

## ARTICLE



# Biological Roots of Human Conflict

Lou Marinoff

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## Abstract

The biological roots of human conflict are evolutionarily ancient, and correspondingly deep. Fortunately, some of our most destructive human tendencies can be mitigated or obviated by cultural evolution. But since culture is to biology as software is to hardware, one must correctly understand the biological nature of conflict in order to nurture effective resolutions, and beyond that to build enduring cultures of peace. This paper focuses on the biological roots of human conflict. A sequel would focus on conflict resolution via cultural evolution.



## Keywords

entropy, violence, conflict, gestures of appeasement, biological evolution, optimum number, sexuality, primate brain, cultural evolution

## 1. NEGENTROPY AND THE STRUGGLE FOR SURVIVAL

It was quantum physicist Erwin Shroedinger (1948) who first described *life* as an improbably well-organized assembly of matter, marked by the unique capacity to resist entropy, at least for a while. Entropy is non-recoverable energy necessarily expended by any and every physical system, which renders all such systems less than 100% efficient. Caught in the slipstream of entropy, all systems (starting with our universe) move toward states of increasing disorder. Life is the great exception to this law, for living beings – at least from birth to maturity – move toward states of increasing order, manifesting negative entropy, or *negentropy*, in the process. Normally, negentropy wanes and entropy waxes only after a period of biological maturity, as all living beings sooner or later slide into senescence, decline, and death. After death entropy takes over with a vengeance, first dissolving, then

chaotically scattering the constituent elements of what was once a living being (a precious few bits and pieces may enjoy non-sentient longevity as fossils). It is this ability to temporarily reverse and defy entropy that characterizes the biophysical dimension of life.

One inevitable transaction cost, however, becomes apparent across much of the spectrum of living entities: beyond a certain level of complexity, living entities are obliged to sustain their negentropy by removing order from their environments and returning disorder to them. In other words, they need to ingest other living beings – or kill and then ingest them, or find and ingest their carrion – in order to survive and reproduce. Life necessarily feeds on life. This causal nexus is called “the food chain,” and its links are often necessarily violent. Since most living entities do not voluntarily surrender their lives to become food for others, their lives must often be wrested from them by force. This process is evidenced in the predator-prey relations observable throughout nature.



That said, predators and prey are not normally in conflict. Even though their transactions, if successful, are violently lethal, the contest is between unequals. By contrast, conflicts arise from contests between equals, or near equals. So, for example, a lion that hunts and kills an antelope is not in conflict with it; whereas hyenas that try to drive the lion away from its kill are definitely in conflict with the lion, just as lions themselves are in frequent conflict with one another.

From this example flow the two most general causes of conflict: First, competition over a vital resource between two or more species and second, competition within a species over a vital resource. Vital resources themselves include food, territory that contains food, and access to conspecifics for reproductive purposes.<sup>1</sup>

This nexus of predator-prey relations, along with inter-specific and intra-specific conflicts, comprises Darwin's (1859) struggle for existence. This struggle unfolds across all life-supporting domains, whether terrestrial, aquatic, or aerial. As Spengler (1932, p. 22) noted: "Every drop of water is a battlefield" – at least from the perspective of the protozoa it contains. Nor is this struggle confined to fauna: flora is engaged in it as well, although the pace is sufficiently slow to escape the untrained eye. But if one were to view a time-lapse video of the forest floor or the jungle canopy, one would perceive similarly unremitting competitions between and among plants for access to their vital resources, primarily water and sunlight. Viewed at sufficient speed, these competitions would also resemble conflicts.

All living beings, at every level of sentience, instinctively have vested interests in self-preservation and reproduction, which entail fending off entropy for as long as possible. Conflicts are part and parcel of this process.

## 2. REGULATION OF CONFLICTS IN NATURE VIA OPTIMUM NUMBERS

Given that the primary purpose of conflicts in nature is to establish access to food and reproductive resources, nature herself must impose some limits on the scale and severity of intraspecific conflicts, or else a given species could not survive long. Animals unable to compete will not transmit their genes to the next generation; whereas animals that compete "too well" may exhaust their resources owing to over-exploitation of their habitat, and will similarly perish.

The neglected but brilliant neo-Darwinian zoologist Vero Wynne-Edwards (1962) posed this insightful question:

How does nature prevent animals from over-exploiting their resources? His fascinating answer sheds light on animal conflicts, including – indirectly as we shall see – human conflicts.

To begin with, the prospects for survival of any species are enhanced as a function of its ability to disperse as widely as possible, through a variety of habitats, in tandem with its ability to vary its diet as much as possible. While specialization within a particular niche may confer evolutionary advantages, overspecialization clearly poses risks (e.g. see Carr, 1972).<sup>2</sup> If we examine the most successful social animals – e.g. ants, rats, and humans – we see exactly these principles at work. Ants, rats and humans are among the most widely-dispersed animals on our planet, and moreover are virtually omnivorous.

