Inherited Behaviors in Evolutionarily Novel Environments: The Fixity of Human Social Structure and the Flexibility of its Manifestations

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This paper is an overview of some of the key elements of evolutionary psychology. It is particularly focused on the theme of innate behavioral protocols, shaped by natural selection, responding to the recent innovation of modern human society. It also discusses the greater behavioral rigidity animals exhibit interacting with other members of their own species than they do in interacting with the external environment at large, and how this is reflected in familiar social structures emerging in different human groups living in vastly different relations to their environment. Finally, it discusses the manner in which the existence of innate behavioral tendencies has been a subject of controversy. While acknowledging an inherited basis to phenomena like war or rape is disheartening, the very fact that we find such things so disturbing must also have some inextricable role in the psychological structure natural selection has created, and this should be a basis for hope about the human condition. Ultimately, there is no meaningful way we could even define anything as universally adverse or unacceptable if we did not all share a highly structured, evolved perceptual framework about how the world works and what is desirable within it.

Blank Slates and Structured Minds

In her classic work of anthropology *Patterns of Culture*, Ruth Benedict states:

"*Most people are shaped to the form of their culture because of the enormous malleability of their original endowment. They are plastic to the moulding force of the society into which they are born*." (1)

This sentiment, echoed in a myriad of ways, has been the underlying assumption of a great deal of modern study of human behavior, a common framework on which fields such as psychology and anthropology are based. Biology endows humans with a few very basic drives, that compel us to desire things like sex or food. Behavior is motivated by such drives, but the actual form it takes in pursuing them has no innate parameters whatsoever. Rather it is the result of the brain's all-purpose computational capacity to assess variables in the environment and, out of an infinity of potential alternatives, determine a course of action. This paradigm is adequately prevalent that it is termed the Standard Social Sciences Model (SSSM) by John Tooby and Leda Cosmides in their 1992 paper *The Psychological Foundations of Culture* (2).

One could easily get the mistaken impression from the term Standard Social Sciences Model that it was referring to some broader set of principles of human behavior that were consistent throughout various disciplines, but it only refers to the general assumption of infinite behavioral malleability on which highly disparate models of human society are based. Various social scientists – say, a Marxist anthropologist, a post-structuralist and a behavioral psychologist - all might find the idea of innate behavioral protocols, shaped by natural selection, equally adverse, but they would also perhaps find relatively little else to agree on. This fact in and of itself warrants some skepticism about the validity of

the SSSM. The so-called natural sciences have had no difficulty establishing a vast body of principles on which all agree. Not only do all chemists acknowledge that the covalent bonding of atoms to form molecules exists, but all biologists do, as well, and can see how such chemical processes are the basic framework out of which the more complex phenomenon of life that they study emerges. As Edward Wilson said:

"*Everyone knows the social sciences are hypercomplex. They are inherently far more difficult than physics and chemistry, and as a result they, not physics and chemistry, should be called the hard sciences. They just seem easier, because we can talk with other human beings but not with photons, gluons, and sulfide radicals. Consequently, too many social-science textbooks are a scandal of banality.*" (3)

Another cause for skepticism about the SSSM is the remarkable consistency of some aspects of human behavior throughout cultures, times and places. If biology endows humans with a sex drive and an all-purpose cognitive mechanism that makes behavioral decisions, it is not surprising that humans in every culture have sex. But it is somewhat curious that humans in every culture get married (4). There is no *a priori* reason that, of all the possible configurations of sexual interaction that can be imagined, every culture ever documented should not only conceive of the idea of a prolonged, formally acknowledged partnership between two people, but make such an idea a central institution. Such an arrangement is certainly not the only one in which a population could reproduce at an adequate rate to remain viable.

Further incredulity about the idea of humans as a blank slate is engendered by other behaviors that are not only universally found in all cultures, but have little apparent relationship with the very limited set of basic drives by which biology is acknowledged to influence us. Rather, they appear as sophisticated, fully articulated behavioral phenomenon found in all peoples, no matter how drastically their cultures may vary in their material basis. People living in grass huts or skyscrapers all have humor, body adornment, music, and myth, to name a few. If people based their actions purely on computation of all the possible courses of action, it would certainly be terribly curious that every group of them had decided to institute marriage; but at least marriage is a means of consummating one of the drives recognized by the SSSM. But it would be positively baffling that every culture also has verse poetry, with breaks of approximately three seconds between lines during recitation, as this highly specific arrangement certainly does not seem to be an immediate pursuit of food or sex or any other such need (5). Such realities lead to a pronounced suspicion that evolution has generated not only a basic repertoire of what we should want – reproduction, the avoidance of danger, etc. - but that it has also created specific instructions for how we should get it.

