availability.
- Food Quality
 - Primates will seek after high quality foods. Filled with carbohydrates and fats. There must also be some protein in their diet.
 - See chart page 176
 - Primates choose carefully what they eat. Trichromatic vision in some primates may have actually been needed to determine certain types of food.
 - Physical deterrents
 - Protective husks, spines, shells
 - Chemical deterrents – secondary compounds
 - Tannins – Bind with proteins and make it difficult to digest.
 - Alkaloids – Disrupt metabolism in the primate's cells.
 - Younger leaves are lower in both of these.
 - Some primates have special ways of detoxifying foods.
 - Special stomachs to digest dangerous compounds
 - Other practices. Ex: Red colobus (*Procolobus kirkii*) eating charcoal to detoxify.
 - Zoopharmacognosy – Animal self medication.
 - Ex: Baboons in Ethiopia eating certain berry to prevent disease.
 - Ex: Chimpanzees swallowing bristly leaves, helping to clean their system and purge out parasites.
 - Chart on page 182
 - Female diets are generally better than males.
- Spatial Distribution of Food
 - Tradeoff between nutritional value of food and how easy it is to find and consume.
 - Higher quality foods are generally more patchily distributed.
 - The density of items in a patch determines foraging efficiency.
 - Nearly all primates will adjust the size of their feeding groups based on the size of food patches.
 - Primates with fluid grouping patterns will often split up into smaller feeding parties. Ex: Chimpanzees, Spider monkeys.
 - There can be within-group and between-group competition over food resources.
 - Not all competitions involve direct contests, because not all resources can be monopolized by the dominant group.
 - When a resource cannot be defended or is not defended, the competition is described as scramble.
 - Density of a food patch is a key detail here.
 - If food patches occur at relatively high densities compared to the daily travel path, then the resources can be defended. But if they are too spread out to monitor daily, the patches cannot be defended.
 - The degree of frugivory generally correlates positively with time spent traveling, daily path lengths, and home range size.
 - Small home ranges, such those of folivores might seem easy to defend, but the food available rarely inspires territorial behavior. It isn't worth the time, energy, or potential injury.
- The Temporal Availability of Food Resources
 - Seasons affect the availability of food as we move away from the equator.
 - Ex: Rainy season is a time of plenty.
 - A reduction in the amount of fruit available will decrease daily path lengths, and require them to eat more leaves.
 - Some primates will adjust their grouping patterns based on the food available to them.

- Reproductive seasonality is more pronounced in primates that face strong seasonal fluctuations.

Chapter 7 – Female Strategies

- Ecology of Female Relationships.
 - Egalitarian relationships develop when competition among females is indirect.
 - Instead of engaging in conflicts, females may scramble for resources.
 - Scramble competition.
 - Under these circumstances, relationships between females are weak.
 - No alliances forming, little affiliative bonding, no need for post conflict resolution skills.
 - Strong alliances are not necessary when resources are not contested.
 - In the absence of contest competition, females tend to disperse.
 - See chart on page 203.
 - Female-bonded groups, like cercopithecines, form extended matrilineal. Kin groom each other and provide agonistic support.
- Social Dynamics in Female Groups
 - Matrilineal Societies.
 - Ex: baboons (except hamadryas) and Macaques.
 - In matrilineal societies of most baboons, macaques, and vervet monkeys, a female's position in the hierarchy is inherited from her mother. Called maternal ranking.
 - Dependent rank – maternal help to acquire rank.
 - Basic rank – occurs when females reach adult size and can assert their dominance on their own.
 - Each younger sister displaces their older sister's right below their mother. Once they are older than 15 years old, they displace their mother.
 - Peaceful post-conflict reconciliations are plentiful in these societies.
 - Higher grooming rates, grunting.
 - Females might also form affiliative bonds with males.
 - They might later mate with them.
 - Males might perform a babysitting service.
 - Might side with them in agonistic interactions.
 - Female alliances against other groups of females are restricted to matrilineal societies.
 - Dispersing Females
 - Have to work their way into their new groups. Existing females usually don't welcome them at first.
- Population Consequences of Female Strategies
 - When local resource competition leads to higher rates of female dispersal, populations will grow more slowly, or not at all.

Chapter 8 – Male Strategies

- Ecology of Male Relationships
 - Male social strategies are affected by the spatial and temporal distribution of estrous females, just as female social strategies are affected by food resources.
 - Males too take part in aggressive interactions.
 - These may be more violent and like females are aimed at gaining access to contested resources.
 - Males will also form affiliations with one another.
 - May provide mutually beneficial coalition support in competitive interactions.
 - Affiliations differ from associations in which males spend time together because affiliation involves support in agonistic situations.
 - Males that form uni-male groups by evicting young natal males and preventing dispersing male from joining them reduce within-group competition for access to estrous females. However, these male may face strong between-group competition from unattached males attempting to oust them from their positions.
 - Males that live in multi-male groups must contend with competitors both within their own groups and outside of their groups.
 - Dispersing males sometimes form kin-based coalitions.
 - Like females, males don't form coalitions with nonkin for between-group competition.
 - Male-male competition might reduce when female choice is a factor.
- Social Dynamics among Males
 - Patrilocal Societies
 - No unattached males looking for groups.

