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Succession and Climax at Lake Lag

Succession is a progressive, directional change involving the replacement of ~~dominant~~ species within a biotic community. The ecosystem of Lake Lag contains such a community, consisting of the combination of all organisms in one environment. If communities are considered in the sense of a gradually changing continuum, then Lake Lag may be further subdivided into three communities of bottom, surface, and shore. ~~The bottom is~~ the limnetic zone is defined as open water to the depth of effective light penetration. It is characterized by many individuals but few species. At Lake Lag, the dredge tended to yield a less diverse assortment of organisms than the shore, or shallow water region. The shore may possibly be regarded as an example of an ectotone, a transitional region between two communities which contains organisms common to each as well as organisms peculiar to itself. ~~Brine~~ fairy shrimp, for example, in the period from January 14 to January 29 were characteristic both of the shore and the dredge. Similarly, ostracods during the same period were found both on the shore and surface. The shore also possessed certain unique organisms shared by neither bottom or surface, such as the ram's horn snail and the corixid beetle. However, this zonation is not at all decisive. Rather, it appears that some species have a narrow, and others a wide range of tolerance. Thus copepods range from bottom to shore to surface. A comparison of organisms from the bottom and the surface, for instance, reveals a difference not so much in the species but rather in the times that they appear. We find ~~brine~~ fairy shrimp on the bottom about two weeks before a few are noticeable on the surface. The shrimp disappear earlier as well. Similarly, damsel flies and hydrophilids first appear on the bottom and later show up on the shore. Possibly this indicates that the original shore organisms modified their environment to make it more similar to that of the bottom.

– likely, since the lake bottom was wet before the more shoreward area was.

Succession may be either primary, begun on a sterile area such as a rock where conditions for existence are unfavorable, or secondary, located on sites previously occupied by well-developped communities. Lake Lag is an example of secondary succession since we know that many organisms, such as the fairy shrimp and the red copepods survive in the mud in a dormant stage during the dry season. Secondary succession always occurs more rapidly. The completion of a sere, or the entire gradient of communities for a specific area, can be accomplished in a matter of weeks. Thus Lake Lag progresses through various stages of succession in an academic quarter while the development of a bare rock surface into a climactic area may take thousands of years.

Succession may be either autotrophic, dominated by self-nourishing organisms, or heterotrophic, dominated by organisms dependent on producers for food. Lake Lag seems to be an example of the latter, as most of its organisms feed on plants and debris. The cladocera, ostracods, and copepods, which are the three most numerous groups, are heterotrophic zooplankton. However, it is also possible that numerous autotrophic phytoplankton exist too small to be seen with the naked eye. -must, to feed the aforementioned.

In succession the same area is inhabited by a series of temporary communities. The progression of seral, or developmental, stages results from the modification of the physical environment by the dominant community. In general, the established organisms make the environment less hospitable to themselves and more hospitable to new organisms. From our study, it is difficult to determine the exact nature of changes worked on the environment by the inhabitants of Lake Lag. The fauna seem to be characterized more by a mixture of temporary and permanent elements than by a succession of organisms. The brine shrimp eventually disappear? from all zones. On the other hand, ostracods and, to some degree, copepods, seem to become fairly stabilized on all levels. Many organisms shift from one zone to another, disappearing from one place, but reappearing in another. These changes

are caused by the activities of the organisms themselves. However, although the physical environment doesn't cause succession, it determines its pattern. In a lentic, or standing-water community, factors such as temperature, transparency, current, and oxygen and carbon dioxide concentration will influence the actual organisms. For instance, it is possible that current and temperature had an effect on the shift of various organisms, such as the damsel fly and the weevil beetle, from bottom to shore.

Several aspects of succession can be illustrated by the Lake Lag study. For instance, change is generally more rapid in the earlier stages of succession. From the shore, for example, there is tremendous fluctuation from January 14 to January 29. There is also a significant turn-over in surface organisms during the period January 21 - January 29. Another aspect of succession is that the total number of species tends to increase initially, then either decreases or levels off. This is especially true for heterotrophic forms, such as the ones we studied. In the bottom dredge, organisms seem to reach a peak around January 29 and then decline. The surface organisms seem fairly stable throughout the period studied. We can discover fluctuation in the shore organisms, possibly reaching a climax during the week of February 19 and then showing a marked decline. Other factors which our study could not measure include an increase in the total biomass and an increase in the complexity and specialization of food webs.