The key insight of Wynne-Edwards, which applies to all animals except humans, is this: Instead of competing directly over a given food resource, animals compete over a territory – a parcel of land, or a volume of water or air, that contains the food resource itself. To prevent over-exploitation, natural selection delineates an optimum population density for each species in the territory (Wynne-Edwards, p. 493 et passim). When the population density falls below the optimum, competitive social behaviors favor reproduction and population growth. But when the population density reaches or exceeds the optimum, "over-crowding" results, and normal social behaviors break down so as to facilitate a reduction in population density and a return to the optimum. This reduction can be effected in two ways. First, in the absence of spatial constraints, the social group can fission into two or more smaller groups, which then disperse, occupy new territories, and begin anew to increase their population densities. Second, in the presence of spatial (e.g. geographic) constraints, which prevent dispersion, normal social behaviors break down and abnormally violent conflicts ensue, which then have the effect of reducing population density within the territory. Once the optimum density is re-attained, normal social behaviors resume.

Numerous experiments have been conducted, with many species, which confirm this tendency. For example, the settlement of a band of howler monkeys on the island of Barro Colorado led to their successful reproduction and eventual fissioning into many bands, which spread to new territories throughout the island (Russell & Russell, 1968, pp.161-2).

A classic case of the reduction of absolute numbers in the presence of spatial constraints occurred among the baboons on Monkey Hill in London Zoo, which were studied by Sir Solly Zuckerman (1932). He observed and recorded numerous instances of extremely violent behaviour,

1 A "conspecific" means a member of the same species.

2 A population of predators that specializes in one prey only (e.g. arctic fox and arctic hare) will fluctuate in sinusoidal dependence on the prey population, modeled by Lotka-Volterra equations.



including males killing females, and then fighting over possession of the corpses. Published in 1932, his standalone study was thought to represent normal baboon behavior. But when ethologists finally got into the field in the late 1940s, and observed baboons in their natural habitats, it became clear that they did not behave in this way (e.g. Russell & Russell, 1968, p. 82). Had Zuckerman known about optimum numbers, he would have realized that nature's optimal baboon density is around three per square mile; whereas the baboons in London Zoo were confined in an enclosure that may have looked spacious to the untrained eye, they were in fact subjected to a population density 100,000 times higher than normal. No wonder they fought over corpses.

Figure 1 illustrates some typical optimum population densities for several species of social animals (from Pfeiffer, 1970, p. 134, and Forel, 1928, vol. 1, p. 329 ff). Note that human hunter-gatherer societies, which mimicked nature to a large extent, had optimum numbers of the same order of magnitude as wolf-packs (Pfeiffer, 1970, p. 134 and Konner, 1982, p. 9). This is one key to understanding human predisposition to conflict. Hunter-gatherer societies have been the most prevalent and enduring form of human organization. From our earliest days, we aggregated into small, competitive, and mutually-hostile dialectical tribes, which served to disperse us literally around the planet. Large, permanent human settlements were made possible only relatively recently, during the Late Neolithic revolution, when advances in agriculture, animal husbandry, and weaponry offered sustainable alternatives to hunting and gathering.

Figure 1

Group type	Typical number	Typical area (sq. miles)	Optimum density
Ant formicary	1,000,000	0.05	20,000,000
Gibbon family	4	0.1	40
Baboon troop	40	15	3.35
Gorilla troop	17	17	1.0
Human band	30	1,000	0.03
Wolf pack	10	1,000	0.01

Biological evolution, via natural selection, decreed that optimum human population densities should resemble those of wolves – less than one per square mile. But cultural evolution, via synthetic selection, imposes no upper limit on the optimum number. Technologically-driven supply chains and increasingly sophisticated human

institutions have made it possible to sustain population densities many orders of magnitude greater than nature ever intended for us.

For example, figure 2 depicts some typical microstate population densities, which range from 500 to more than 3,000 people per square mile, representing a 100,000-fold increase of our natural density. Beyond this, figure 3 depicts typical population densities in contemporary megacities, ranging from 10,000 to more than 40,000 people per square mile, representing a million-fold increase of nature's limits.<sup>3</sup>

Figure 2

Microstate	Population	Area (sq. miles)	Population/sq. mile
Liechtenstein	34,000	62	548
San Marino	24,000	29	827
Barbados	180,000	166	1,084
Tuvalu	12,000	9	1,333
Malta	400,000	122	3,278

Figure 3

Metropolis	Population/sq. mile
London	10,500
Hong Kong	17,333
New York	25,600
Tokyo	34,132
Mumbai	41,984

If we ask what effects this massive concentration of population exerts on conflict, we can draw some obvious as well as counter-intuitive conclusions. To begin with, cities are clearly more overcrowded, competitive, stressful, and crime-ridden than smaller towns and rural villages. This is partly a function of large numbers. Hunter-gatherers lived together in small dialectical tribes, consisting of no more than a few dozen members, and characterized by the salient feature that every member knew every other member on a first-name basis. In rural agricultural communities, and small villages, people also tend to know one another on a first-name basis. In such settings, conflicts are minimized both by the relative smallness of numbers, and by the overall interests of communal harmony.