A final point of basic concern is the conspicuous similarity much of the universal, or highly prevalent, behavior of humans has to the behavior of other animals. Friendships, family units, status hierarchies, sexual covetousness, group living, gender roles, territoriality, and both intragroup and intergroup aggression exists in humans just as it does in any number of other animals.

From the list of characteristics above, many could give a clear impression of why an emotional or ideological motivation to free humans from the province of "biological" behavior might exist. Regardless of one's particular social or political persuasions, virtually everyone finds many prevailing elements of human behavior deeply disturbing. The fear is that if, for instance, modern nation states are an enormous analog of primate territories and war a large scale counterpart of intergroup aggression, then the heart wrenching suffering caused by modern warfare is an absolute inevitability, fixed by our

genes at birth. This general theme, of whether or not the less appealing aspects of our behavior can be changed, has been a primary focus of the so-called nature vs. nurture debate. In many respects, whether the participants would wish to overtly acknowledge it or not, nature vs. nurture has really been a scientific proxy for a more emotionally charged debate that could be termed ruthlessness vs. benevolence.

Of course, being frightened by the implications of an observed property of nature does not make it exist any less. Moreover, the very idea of behavior that is biologically based, as opposed to environmentally induced, is such an oversimplification as to be largely meaningless. It could perhaps be likened to asking whether the wing or the beak is the basis of a bird. Behavior is a complex synthesis of environmental and genetic factors, so deeply integrated with one another as to be analogous to the complementary function of carbon and hydrogen in an organic molecule. To be fair, some adherents of the SSSM have said precisely this, such as when Stephen Jay Gould writes:

"*For Linnaeus,* Homo sapiens *was both special and not special. Unfortunately, this eminently sensible resolution has been polarized and utterly distorted by most later commentators. Special and not special have come to mean nonbiological and biological, or nurture and nature. These later polarizations are nonsensical. Human beings are animals and everything we do lies within our biological potential.*"

However, on further reading, it is revealed that the biological element of human behavior is our large brain size, which gives us the the capacity for infinite flexibility. Therefore, any behavior or social structure – aggressive, cooperative, stratified, egalitarian – is equally biological, since all are expressions of our capacity to behave in absolutely any manner imaginable:

"*In any case, even if we can compile a list of behavioral traits shared by humans and our closest primate relatives, this does not make a good case for common genetic control. Similar results need not imply similar causes; in fact, evolutionists are so keenly aware of this problem that they have developed a terminology to express it. Similar features due to common genetic ancestry are "homologous"; similarities due to common function, but with different evolutionary histories, are "analogous" (the wings of birds and insects, for example – the common ancestor of both lacked wings). I will argue below that a basic feature of human biology supports the idea that many behavioral similarities between humans and other primates are analogous, and that they have no direct genetic specification in humans."*

And later on:

"*The central feature of our biological uniqueness also provides the major reason for doubting that our behaviors are directly coded by specific genes...markedly increased brain size in human evolution may have had the most profound allometric consequence of all – for it added enough neural connections to convert an inflexible and rather rigidly programmed device into a labile organ, endowed with sufficient logic and memory to substitute nonprogrammed learning for direct specification as the ground of social behavior.* " (6)

This distinction is so limited in significance as to appear largely unnecessary. I sincerely doubt that any social scientists in the past, when speaking of human's alleged lack of innate behavioral predispositions, were ever seriously suggesting that our capacity to learn and acquire culture was the

result of anything *other* than cognitive abilities residing within our brains. Modern refinements of the SSSM's distinction between environmental and biological factors such as Gould's are, therefore, largely terminological rather than substantial.

Learning and Acquisition

Natural selection has specified behavioral protocols on a continuum of fixity and flexibility. For instance, on one end of the continuum, the example could be made of the predator avoidance behavior of noctuid moths. They are preyed upon by bats that use echolocation, emitting waves of ultrasonic sound and discerning the topography of the environment by the sound that bounces back. The moths' hearing is tuned almost exclusively to such frequencies, in two neurons. One responds to low intensities of the frequency, allowing the moths to move away from a potential predator. When the high intensity neuron is stimulated, indicating that predation is imminent, it sends a signal to the cerebral ganglia, inhibiting the thoracic ganglion. Because the thoracic ganglion controls the pattern of wing beat, when it is inhibited, flight either becomes erratic or ceases altogether. The effect is that the moth drops precipitously in flight, thus avoiding the bat (7). This is an example of a predator avoidance behavior that is truly, literally hardwired. If noctuid moths developed a vast cognitive potential, and a particularly melancholy specimen reflected on existence, decided it was futile, and chose suicide by bat as the most noble course of action, it would be unable to avoid dropping in flight when exposed to the bat's ultrasonic frequency.