Theoretically, succession leads to a climax, a state in which the community is in equilibrium with the environment. Instead of preparing the way for new organisms, a community in climax has the genetic ability to maintain itself against environmental resistance and creates conditions which are advantageous only for offspring of its own kind. In Lake Lag, the dredge sampling seems headed for a climax. Probably soon the copepods will disappear entirely and there will be some sort of equilibrium between ostrocods and cladocera.

A similar climax may be achieved by the surface. The shore seems in a greater state of variation, although it is also characterized by certain permanent elements, such as the copepods, ostracods, hydrophilids, brine shrimp, and physa, which may all exist in a balanced state. However, aside from theory, it is doubtful that any community can be completely self-perpetuating. Succession approaching climax has been described as "variable approaching variable" because of the inevitable catastrophes such as severe weather change which drastically alters the environment. Any climax established at Lake Lag will automatically be destroyed when the lake is drained in summer. Even without extreme climatic changes, climax is probably not a static plateau but a process of slow change.

In climax, the species which characterized the pioneer stages are not too important. This seems to be partially true of Lake Lag. Organisms such as the large-eyed notonectid and the coroxid rapidly disappeared from the shore. Similarly, by February 19, cladocera had vanished from the dredge. However, many of the organisms which seem to belong to the climactic stages of all three communities have been present from the beginning of the study. The dredge contained copepods since January 14. Although their numbers have decreased, they were still present on March 4. Cladocera have been present on the surface and the shore since January 14. All that may be concluded from this is that some organisms, such as the shore ostracods who appeared late and played an important role in the climax, behaved predictably while others tended to be more permanent than model examples suggested.

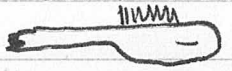
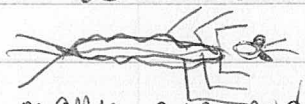
good

suggested fate — how about fish?

Lagunita

quantities? or density

organization is poor

	bottom (dredge)	surface (plankton)	shore
Jan. 14	copepod physa hydrophilid brine shrimp	smaller copepods dysticid (hydrophilid?) weevil beetle  (?) ostrochods	physa dysticid (hydra?) ram's horn snails notonectid corixid beetle (?) water flea diving beetle
Jan. 21	copepod brine shrimp damsel fly hydrophilid	many copepods water flea (cladocera) ostrochod dysticid (hydraphilid?)	copepods brine shrimp dysticid (hydra?) physa water flea
Jan. 29	lots of brine shrimp worm lots of ostrochods damsel fly weevil beetle copepods	few brineshrimp copepods ~~worm/ostrocods~~ hydrophilids (small) cladocera	copepods brineshrimp physa hydrophilid coroxid sowbug
Feb. 3	lots of brine shrimp copepods cladocera, ~~ostrochods~~ worm	~~ostrocods~~ copepods 2 brine shrimp ~~cladocera~~ cladocera	copepods few hydrophlid weevil ostrocod - many
Feb. 19	brine shrimp copepod (few) ostrochods snail	few copepods ostrocods ~~weevil~~ weevil cladocera	 many copepods weevil hydraphilid many ostrocods

	bottom	surface	shore
	cladocera (few)		? 
			few brine shrimp
			snail (physa)
			damselfly
		 (?)	
March 4	few copepods	1 brine shrimp	many copepods
	ostracods	copepods	snail - rams horn
	cladocera	cladocera	hydrophilid
		ostracods	weevil
			snail - physa
			ostracods