Competition between villages does not escalate into wars. However, cultural evolution means some villages

3 Only when people are packed together in extreme urban conditions, such as in crowded elevators or subway cars, do human anxiety and stress levels become overtly clear. That we require "elbow room" is a vestige of our original optimum number.



become city-states, and competitions between contending city-states can and do escalate into wars – as for example the Peloponnesian War that devastated both Sparta and Athens. Moreover, cultural evolution also enables some city-states to become the seats of nation-states, or of world religions, or indeed of empires. Competitions between such entities can and do escalate into wars of ever-larger magnitude and destructive power. Precisely because cultural evolution can override nature's optimum number for humans, there is no limit to human territorial ambition. Constrained by their optimum numbers, ants and rats can never give rise to adventurer-conquerors such as Alexander, Caesar, Genghis Kahn, Napoleon, Hitler, or Tojo.

Nor do the conflicts of nature give rise to inquisitions, war-crimes, genocide, or mutually assured destruction. These developments all originate from the biologically-mandated competitions and hostilities between small bands of hunter-gatherers, which served to disperse them to the overall benefit of the species. However, it is cultural evolution that enabled the transformation of small dialectical tribes into populous ideological tribes (e.g. nation states and world religions), the mobilization of the entire resources of nation states to total war, and – from the twentieth century onward – the conversion of civilian non-combatants into front line troops: targets of 'conventional' bombing, nuclear weapons, and terrorism alike. Because human populations are not bounded by any optimum number, their conflicts have likewise become unbounded.

### 3. REGULATION AND RITUALIZATION OF INTRA-GROUP CONFLICTS IN NATURE

We have briefly examined the evolutionary 'value' of inter-group conflict, in terms of dispersing competitive bands of human hunter-gatherers as widely as possible around the planet. Now we turn to the biological roots of intra-group conflict – conflict within groups of social animals – and ask what mechanisms natural selection has favored for its expression and regulation.

Natural competition unfolds not only between groups of social animals, but also within them. These competitions serve the overarching purpose of stabilizing the group via the emergence of a dominance hierarchy, which maintains order and resolves disputes. Even though the maintenance of a dominance hierarchy itself necessitates the expression of conflict, such conflicts tend to be ritualized in order to minimize injury and death. Natural selection has favored an enormous variety of ritualizations of conflict, whose purpose (I emphasize) is to maintain social order,

and whose alternative – namely anarchy – would militate much more strongly against the survival of individuals and species alike.

Even among solitary territorial predators, the primary mode of conflict regulation is ritualization, accompanied by biologically-programmed gestures of submission or appeasement, via which ritualized conflicts are terminated by non-lethal means. For example, some venomous snakes wrestle, rather than utilizing their fangs against one another. Mantis shrimp batter one another at the point of their heaviest armor – their tails – rather than inflicting lethal wounds on softer tissues. Birds do not peck out each other's eyes, nor do wolves tear each other's jugulars. Animals that routinely inflict mortal injuries on one another in the process of settling territorial or hierarchical conflicts would soon become extinct, whereas animals that ritualize such conflicts would have a marked advantage in the struggle for survival.

The net result is observable across the entire animal kingdom: There is a near-universal repertoire of behavioral "lock-and-key" mechanisms, such that an intra-specific conflict is terminated by a pre-programmed gesture of submission from the loser, which is invariably recognized by the winner, who then ceases his attack. Similarly, gestures of appeasement are utilized by more submissive animals when approaching more dominant ones, to pre-empt aggressive attacks. These behaviors are readily observable across the spectrum of social animals. The general rule is: whenever nature bequeaths a lethal weapon to a species – be it venom, fangs, claws, horns, hooves, tusks, etc. – nature invariably provides a foolproof means of preventing indiscriminant use among rival conspecifics. All such conflicts are ritualized, and can be terminated by mutually-recognized gestures of submission or appeasement.

### 4. ABSENCE OF REGULATION AND RITUALIZATION OF HUMAN CONFLICTS

Unfortunately, the human species falls prey to one of natural selection's many ironic economies. One such economy declares that since humans are born utterly bereft of lethal weapons, and moreover do not develop any in tandem with their biological maturation, humans have no need for any biologically programmed gestures of submission or appeasement. It is only by cultural conventions – white flags, red crosses, hands in the air, formal documents of surrender – that human conflicts can sometimes be ended; and similarly, only by other cultural conventions – diplomacy, treaties, arms-limitation agreements – that future conflicts can sometimes be averted. But there can be no biological imperative to obey, or to disobey, any cultural convention.



Endless attempts have been made to finesse this problem, but none is infallible. For example, the convention of “single combat” – in which a champion from each contending army fights to decide the battle – was made famous in the Old Testament tale of David and Goliath. But it has scarcely become a norm.

In a similar vein, the ancient Greeks instituted the Olympic Games – and the modern world resuscitated them – in an effort to regulate and ritualize, respectively, inter-tribal and international conflicts. While such pacific diversions allow for bloodless expressions of tribalism and nationalism, they were and are powerless to prevent human blood-letting on increasingly extravagant scales.