At the other end of the continuum, behavior may be quite variable, and show a large capacity for modification based on experience. However, a mental template still functions as the basis for complex and variable behavior, specifying the range of stimulus on which learning may be based and placing parameters on the behavior that can result from such learning. There simply is no such thing as an animal that is born with no innate preconceptions about how the world works or what it should do in it. If we were to briefly examine the potential life of such an animal, and compare it with a creature with specialized cognitive procedures for solving problems relevant to its particular needs, we can quickly see why.

Animal A, the one with only an all-purpose, or domain-general, cognitive mechanism for evaluating options and formulating courses of action, is born on the same day as Animal B, born with specialized, or domain-specific, cognitive mechanisms. For simplicity, we will say that neither is a species with parental care of any period, so their fate is exclusively determined by the actions they take. Both are born in exactly the same place, hungry and thirsty, and both must avoid any potential predators for at least long enough to reproduce once. Animal A considers its options. Animal B, born with an internal rule that tells it if it is feeling equal sensations of hunger and thirst, it should drink first, makes its way down to a nearby river. It does not formulate this rule just now because it has considered the likelihood of surviving prolonged thirst or hunger; keep in mind it has not experienced anything of the world and thus has absolutely no means of coming to any conclusion about which of these two drives is likely to be more immediately relevant to its survival. It has this rule because generations upon generations of its kind have either lived or died based on the extent to which they randomly prioritized the two physical needs, until the tendency to favor thirst became a behavioral rule innate to the cognitive structure of its species. When it gets to the river, it is very wary, constantly pausing to eye the surface of the water, as it also has an inborn rule that tells it that large bodies of water host crocodiles that will suddenly emerge and devour it. It has never given this a moment's consideration, it is just the case that its ancestors were wary at large bodies of water, and they got eaten by crocodiles less often than their

counterparts who were not, who accordingly did not live to reproduce. It then ambles off out of view of Animal A, who is still evaluating all the possible alternative courses of action it could take. Indeed, three hours later, Animal A is still stuck in exactly the same place it was born in. Then an eagle flies overhead and, with merciless speed, swoops out of the sky and rends our blank slate limb for limb before it has had a chance to formulate an escape plan.

Why hadn't Animal A done anything in the three hours it had to live, and why can't it at least bring itself to run in the face of imminent danger? Because the number of options available to it are infinite and it has not had time to think through even the tiniest portion of them. If you think its fate in the eagle's grasp was cruel, I would propose that a long life would have been a worse torment; having to evaluate every single possible alternative before taking any action sounds like the hell to which the overly impulsive are consigned in a cosmology imagined by Jorge Luis Borges.

Animal A could have gone down to the river to take a drink like Animal B. Or it could have decided it wanted to satiate its hunger drive. But what does Animal A like to eat, and how does it go about acquiring it? Maybe it could decide to eat dirt first, since that is likely what would be most abundantly available, and after a few millennia of deliberation it might have decided that its survival chances were maximized if it started off eating what was most abundantly available. Had it not died long before embarking on this experiment, experience could have then told it that dirt was not suitable food, and it would have learned a valuable life lesson. Maybe it should eat the fallen leaves of the tree that is nearby. Or maybe leaves are nourishing, but only when they come from branches with small birds perched on them, so maybe it should see if it is the kind of animal that can get into trees, climbing, flying, jumping, or by an infinity of other possible means, to eat the leaves off the branch with the birds on it. Maybe it should swim to the bottom of the river and see if the crocodile has any food it wants to share. Maybe other animals like to share. But how to ask? Should it make some sort of symbol on the bottom of the river out of rocks? If so, a circle or a spiral? If we saw such an animal (who, by the way, is wingless and small) eating dirt, or trying to fly, or trying to get the attention of crocodiles it was swimming around with, we would regard its behavior as pathological. But really, it would just be the perfectly reasonable behavior of a domain generalist, trying out all its options and learning from experience what is conducive to its welfare and what is not. Even if nothing kills it, the animal dies far, far before it can ever acquire sustenance, and thus 'domain generality' is a synonym of 'deadly behavioral pathology'.

Perhaps at this point you object, thinking that the seemingly innocuous detail at the beginning of Animal A's life, that it lacked parental care of any kind, is, upon reflection, fundamental. Perhaps you think the domain generalist could learn to survive via a period of learning by its parent. But if so, you simply are not appreciating the magnitude of the calculations an animal with no inborn guidelines would have to make. No cognitive structure existing in any animal could perform an infinity of calculations, nor could any supercomputer. Thus domain generality simply could not evolve. Ironically, if it somehow did, and generations began to persist by explicit instruction parent to offspring, they would actually require a far more stable environment than other animals, or else they would perish. To survive at all in this extremely hypothetical situation, they would have to have one innate rule, in addition to their drives, which would be that if they were presented with a situation they had learned a response to, they should always use the learned response rather than begin pondering all the variables. If this rule were followed, this outlandish species could perhaps survive until unanticipated environmental change occurred. Perhaps an ice age would require moving to a new environment. Perhaps a predator would evolve a new capability for preying on them. When this happened, they

would again be faced with the task of considering absolutely every possibility, and go extinct.