- Don't have to gain access to a group of females.
- When males can monopolize access to estrous females, they form hierarchical relationships through aggressive interactions. Ex: Chimpanzees
 - High ranking Chimpanzees have more mating success than lower ranking individuals.
- Male hierarchies are rarely as stable as female matrilineal.
 - Challengers from low-ranking males, often in coalitions, cause rank reversals.
- Males do not inherit their fathers rank.
- In Bonobos, maternal assistance affects male rank and mating success.
 - Male bonobos rarely form coalitions with each other.
- Age graded system do exist in males. Ex: Red Howlers, Hamadryas Baboons, mountain gorillas, marmosets and tamarins.
 - Dominant father might permit a son to stay. When son gets old enough, he will take fathers place, but keep father around.
 - Even in this case though, the males retain stronger relationships with eh females in the group than in between themselves.
- When Males Disperse
 - Dispersing males may change groups several times in their lives.
 - See chart on page 250

Chapter 9 – Developmental Stages Through the Life Cycle

- Infancy
 - Lemurs and Lorises are more altricial at birth.
 - Primate infants are dependent on their mothers for food and transportation.
 - Mothers respond to their infant's distress calls much more readily than other infants.
 - Alloparental Care
 - Care to an infant by individuals other than the parents.
 - Mother's parity – Nulliparous, Primiparous, Multiparous
 - High-ranking females are much less protective of their infants.
- Weaning Conflict
 - Primate infants want to keep breast-feeding, but the mothers want to get rid of them as soon as possible so they can mate again.
- Juvenile Challenges
 - Primate youths have to learn about the social environment in which they live.
 - Some of this is done by playing.

Chapter 10 – Communication and Cognition

- Primate communication
 - Genital displays, vocalization, body posture, temporary anatomical distortions, smells, facial expressions, urine washing rituals.
- Communication is a two way street. There must be at least one actor and one receiver in each interaction.
- Communication components:
 - Signal
 - Vocalizations, facial expressions, postures, movements, odors, touch.
 - Each species has its own signals.
 - The form the communication takes.
 - Motivation
 - The internal state of the actor sending the signal.
 - Fear, aggression, sexual interest, appeasement, alarm, excitement.
 - Meaning
 - The message that is received by the recipients of a signal.
 - Meaning can vary by who is giving the signal and what the context is.
 - Vervet monkeys respond more strongly to distress calls from their offspring.
 - Function
 - The evolutionary advantage.
 - Finding appropriate mates (smells), scent marking to avoid actual fights.
- Modes of communication
 - Tactile (touch)
 - Primates are highly physical creatures. Infants are carried, etc.
 - Male baboons form coalitions by grasping testicles.
 - Physical contact is a prerequisite for sexual interactions.
 - Visual
 - Forward facing, overlapping vision with depth perception. Color vision.

- Body posture used as communication in all primates. Facial expressions used only by monkeys and apes.
 - Some primates are able to send deceptive signals.
 - Olfactory
 - All primates, including humans respond to odors.
 - Can be detected both in the presence of the signaler and as a smell that was left behind.
 - Pheromones – best known for information regarding female reproductive condition. May also convey information about identity, age, sex.
 - Olfactory communication can be passive or active.
 - Female leaving scent trail. Ring-tailed lemur (*Lemur catta*) wrist marking a branch during a stink fight.
 - Spider monkeys rubbing saliva and chewed up leaves into their chest.
 - Vocal
 - Ability to distinguish calls from one's own group.
 - Good for distinguishing unrelated mates, avoiding competitors, etc.
 - Male Orangutans give long distance calls to warn intruding males and to attract estrous females.
 - Long distance calls are in a low frequency.
 - Howler monkeys.
 - Individual calls can be associated with rank and kinship relationships in many primates.
 - Chimpanzee long range “pant-hoots” are highly specific to individuals.
 - Different populations exhibit acoustical differences.
 - Vocalizations in primates seem to be innate, but proper usage is learned.
 - Ex: Vervet monkey infants give alarm calls for harmless birds.
 - Vocalization can be intentional or involuntary.
 - Male chimpanzees purposefully stay quiet when they are patrolling their region to avoid detection.
 - Some species use different types of alarm calls for different types of predators.
 - Ring tailed lemurs.
 - Japanese macaques developed a new alarm call for a new snake they encountered at a facility in Texas.
- Cognition
 - Learning and Imitation
 - Primates learn by example. Little evidence of teaching except in humans and chimpanzees.
 - Little evidence of imitation, except among young primates at play.
 - Apes are better at learning things from their social group than monkeys.
 - Chimpanzees will carry tools to the location where they are needed. They recognize the object-task relationship. This has never been observed in monkeys.
 - Capuchins are the most adept tool users among monkeys.
 - Ecological Intelligence
 - Spatial memory.
 - Remembering the location of food resources.
 - Especially useful for primates that feed on patchily distributed food.
 - Frugivorous primates generally are larger brained, and this could be attributed to the stronger cognitive abilities required to locate their food.
 - Tool use.
 - All great apes are nest builders.
 - Orangutans use twigs to extract insects.
 - Chimpanzees scrunch of leaves to extract drinking water. Use stones to break into things.
 - Tool composites: Use of two tools towards a common goal. Example: hammer and anvil.
 - Table 10.1 p. 306
 - Tools might also be used for social and defensive displays.
 - Social Intelligence
 - Deception. Gorillas, Chimps?
 - Formation of alliances.
 - Machiavellian intelligence – Deception.
 - Deception requires the possession of a theory of mind.