When Genghis Kahn’s Mongol hordes swept across Asia, some villagers piled their valuables outside their gates as peace-offerings, but were slaughtered anyway. Other villagers put up futile resistance and were spared, owing to the Kahn’s amusement at their courage. There was no convention operating, only human caprice.

The escalating atrocities of modern warfare make a mockery of cultural conventions. During World War One, by convention, field hospitals (whose tents were marked with red crosses, clearly visible to reconnaissance planes) were not shelled by artillery, nor were medical personnel (who wore red crosses on their sleeves) fired at.<sup>4</sup> Similarly, prisoners of war were in general well-treated, owing to the Hague convention. The use of mustard gas by the Germans in 1917 (and soon after by all combatant nations) resulted in the Geneva Protocol of 1925, which banned chemical weapons – in theory but tragically not in practice. But during World War One, at least civilian populations were still regarded as non-combatants.

The unprecedented step of regarding unarmed civilian populations as “front-line” combatants, which stemmed from the 20th-century technological evolution of “total war”, was first taken by Hitler and Mussolini during the Spanish Civil War. In 1937, at the behest of Franco, they dropped incendiary bombs on the citizens of Guernica. During World War Two the tactic of murdering defenseless civilian populations proliferated and escalated, resulting in (among many other examples) the blitz of London, the rape of Nanjing, the siege of Leningrad, the firestorms of Tokyo, Hamburg, and Dresden, and the atomic bombings of Hiroshima and Nagasaki.

The evolution of civilians into ‘front-line combatants’ was paralleled by the mass-murder of ‘captive’ civilian populations by their own governments. Hitler’s genocide, Stalin’s purges, Mao Tse Tung’s Cultural Revolution, and Pol Pot’s killing fields represent atrocities on historically

unprecedented scales, all made possible by one and the same human biological trait: the lack of a reliable mechanism that recognizes surrender or appeasement, which in turn would prevent the use of lethal force.

From these heinous precedents, which deliberately targeted specific civilian populations *en masse*, it was but a short step to the proliferation of terrorism, perpetrated by both state-sponsored and non-state actors, domestic and foreign alike, who deliberately target random civilian populations, typically to promote an ideological agenda. This represents a further degeneration of the lack of human restraint on killing conspecifics, and beyond that it represents the willingness to target victims *precisely because they are defenseless and unarmed*, and pose no biologically competitive threat to their killers. This is the very antithesis of chivalry, but chivalry is only one more cultural convention that can be flouted at will, for it has no purchase in our biology.

In fact, if we reflect on even more pervasive conflicts such as domestic violence against women and children (perpetrated mostly by men), bullying (perpetrated mostly by children against one another), and – at least in the US – handgun shootings, we discover that human conflicts are ubiquitous even in peacetime, and that in the vast majority of cases the perpetrator and the victim are personally acquainted.

These genres of conflicts are almost entirely divorced from the biological imperatives of nature’s clashes, and illustrate that the human animal is psychologically conflicted in ways that militate against its normal biological survival and reproduction.<sup>5</sup>

Indeed, if we consider an extreme example of this tendency, namely dueling, we can lay bare a salient psychological principle at work. Dueling was once a widespread practice, by which any gentleman who took offence at remarks made by another gentleman could “demand satisfaction” – which meant a duel to the death. Dueling pistols were sold in matching pairs, and enjoyed a robust commerce. Duels could also be fought with swords.

But consider how dueling represents a polar opposite of conspecific conflicts in nature. Within each social species in the animal kingdom, we witness ritualized non-lethal conflicts over vital resources. Except among humans, where we witness ritualized lethal conflicts over non-vital resources. The kinds of resources over which humans kill and die so readily are not biologically vital, rather, culturally conceptual: one’s name, one’s reputation, one’s honor. The French were among the first to outlaw the custom of dueling, for the pragmatic reason that they were losing

4 More recently they have become targets of choice.

5 Freud also arrived at this conclusion during World War One. “But war cannot be abolished; as long as the conditions of existence among races are so varied and the repulsions between them are so vehement, there will have to be wars. The question then arises whether we shall be the ones to yield and adapt ourselves to it. Shall we not admit that in our civilized attitude towards death we have again lived psychologically beyond our means? Shall we not turn around and avow the truth?” Freud, 1914-1916.



more officers – and mathematical geniuses like Galois – in duels than in combat.<sup>6</sup>

Thomas Hobbes and Sigmund Freud both drew attention to this alarming and uniquely human tendency, a predisposition to be provoked to deadly conflict by mere words or gestures. Both Hobbes and Freud seized upon the same term, *trifles*, to describe the triviality or insignificance of matters that can and do precipitate deadly human conflicts.

People will resort to violence, said Hobbes, “... for trifles, as a word, a smile, a different opinion, and any other sign of undervalue, either direct in their persons, or by reflection in their kindred, their friends, their nation, their profession, or their name.” (Hobbes, 1651, ch.13).