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T E R R I T O R I A L I T Y

A N D

A G G R E S S I O N

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In order to understand the significant relationship between aggression and territoriality, it is necessary to first discuss the nature of territory. Territory is defined as an area which an individual animal or a group of animals defends against aggressors of the same species.[1] The establishment of territory often corresponds to an animal's breeding season, as in grouse. However, studies reveal many exceptions. Robins defend territory long after the conclusion of their breeding season.[2] The callicebus monkey perversely maintains his territory throughout the year except during the breeding period, at which time the carefully-defined territories break up and a sexual free-for-all begins. Once each individual has mated to his or her satisfaction, the monkeys sedately reestablish territories.[3] The size of the territory is directly related to the size and mobility of the animal. Yet territorial size has a wide variation within a species and seems more dependent on the ability of an animal to bluff his neighbor into submission than anything else. Animals delineate their territories by depositing scent or excrement at the boundaries.[4] Both dogs and wolves, for example, make use of their pungent urine to warn away prospective intruders. Only under conditions of extreme duress can animals be persuaded to violate these self-imposed limitations.[5] Thus, a territorial species is one in which all males and sometimes females, acting either individually, in pairs, or as a group, have an instinctive drive to establish territory and defend it from intraspecific aggression. Naturalists do not agree on the role of instinct in the creation of territory. To the extent that it does play

a part in the development of territory, instinct seems to be "open," that is capable of being influenced by the environment. Thus, the disposition to possess and defend property may well be innate, but the exact location of this property must be learned.[6]

Indisputably, territoriality is not a universal characteristic of the animal kingdom. Many species do not establish territories at all. Among certain primates, territories are maintained only under conditions of overcrowding or famine. Nevertheless, because it is widespread in the animal world, territoriality must have some survival value. It must provide certain biological advantages because it is favored by natural selection.[7] Explanations of the function of territory range from the mundane to the sublime, from the scientific to the mystical. Naturalists are even at a loss to define the various types of territoriality. One bewildered observer diligently recorded that geese are willing to defend family-territory, mated-female-territory, feeding-territory, nesting-territory, resting-territory, sleeping-territory, and even moving-territory.[8]

Some investigators argue convincingly that territory is primarily designed to insure an adequate food supply. They maintain that possession of territory saves an animal time in his search for food. He is familiar with the most likely places to successfully seek nourishment.[9] Also, his territory provides him with a sort of private larder, from which he can exclude all poachers. However, it is certain that the need for a stable food supply is not always the basis of territory. Among the great tits, a species of bird, parents ignore all territorial boundaries, ranging over vast areas in an effort to secure

enough food for the nestlings.[10] Studies of robins and sparrows also indicate that these birds do not establish territory for economic reasons. The godwit, a sea bird, has the entire ocean at his disposal.[11] There is no reason for him to limit his feeding grounds to one particular watery segment.

Other explanations of territory are similarly true and false at the same time. They apply to some species, but not to others. Among certain animals, for instance, territory reduces disease.[12] Those magpies which remain without territory are more likely to die from sickness or parasites than those who possess property. Another by-product of territory is a reduction of dangerous fighting. Territory tends to ritualize aggression in an invading animal, thus lessening the possibility of mortal combat. Familiarity with a specific territory also provides animals with security against predators,[13] who may be confused by the intracacies of their prey's domain. The setting-up of territories is responsible in part for the creation of well-spaced communities.[14] Apparently animals do not like to be crowded any more than do human beings.[15] Crayfish are perhaps the naturalist's best example of animals wh o use territory to maintain regularly spaced properties. Of course, gulls establish territories in such close proximity that they are constantly engaged in squabbles because they are always bumping into each other or invading each other's property.

All these aspects of territoriality indicate that it is a phenomenon which contributes to the survival of the population. Possession of territory also protects a species by encouraging both mating and rearing of young. Exercising of the territorial

instinct may take one of two forms. Arena behavior, which is characteristic of only approximately 100 species, occurs when the most sexually dominate males establish a stamping ground, hilling ground, or strutting ground (all different and specialized terms for a breeding ground) and defend it against all challengers. In arena species, territory allows the more worthy males to make the major contribution to the gene pool. Fur seals[16] establish territories during the breeding season. The best (that is, the most sexually attractive) properties lie near the water's edge. Therefore the first arrivals are challenged till the superior males hold these positions. Being closest to the sea, these males are the first to form harems. Less fortunate and less fit males wait patiently for the overflow.