Chapter 11 – Community Ecology

- Primate Communities
 - It is rare to only find a single species of primate at a time.
 - Except in really extreme locations. Ex. Japan.
 - Sympatric primates are those found in the same ecological communities.
 - No two primates have identical ecological niches, but the niches may be very similar.
 - This is a result of competition between species which over time leads to some degree of differentiation.
 - Niche Divergence
 - Sympatric communities of primates.
 - Ex: Red colobus monkeys and black-and-white colobus monkeys devote different feed on different plant species, and devote different proportions of time to leaves and seeds.
 - Polyspecific Associations (mixed species associations)
 - Large body primates generally dominate small body primates
 - May not be the case if the smaller primates have a very large group.
 - Occasionally individuals may group up with primates of a different species
 - Ex: Guenons with different guenon species groups.
 - Foraging Benefits
 - No need for high vigilance because they are in a large group.
 - A species might gain access to food it would otherwise not be able to have. Ex: some species can crack open nuts/fruits that are too tough for other species.
 - Predator Protection
 - Bigger group, don't have to spend as much time watching for predators.
 - Start understanding each other's alarm calls.
- Predator-Prey Interactions
 - Ex: Chimpanzees and red colobus monkeys (Gombe National Park)
 - Ex: Tamarins will avoid sleeping in the same place as the night before to help avoid predation.
 - Primates as Predators
 - Most primate predation is done opportunistically. Ex: A capuchin stumbling upon a nest of eggs.
 - Some primates hunt, such as capuchins and chimpanzees.
 - Predation by chimpanzees on red colobus monkeys may be more for social benefit.
 - Primates as Prey
 - Chimpanzees take a serious toll on the red colobus population.
- Primate-Plant Interactions
 - Primates can have either a helpful or a destructive influence on plants.
 - Primates might help to disperse seeds.
 - Pollination
 - Primates might spread pollen as they move from one flower to another while eating.
 - Seed Dispersal
 - Most primates eat at least some kinds of fruit, so they are in contact with seeds.
 - Primates drop a lot of food, like a seed pod after they have opened it, resulting in the plant germinating.
 - Primates might carry seeds long distances after swallowing them and depositing them at another location.
 - Old World Cercopithecines are an exception with their cheek pouches.
- Conservation of communities.
 - In areas where primate biomass is high, they play a critical role in the regeneration of the forest. This is due to frugivorous primates helping to disperse seeds.
 - The forest and the primate are dependent on one another.
 - Ex: Madagascar forests need Lemurs in order to continue life.
 - It is important to preserve the diversity of a forest.

Chapter 12 – Conservation

- Threats to Primates
 - Nothing is more devastating than the destruction of primate habitats. Ex: Amazon Logging.
 - Selective logging. More difficult to monitor.
 - Habitat Disturbances
 - Fragmenting the forest can lead to inbreeding.
 - Sometimes actually leads to population growth, because there are no predators.
 - Hunting Pressures
 - Some cultures have taboos against hunting certain primates.
 - Some primates are hunted for their meat. Others are hunted as trophy kills (Ex: Gorillas)

- The slow reproductive rates of great apes makes hunting them even more damaging.
 - Some primates actually make behavioral changes to avoid being hunted. Ex: Guenons in Congo dropping to the ground to flee hunters rather than running through the canopy.
- Conservation Policies.
 - Conservation requires the cooperation of everyone.
 - Economic Incentives
 - Turning the forest into something profitable for the people who used to hunt the primates or destroy the forest can help to save the habitat.
 - Increased Public Awareness
 - Educational campaigns can be very helpful.
 - Nongovernmental Organizations
 - Sponsor opportunities for policymakers and researchers.
- Noninvasive Research
 - There has been research done, but there is much more to do. Some primates have hardly been studied, for a variety of reasons. Others have only been studied in one or two settings, so there is little known about the variety that might be found in the species.
 - Technology is helping to improve research techniques.
 - Ex: Hair samples can be used to determine what the primate ate.
 - Genetic technology has been very helpful.
 - Evaluating paternity by DNA hair samples can be used in population genetics research.
 - It is likely that we will live through the extinction of some primate species.