Similarly, Freud later wrote “In our unconscious impulses we daily and hourly get rid of anyone who stands in our way, of anyone who has offended or injured us... Indeed, our unconscious will murder even for trifles; like the ancient Athenian code of Draco, it knows no other punishment for crime than death.” (Freud, Volume XIV, 1914-16).

And at yet a further extreme, let us recall that Russian roulette was invented by White Russian army officers to alleviate their boredom. So while it requires little more than verbal provocation to impel some humans to violent conflict, it requires little more than boredom to impel others toward potential suicide. No wonder that Freud toyed on and off with the notion of *Thanatos*, a “death-instinct”, which he posited as an equal and opposite force to *Eros*, the life-affirming instinct.

Long before Hobbes identified man’s primal state as a “war of all against all”, and long before Freud declared the Id to be Draconian, Plato anticipated them both in *Laws*, a dialogue between a Cretan named Cleinias and an Athenian stranger:

Cleinias: He seems to me to have thought the world foolish in not understanding that all are always at war with one another ... For what men in general term peace would be said by him to be only a name; in reality every city is in a natural state of war with every other, not indeed proclaimed by heralds, but everlasting...

Athenian: And is what you say applicable only to states, or also to villages?

Cleinias: To both alike ...

Athenian: And in the village will there be the same war of family against family, and of individual against individual?

Cleinias: The same.

Athenian: And should each man conceive himself to be his own enemy: -what shall we say?

Cleinias: O Athenian Stranger – inhabitant of Attica I will not call you, for you seem to deserve rather to be named after the goddess herself, because you go back to first principles you have thrown a light upon the argument, and will now be better able to understand what I was just saying – that all men are publicly one another’s enemies, and each man privately his own.” (Plato)

Biologically and psychologically, man is a conflicted animal. It is therefore not surprising to discover that human sexuality is also infused with violent conflict.

## 5. SEXUALITY AND VIOLENT CONFLICT

Sexual dimorphism must be accounted a successful experiment, not only in terms of the diversity of creatures to which it has given rise, but also in terms of their complexity. That said, nature has also favored the linkage of sexuality with conflict, such that the transaction costs of sexual reproduction can be violent or even lethal.

For example, in numerous species of spiders and praying mantises, in which the female is considerably larger than the male, she often devours him after or even during copulation. For another example, numerous varieties of ungulates – e.g. antelope, deer, elk, moose – are called *tournament species*, because the males enter into violent combat with one other seasonally, during the so-called *rut*, fighting for the privilege of reproductive access to females. About five percent of the males will end up inseminating ninety-five percent of the females, but not before brutal and sometimes even lethal conflicts. For another example, a mature male lion may attempt a ‘hostile takeover’ of a pride, which he can accomplish only by defeating the incumbent dominant male in a ferocious fight, which may leave one or both of them severely or mortally injured. If victorious, the usurper will then proceed to kill all the cubs sired by his predecessor, while the females look on helplessly. But nature has a method to this madness, as the very process of losing their cubs brings the females into heat, whereupon they will mate with the murderer of their offspring – hoping, if lions can hope, that their new master will fend off challengers long enough for their cubs to reach adulthood.

These undeniable links between sexuality and violent conflict, discernible throughout the animal kingdom, are

<sup>6</sup> Evariste Galois, the French mathematical genius who invented Galois theory and group theory, died in a duel at age twenty-one.



also manifest among our nearest living relatives: the apes. Unlike social insects, arachnids, hamsters, hyenas, and other species in which the female is dominant, primates (like the majority of social mammals) are characterized by male dominance hierarchies. Typically, such hierarchies serve two simultaneous purposes: defense of the group from external threats, whether conspecific or otherwise, and maintenance of internal social order, including regulation of sexual access to females. Alpha males exercise their dominance through displays, and through actual fighting.

It lies beyond the scope of this article to detail the variegated nature of sexual (and other) conflicts among primates. Instead, let us focus briefly on such behaviors among chimpanzees, who in many respects are contenders for the title of our “closest living relatives”. Thanks largely to the now-legendary research of Jane Goodall (1973, 1986) with the chimpanzees of Gombe, a number of revelations have come to light.

First and foremost, chimpanzee bands are rife with conflicts, on a daily and indeed an hourly basis.<sup>7</sup> There are constant tensions and unpredictable outbursts among chimps: playing, teasing, and bullying can escalate into violence at any moment. As usual, males challenge other males, jostling for position in their dominance hierarchy; while females who mate with stronger males also exercise dominance over females who mate with weaker ones. Adolescent males who annoy females with unwanted sexual overtures run the risk of violent retribution from mature females and males alike. (Goodall, 1986).

Male chimpanzees are incredibly strong and, although they lack elongated fangs and claws, they can easily maim or kill unarmed humans who provoke them. However, unlike humans, chimpanzees have evolved recognized gestures of appeasement and submission, but as with humans, there is no guarantee that such gestures will be honored. Approaching a dominant male monkey or ape requires downcast eyes and a groveling posture, along with submissive vocalizations (Williams, 1971, p. 21-22). This behavior is entirely reminiscent of human approaches to social superiors, and has undeniable cross-cultural similarities: bowing, genuflecting, or kowtowing, lowering the gaze and averting direct eye-contact, and so forth. These behaviors clearly have their roots in primate evolution.