Observations of the Uganda kob,[17] an animal resembling a deer, have led to the conclusion that females of arena species will not copulate with any male who does not possess territory. Apparently she is more attracted to the property than to the male. Another interesting development is that propertyless males accept a "psychological castration." Physically intact, they voluntarily renounce the pleasures of mating. Similar studies of magpies and muskrats[18] reveal that only those with territory constitute a breeding population.

Just as female kobs are drawn more to the land than to the male, so the male himself is more concerned with his property than with his mate of the moment. H is attachment to the land is so strong that when the female departs, the male elects to remain as proprietor of his territory. Similarly, his physical displays are directed not at females, but at other males. Signs

of threat and/or sublimated aggression are designed not to attract the female but to impress rival males. Studies of grouse and ruffs[19] also suggest that the male is primarily concerned with establishing status in the eyes of other males.

Arena behavior is a good example of territoriality facilitating the selection of most fit mates. But pair behavior, in which a male and a female simultaneously defend a shared territory, suggests that courtship and territory are not neccessarily linked. According to Robert Ardrey and Leslie Reid,[20] the pair is united primarily by defense of their common territory. Sexual attraction may perpetuate or contribute to the bond, but its prime object is to insure the survival of the population. One of the most striking examples of pair behavior is found among roe deer.[21] A buck and a doe will defend an established territory together. However, the doe is not the buck's mate. On the contrary, he joins her when she is already pregnant. Yet he defends her, insures her privacy, provides her with food. When her young are born, he protects them. As soon as the doe and her fawns no longer have need of the buck, the territory dissolves.

Both arena and pair behavior have led some authorities to speculate that territory supplies the animal world with a "biological morality,"[22] in which the instinct to maintain and defend territory encourages the survival of the population at the expense of the individual. Naturalists have recorded with some horror[23] that an albatross chick removed more than six feet from its nest will be left to die by his watch parents, whose instinct compels them to protect the nest, the symbol of the population, rather than the individual chick. As we have learned,

natural selection is concerned with populations, not with individuals. Thus, biological morality may make animals act against personal interests. In arena species, for example, animals do not invade each others' territory. Nor do they attempt to seize a female already established on the property of another. The female is not free to mate with the first male she meets, but is driven by instinct to search out the finest plot of land. Biological morality may also be observed in the pair bond. The permanent or semi-permanent attachment of male to female unquestionably limits his freedom. Yet such a bond is necessary among species in which the female is unable to rear her offspring alone.

Dissatisfaction with sexual and economic explanations of territory have led some naturalists to suggest that the phenomenon has a psychological basis. As I indicated earlier, the territorial behavior of too many species cannot be explained by either the need to mate or to secure food. Schaller discovered that the gorilla group remains stable even when no female is ready to breed.[24] Ardrey reported that green sunfish establish territories when they are too young to be concerned with either mating or rearing young. Frank Fraser Darling, well-known for his studies of red deer, tempted a herd to leave its territory by placing a tempting supply of food just beyond the boundaries. The deers refused to violate the demarcation lines, although no natural predators or obstacles existed. Darling Draws the conclusion that food supply does not necessarily explain territoriality. In reporting this experiment, Ardrey draws the conclusion that territory must satisfy a psychological need for identity.[25] He

claims that other animals besides man have the compulson to differentiate themselves from others of their kind. They do so by forming social groups. Within the group, each animal's territory gives him status, thus distinguishing him from other members. In some species, the social group itself has a territorial basis and may very well fulfill an animal's desire for social contact. It is quite true that, among certain animals, territory is specifically designed to prevent overcrowding; that in densely populated, artificial conditions the animals become either unnaturally hostile or lethargic.[26] However, it is equally true that many animals, especially primates, crave the companionship of their own species. Howler monkeys,[27] chimpanzees,[28] and gorillas[29] all seem to derive pleasure from the company of other howler monkeys, chimpanzees, and gorillas. Gulls choose to live in colonies so densely packed that they are continually bickering with each other over territorial rights.

Although the companionship-identity theory rings of pseudo-science and anthropomorphism, we must admit that more respectable analyses are also inadequate, if not suspect. In particular, scientists have not been able to satisfactorily explain the homing instinct, that inexplicably strong urge which compels salmon to risk death in order to reach their former birth-place. or which enables albatross to rebuild their nests at the beginning of the breeding season on the average of one yard from the previous sites. Such fundamental devotion to territory suggests that it is an instinct not fully explainable in economic or sexual terms.