In particular, the stare-threat is carried over directly from apes to humans. Among chimpanzees, staring is an aggressive threat, an overture and invitation to violence. And in polite human cultures, world-wide, children are also taught that staring is “rude,” precisely because it is a provocation to violence among adolescent and adult males. Significantly, among human females, staring has a different meaning: generally it signals sexual interest. Worldwide,

when women stare at men, or return men’s stares, they are initiating or responding to sexual overtures. By contrast, when disinterested, women avert their gazes.

This ambiguous biological meaning of a single behavior – staring – is neither an isolated example, nor a coincidence. Rather, it is a primatological expression of the commingling of sexuality with conflict. This commingling is evidenced at the appeasement end of the behavioral spectrum as well: when a chimpanzee wishes to express submissiveness to a social superior, it presents its posterior and even allows itself to be ritually mounted. This applies to male-to-male submissiveness as well, and is not a homosexual gesture. Since chimps do not copulate face-to-face, presentation of the posterior is also normal female sexual behavior toward a male.

If we ask how evolution has managed to conflate these visual and postural cues among chimps and other primates, commingling sexuality with violence when it comes to staring and sexuality with social submissiveness when it comes to lordosis behavior, we find an answer rooted in the anatomy of the primate brain.

The Papez-Maclean neuroscientific theory of emotion decisively displaced the proto-behaviorist James-Lange theory, by taking into account the modular triune brain of primates (Papez, 1937, MacLean, 1949, 1962, Koestler, 1967). In the evolution of primates, nature did not discard the primitive yet robust reptilian brain (centered around the limbic system), but rather added two developmental modules: the meso-cortex, which accounts for the competitive success of myriad ground-dwelling social mammals, and the neo-cortex, which is the most recent module, and nature’s most extravagant ‘gift’ to primates.

The outstanding visible feature of the meso-cortex, or lower mammalian brain, is its relatively large olfactory bulb, which interfaces directly with the limbic system, mediating the spectrum of instinctive physiological behaviors associated with self-preservation: so-called “flight-or-flight” behaviors, postures of threat, appeasement, and sexual behavior. In lower mammalian orders, the sense of smell is not only acute: it is the universal and incorruptible arbiter of social relations. Olfaction (and pheromones) governs species recognition, maintenance of the optimum number, identification within dominance hierarchies, and recognition of female sexual receptivity, or non-receptivity, as the case may be. Animals with a powerful sense of smell indulge neither in gratuitous killing of conspecifics, nor in rape, bullying, or other violent abuses of other individuals.

The evolution of the neo-cortex enables primates to use tools and – in hominids and humans – symbols, to conceive as well as to perceive, and moreover to place a premium on conception over perception. But the transfer of executive functions from the meso-cortex to the

7 According to Goodall (1986, p. 341), alpha-males fight, on average, every nine hours; other males, every sixty-two hours; females, every ninety-two hours.



neo-cortex entails one particular transaction cost, which has become our bane: a shift from the primacy of olfaction to that of vision. While lower mammalian predators have excellent vision (and some of them, superlative night-vision), they still keep their noses to the ground, and rely primarily on olfaction to govern their social transactions. By contrast, primates live in or near trees, depending much more on vision than olfaction. In consequence, their olfactory bulbs have shrunk via negative allometry, with the perceptual consequence of a greatly diminished sense of smell. But the anatomical consequence is severe, for it entails the loss of the olfactory interface with the limbic system. It is visual cues that mostly mediate critical behaviors among primates, but the primate visual cortex has no direct contact with the instinctive reptilian brain. This means that, among increasingly higher primates, there is decreasing evolutionary control over violent behavior, as well as sexual misbehavior. Moreover, in the absence of an olfactory differentiator, the two have become conflated. Thus, for example, in monkeys:

“... fighting is frequently a preliminary to both feeding and mating. One sees combative behaviour even in the nursing babe which will angrily fight the breast if no milk is forthcoming, and at the same time develop penile erection... Within the space of a millimeter [in the limbic brain], one may pass from a point at which stimulation results in erection and an apparent state of placidity to one at which the electrical current elicits erection in conjunction with an angry or fearful type of vocalization and showing of fangs.” (MacLean, 1962, p. 296)

This is why we see endemic social and sexual violence among monkeys, apes, and humans. Chimpanzee behavior vacillates incessantly and unpredictably, from mutual grooming and displays of affection in one moment, to bickering and fighting in the next. Chimps regularly engage in bullying, as well as sexual abuse and sexual violence. Like humans, they utilize sexuality not only for procreation, but also for recreation, domination, predation, and humiliation.<sup>8</sup>

And as Jane Goodall's research revealed, the male chimpanzees of Gombe are also capable of forming war-parties, and of hunting down and killing chimpanzees from neighboring bands, in the presence of abundant food, and in the absence of population pressure (Goodall, 1986, p. 341).

Thus the roots of human conflict lie partly in the flawed architecture of the primate brain itself.

## 6. IS THE PRIMATE BRAIN ADAPTIVE?

Although we share 98% of our DNA with chimpanzees (along with 100% of our tendencies toward sexual promiscuity and gratuitous violence), the 2% differential represents an enormous and unbridgeable gulf. Chimps in the wild can learn to use rudimentary tools – such as stones, twigs, and leaves – and under human tutelage, they have learned basic sign language (Linden, 1974). They can also paint, but solely in the style of abstract impressionism (that may yet make a monkey out of Jackson Pollack). But they cannot learn sophisticated tool-use, nor the use of symbolic structures such as natural languages and mathematics.

Given our biological proximity to chimps and other apes, yet our vast cultural distance from them, we are bound to ask a Darwinian question: what happened to the intermediate forms? The neo-Darwinian answer, provided partly by the fossil record and partly by molecular anthropology (via immunological distancing), suggests that we diverged from the great apes around 15 million years ago, and that our last common ancestor was a creature called *Dryopithecus* (e.g. Johanson & Maitland, 1981, pp. 281-284).

As for the fate of the intermediate forms – australopithecines, hominids, Neanderthals – they are all extinct. Unlike the mass-extinction of the dinosaurs, ostensibly caused by a single cataclysmic meteorite that precipitated drastic global climate change, the extinctions of our primate forebears appear to have been gradual, and premeditated. It is entirely conceivable that successively bigger-brained humanoids hunted smaller-brained humanoids to extinction.

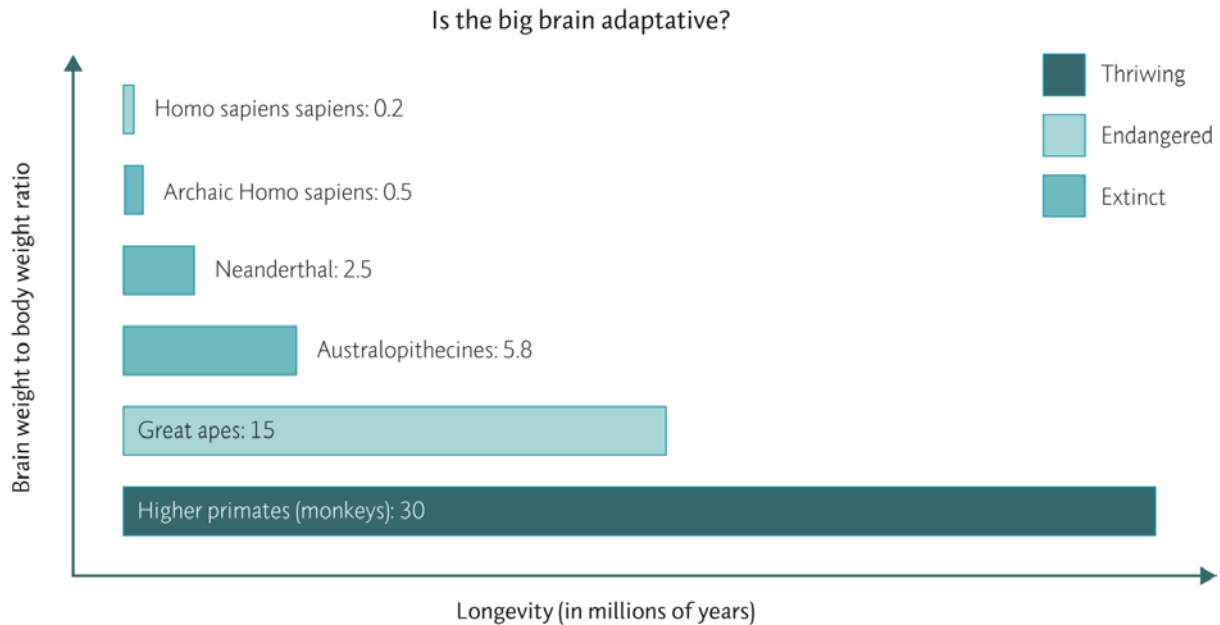
Even if one wishes to avoid speculating about causes, the fossil record speaks unequivocally and undeniably about effects: the life-expectancies of primate species have been inversely proportional to their cranial capacities. The bigger-brained the species, the sooner it became extinct. This tendency is plainly illustrated in figure 4. Based on this evidence, one would be led to conclude – at least biologically speaking – that the big primate brain is not a particularly adaptive structure. We almost proved this conclusively during the Cuban missile crisis, when we stood on the brink of nuclear Armageddon. Had we unleashed those weapons, a future alien civilization encountering our irradiated planet would have pronounced the primate brain an evolutionary dead-end. And no-one could have argued with them.

<sup>8</sup> In humans, the autonomic nervous system controls a number of physiological reactions common to situations of anger, fear, pain, and sexual response. This includes increased pulse rate and blood pressure, reduced rate of bleeding, hyperventilation, adrenaline secretion, increase in muscular tension, involuntary muscular activity and vocalization, gastro-intestinal inhibition, bristling of body hair, and pupil dilation. Physiologically, human sexual arousal is equivalent to anger plus four additional ingredients: tumescence, genital secretions, rhythmic pelvic thrusts and orgasm. See Kinsey et al., 1953, p. 705.