Naturalists, biologists, and sociologists may dispute explanations of territoriality, but they are all convinced that it exists. Most of them would agree moreover that it is closely linked to intraspecific aggression,[30] that is, aggression within the species. According to H.G. Andrewartha,[31] the relationship is so intimate that size of territory is determined exclusively by the ability of an animal to dominate his neighbors. It is important to keep in mind that predation is not an aggressive activity. A hawk preying on a sparrow is no more aggressive than a butcher "preying" on a calf. Intraspecific aggression is triggered by particular distinguishing features on the body of the enemy. The bright red breast of a robin will, under proper conditions, stimulate attack by another robin. Robins will also mistakenly attack other birds of similar appearance which belong to different species. In part, aggression seems to be a reflex.[32] In chimpanzees, it can be self-induced by rhythmic chanting.

Intraspecific fighting is usually the result of aggression perpetrated by an individual or a group of animals. The aggression may consist of territorial violation, either for the purpose of acquiring status or merely for pure enjoyment. As has already been suggested, males fight for territory, not for females. Rats will fight as soon as a stranger is introduced into the cage, in which the inhabits have set up a territory. Among elephant seals, the defender chases his rival only to the territory's edge. Like most other territorial species, he is not interested in killing the intruder, but only in securing his rapid departure. Gray seals in the role of intruder seldom

wait for actual battle.[33] As soon as the owner charges, they retreat. Such behavior illustrates a curious aspect of territoriality. Invaders seem to recognize property rights. They behave in a guilty fashion as soon as they cross a territorial boundary. They are almost always defeated by the proprietor, although he may be smaller and weaker.[34] For example, a bird easily subordinated in neutral, unclaimed territory tends to become dominant over the same individual when the encounter takes place in his home territory.[35] The closer the proprietor gets to the interior of his territory, the more his confidence increases. Similarly, as he advances to the edge of his property, his courage decreases proportionately.

One of the most important characteristics of territory is the periphery,[36] or the edge shared by two adjacent territories held by members of the same species. This border region is where most aggression occurs. Guard bees attack strange bees when they land in the nest entrance - the territorial border. Cicada-killer wasps display threat and attack (chasing, butting, or grappling) from the moment an intruder crosses the edge of their property.[38] Among three-spined sticklebacks, the peace is most frequently broken where territories adjoin.[38] In all instances of border aggression, the actual fighting is more stimulating than dangerous. In fact, the callicebus monkey regards peripheral aggression as a family diversion.[39] Every morning, the whole family rushes to the rim of its property only to be met by a similar family eagerly awaiting the daily sport.

The term aggression carries with it all sorts of negative

connotations. The intellect is immediately prejudiced against "aggressive" behavior. However, aggression does confer some positive advantages, especially when it is practiced in a controlled form. One author went so far as to maintain that few animals could survive without it.[40] We have already seen that in arena species, males establish territories and, by doing so, acquire mates. Competition for territory, resulting in the selection of better-qualified males for breeding, is nothing more than sublimated aggressive behavior. Two great tits, involved in a dominance dispute, will each display the colored patch on its throat. The most sexually impressive will then claim the territory, without any further aggressive action.[41] Sublimated aggression also provides a recognizeable social order,[42] such as the pecking order among chickens, or the social hierachy of a baboon troop. Such structured orders often facilitate the survival of the population, as they tend to protect the young and sexually dominant males. The baboon troop is ordinarily defended by those males who have not yet reached sexual maturity, thus protecting the actual contributors to the gene pool.[43] However, it is only fair to add that in a natural environment, hierarchies are much less rigid than in captivity.[44] In the latter situation, subordinate animals can't avoid infringing on the territory of the more dominant ones, who are then forced to maintain their position by constant aggressive behavior.

Aggression may also be an excellent outlet for frustration or an alternative to monotonous placidity. It is not impossible that animals often fight for the pure pleasure of fighting.