Figure 4



## 7. THE POWER OF CULTURAL EVOLUTION

The power of culture can either exacerbate or ameliorate our worst biological predispositions, depending, *sui generis*, on culture itself. Nothing illustrates this better than comparative average life expectancies of individuals and populations within our species. First, let us note that our closest living relatives – the great apes – all have life expectancies of 30-35 years (Montagu, 1968, p. 109). While an ape's tool-like use of a stone, a leaf, or a twig may enhance its quality of life, any effect on its longevity is clearly marginal. By contrast, if we ask what the average life expectancy of a human is, the answer will depend greatly on cultural arrangements (see Figure 5). Our ancestral hunter-gatherers had average life expectancies similar to those of the great apes and this continued throughout centuries of early civilization. While every generation saw numerous people who attained reasonable or even great longevity, the average remained low, owing partly to appalling infant and child mortality rates, partly to epidemic diseases, and partly to fundamental ignorance or superstition concerning hygiene, among other health-enhancing practices.

Figure 5

Species	Gestation (days)	Menarche (years)	Completion of growth (years)	Life span (years)
Gibbon	210	8.5	9	30
Orang-utan	273	2.0	11	30
Chimpanzee	231	8.8	11	35
Gorilla	252	9.0	11	35
Human	266	13.5	20	35 - 80

In the US, white males born in 1850 had a life expectancy of only 38.3 years; white females, only 40.5 years. Life expectancies rose slowly but steadily in the US, and by 2011 had almost doubled for males (76.3 years), and more than doubled for females (81.1 years).<sup>9</sup> The main drivers of this dramatic increase, not only in the US but throughout the developed world, are access to clean water and hygienic living conditions, literacy and higher education, safe and humane working conditions, and cutting edge medical science and allied technologies. The doubling of our biologically-mandated life expectancies in a mere 160-year period is irrefutable evidence of the power of cultural evolution to override biological defaults. Even so, the US is not among the world-leading nations in current life expectancy. Social democracies that complement technological development

<sup>9</sup> <http://www.infoplease.com/ipa/A0005140.html>

<sup>10</sup> [http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_life\\_expectancy](http://en.wikipedia.org/wiki/List_of_countries_by_life_expectancy)

<sup>11</sup> For some odd reason, one rarely encounters the verb *debellate* – literally, de-war. Just as venomous serpents can be de-fanged in captivity, and jungle cats can similarly be de-clawed, so human cultures can be de-warred or debellated. Of course, deballation is a large-scale undertaking, and may also be entirely reversible over time.



with universal health care fare measurably better, while failed and failing states (typically in sub-Saharan Africa) fare far worse.<sup>10</sup>

Similarly, tribes, nation-states and religions with long histories and traditions of conflict can evolve culturally into pacific pathways. Even in the worst cases, such as Europe, after centuries of unremitting political and religious wars, Europeans (perhaps temporarily numbed by economic unification) appear to be thoroughly debellated.<sup>11</sup>

But in general, as we have seen, biological evolution predisposes humans to conflict. As Plato observed, each person is self-conflicted to begin with, and subsequently partakes in conflicts within and between successive social and political spheres be they families, communities, villages, city-states, empires and ultimately, perhaps, federations of planets on galactic scales.

Cultural evolution can either magnify and intensify human conflict, or diminish and nullify it. How cultural evolution can be directed toward the resolution of conflict, rather than toward its perpetuation and exacerbation, is a fitting subject for a sequel to this article. But if cultural evolution is consecrated chiefly to placing weapons of ever-increasing destructiveness in the hands of bellicose adventurer-conquerors, and to pandering to the rapacity of their ideological tribes, then human conflict is certain to continue without surcease, and to convey us all repeatedly to the brink of self-annihilation as a species.

The cautionary and perhaps prophetic British biologist J.B.S. Haldane portrayed the appearance of *Nova Aquilae* in 1918, as witnessed by:

“... three Europeans in India looking at a great new star in the Milky Way. These were apparently all of

the guests at a large dance who were interested in such matters. Amongst those who were at all competent to form views as to the origin of this cosmoclastic explosion, the most popular theory attributed it to a collision between two stars, or a star and a nebula. There seem, however, to be at least two possible alternatives to this hypothesis. Perhaps it was the last judgment of some inhabited world, perhaps a too successful experiment in induced radioactivity on the part of some of the dwellers there. And perhaps these two hypotheses are identical, and what we were watching that evening was the detonation of a world on which too many men came out to look at the stars when they should have been dancing.” (Haldane, 1923, pp. 3-4)

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## About the author

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### Lou Marinoff

marinoff@frontiernet.net

Lou Marinoff is Professor of Philosophy at the City College of New York, founding president of the American Philosophical Practitioners Association, and editor of the APPA Journal. He has authored several internationally best-selling books, numerous book chapters, and many scholarly articles.



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