Studies of robins and fiddler crabs have been unable to reveal any "rational" reason for their constant squabblings. Ardrey claims that gulls voluntarily form noyeaus, or societies in which individuals are bound together by mutual animosity.[45] On the other hand, aggression may conceivably be responsible for the amazing degree of inward amity achieved among groups of howler monkeys or black lemurs. Their aggression tends to be directed outward against other groups of the same species. The culmination of such group harmony occurs among congregations of the smooth-billed ani, a cuckoo-like bird.[46] The females cooperatively build one large nest, in which they proceed to lay all their eggs. The hens take turns brooding and, when the eggs are hatched, participate jointly in the feeding. Yet their co-op spirit does not extend to other groups of smooth-billed anis, with whom they do not hesitate to fight and bicker.

By far the most important benefit of territorial and status-seeking aggression is the fact that both offence and defence have become ritualized; that is, the actions of both aggressor and defender are neutralized into harmless display. We have seen that aggression provides certain selective benefits. Its great danger is that it can lead to the elimination of too many animals it if is not controlled.[47] It is in the interest of the individual to eliminate all rivals who challenge his possession to territory or to females.[48] H owever, carried to its logical extreme, such a behavior pattern would exterminate large numbers of animals. Therefore, natural selections favors behavior which avoids outright killing and carnage. Fighting is so potentially dangerous that it has been replaced by display

and threat.[49] Red deer use their antlers to intimidate each other. Occasionally they spar, but never inflict injury. Before a dangerous situation arises, one always retreats. Shrews[50] bite at each other's tails, scream, and grapple with each other, but damage is slight. Howling monkeys also shriek fearfully, but rarely have physical contact. Chimapnzees charge aggressively at one another, dragging branches, throwing rocks, leaping, stamping, pounding the ground. They too avoid unsafe struggles.[51]

Responses to aggression have become ritualized as well. Threats to discourage rivals or intruders are nothing more than a demonstrative substitution for violence. Singing among nighting-gales,[52] display of savage-looking incisors among baboons,[53] eyebrow raising among vervet monkeys,[54] and defecating on an unwelcome aggressor, a form of threat favored by the Antarctic skua,[55] are usually enough to discourage aggressive hostilities. Schaller noted that gorillas interpret staring among men as a threat.[56] These and other defensive actions may be frightening or unpleasant, but they certainly do not endanger the life of either aggressor or defender. Thus, they can be naturally selected as a form of species protection.

Studies indicate that animals have a strong inhibition against killing another animal of the same species. Instances of death due to intraspecific fighting are uncommon. They occur almost exclusively in artificial, overcrowded conditions. Even in these circumstances, experiments with caged wild rats[57] suggest that the victim does not die from wounds inflicted, but rather from an accumulation of stress. The aggressor's normal

response would be to flee once he had invaded the territory of the proprietor. Limited by the artificial environment, he cannot fulfill this normal behavior pattern of escape. His only alternative behavior pattern is to die. Another finding to substantiate this theory is the fact that a proprietor who has successfully defeated an aggressor will refrain from killing him. A wolf or shrew surrenders by throwing himself on his back, exposing the vulnerable stomach region. The victor, instead of finishing off its victim, will merely walk away. Stags, rats, and seals never try to kill the aggressor, but only to chase him from their territory.

One of the most significant results of ritualized aggression is the displacement activity,[58] which occurs when an animal is motivated by two contradictory tendencies: to act aggressively or to flee. The result is a seemingly unrelated activity which nevertheless releases frustration while preventing harm to either animal. Often, two bucks challenging each other at the edge of their adjacent territories will, instead of fighting, turn their wrath on near-by trees. Tail-beating among fish is a common displacement activity. Infuriated gorillas will scratch vigorously, eat intensively, or beat their chests instead of attacking.[59] Spiny-rayed fish have been observed to suffer from conflicting urges to flee or to attack. They do neither. Instead, turning sideways, they display themselves at their broadest and most impressive. Natural selection has developed on this part of their anatomy a startling array of colors. One of the most interesting displacement activities is the "pseudo-infantile, pseudo-sexual display."[60] In this

sort of behavior, the conquered animal behaves like an infant or makes sexual advances which arouse parental or sexual responses in the victor. In all these cases, displacement activity successfully averts the possibility that territorial violation could prove harmful, or even fatal, to a species.

The nature-nurture controversy over aggression still rages. Is aggression innate or learned? Different investigators suggest different conclusions. Some naturalists like Ardrey and Konrad Lorenz speculate that aggression is an inherent drive which provides animals with much-needed stimulation. They believe it is complemented by the territorial instinct. The interaction between these two biological urges hopefully establishes an equilibrium, the displacement activity, which contributes to the survival of the species.[62] However, it is probable that, to some extent, aggression is the result of upbringing. It is, in part, learned. Experiments have shown that monkeys raised by "motherless mothers" (monkeys taken away from their own mothers at birth) are comparable to juvenile delinquents in terms of their vindictiveness and aggressive cruelty.[62] It is also quite possible from a physiological standpoint that aggression can be controlled. The rage mechanism is located in the hypothalamus, "an area at the base of the brain stem just above the crossing of the optic nerves."[63] However, in higher mammals, this mechanism is under the supervision of the cerebral cortex, the center of intelligence.[64] This discovery suggests that an animal's conscious mind can influence his feelings of aggression. Perhaps the most significant example of controlled aggression is found in baboon troops.[65] Baboons

travel in large groups of 600-700 members. It is almost impossible to observe aggression between troops. They simply do not intrude on each other's territories. Experiments have shown that they have territorial instincts as strongly developed as in other species. H owever, their refusal to act aggressively has been selected as a behavioral trait because, if released, their fighting potential would be dangerous.

What is man's relation to territoriality and aggression? It is possible that, to some extent, man is a territorial species. No Trespassing signs, artificial creations like the Great Wall of China or the Berlin Wall confirm that man has a special and intimate relationship with the land. Perhaps, as Ardrey suggests in the case of other animals, the possession of territory enables man to establish individual identity.[66] On the other hand, no human territorial instinct has been established as scientific fact. As a field of investigation, territory and its related aggression seem to suffer from singularly difficult complications. It is very hard to determine whether man's desire for property is innate or learned, whether patriotism is a biological urge[67] or a trained response. On the one hand, it seems unreasonable to apply to man studies of animals with quite different social structures. Too often, it seems as if men like Ardrey, Lorenz, and Reid overlook the qualities which distinguish men from dogs or penguins or fish. Under cover of so-called scientific proof, they seek to promote social or political theories. Ardrey, in essence, supports man's "innate" right to acquire and defend property. He condemns communism as unnatural. Lorenz uses science to

justify his pessimistic opinion of the human race. And Reid makes the fallacious assumption that order and hierarchical structure in the natural world imply a similar arrangement in the political world.[68] On the other hand, it is also a mistake to think that man exists in glorious isolation apart from other animals. In reading Jane Goodall's narrative, we exclaim at how human the chimpanzees seem.[69] It is tempting to turn this conclusion around: How chimp-like men are!

It is undeniable that man is aggressive, whether or not his aggression has a territorial basis. Man condemns his aggression as bestial. However, as one author pointed out,[70] in doing so he insults the rest of the animal kingdom, which has succeeded in controlling its aggression to a far greater degree than has man. On this subject, as on the question of territoriality, debate is plentiful. Naturalists like Ardrey and Lorenz argue that aggression is "a deep-seated, universal drive, not merely a response to frustration."[71] Lorenz maintains that human intraspecific aggression, such as war, is as instinctive as it is in other species. Others reject the whole concept that aggression is practiced by nation states.[72] Still others argue that aggression can be controlled by man's conscious intellect. Proponants of this theory feel that social and parental pressures make it easy for a child to acquire intensely aggressive characteristics at an early age. By altering the culture, man may be able to limit human aggression.[73]

It is apparent to all, however, that man's aggression is a grave danger, instead of just a scientific curiosity, because its overt manifestations far outweigh its ritual aspects.[74] No one

is sure why this is so. Lorenz suggests[95] that man's rapid progress in weaponry soon outdistanced any inhibitions he had against killing members of his own species. He points out that it is much easier to drop a bomb than to strangle someone. In any event, all share the hope that man, confronted by the prospect of nuclear warfare, can develop some effective displacement activities (the space race and competetive sports already exist as a partial solution) and catch up with the rest of the animals.

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Very good
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