But now let us examine another hypothetical animal, Animal C. Animal C's brain is composed of numerous modules that are specially designed for carrying out certain tasks, just like Animal B's, but with a far greater degree of rigidity. Animal C's modules contain no generalized templates whatsoever, only precise models of reality explicit in every detail. For instance, B has an inborn wariness at water that causes it to look for a very crude approximation of a crocodile. It really just reacts with fear any time something bumpy emerges out of the water, or scaly, or that appears to have big round white eyes. Quite often, logs, individual plates of bark, or the white petals of flowers drifting on the surface of the river will scare B terribly. If you made a model of a crocodile but rearranged all its parts into some total anatomical absurdity, with tails emerging out of the tops of heads and all the legs on one side of the body, B would react just like it was a real predator. If you took one element away, say the eyes, but left scaliness and bumpiness, you'd get a predator avoidance reaction to your model 2/3 as strong as with all elements intact. If you made the model bigger than any real crocodile, or more scaly or more bumpy, you would get a stronger predator avoidance reaction than any animal of its kind has ever had to a real crocodile. (For instance, fighting fish respond with characteristic aggression to models of other fighting fish, but the aggressive response is weaker if the model does not incorporate all the relevant stimulus. However, they will respond with greater aggression than to any real fighting fish to large red objects passing by their tanks, which emulate the red undersides of other males.) (8)

Animal C is not so easily fooled is not so easily fooled as Animal B, or as fighting fish. It has specific pictures of all imaginable kinds and configurations of crocodiles in its mind, perfect replicas of actual crocodiles in all their intricate detail that were observed by its ancestors, and it responds only to these pictures. It has a specific image of a crocodile halfway out of the water with its mouth still closed. It has another image of the same crocodile with its mouth all the way open. It has another of a crocodile that has a bad scar on the top of its head. What happens to Animal C, who is born at the exact same time and place as A and B? One can conceive of a few different fates. If the animal is born with precise images, to which it has a hardwired response, of every possible configuration of every possible situation it will ever encounter, it presumably has an enormous brain that is so metabolically expensive all the food in the world would keep it alive for only a very short period of time, and it dies of starvation immediately. If it does not, and evolution stopped loading its brain with predetermined images after it addressed crocodiles thoroughly, crocodiles are still all its very large brain has room for, and it has no means of determining other immediately relevant things, like how to eat and drink and avoid other predators. Therefore, it just sits there right next to A, a perfectly honed crocodile avoidance machine capable of little else, and the eagle benefits greatly from not one but two failed experiments in biological design.

These theoretical deliberations predict that our minds, and those of other animals, should have distinct mechanisms 'about' the issues that are relevant to its survival and reproduction – mating, avoiding danger, finding food – but these mechanisms should not be overly specific in the stimulus they respond to or the behavior they prescribe, and thus should be capable of being refined and modified by experience of the real world.

Situations in which an animal is deprived of contact with other members of its species provide particularly vivid examples of the existence of a dedicated cognitive apparatus 'for' a given behavior and the essential role experience plays in shaping that behavior into a functional whole. A classic case is development of song in the chaffinches. When raised in isolated captivity, unable to hear the songs

of other members of its species, they will still develop a song at the relevant age. This distinctive species-typical behavior emerges without any observation of it actually occurring in a social setting, as predictably and inevitably as teeth emerge. However, the song will be a highly simplified version of what a free-living counterpart would learn, lacking the right syllables or their coherent organization into appropriate phrases. Chaffinches reared with another individual of the same age (thus given the opportunity for some observation of song, but not of an adult that has learned the correct forms) develop a song of intermediate complexity to isolated birds and free living ones (9).

The nature of song acquisition in such birds seem to be a fairly precise analogue of language acquisition in humans. Babbling begins in infancy to develop the neuromuscular coordination necessary for speech, and the astonishingly complex task of acquiring the language spoken in a child's environment is rapidly underway in the first few years of life, when other mental tasks of similar complexity, for which humans do not have a specific cognitive adaptation, would be utterly out of the question (10). Humans remain more or less completely unaware throughout their lives of the sophisticated rules they unconsciously employ to construct language. If language is not learned during a critical developmental window early in life, it is not acquired with fluency. For instance, deaf people who do not learn sign language early in life do not achieve 'native' proficiency with it if they learn later in life.

Behavior in numerous other species seems to be sensitive to such a critical window during which it must be acquired, or forever be impaired. Animals raised in barren, socially isolated environments very frequently develop repetitive, seemingly purposeless, often quite bizarre behaviors called stereotypies (11). The stereotypies are species-typical – carnivores ceaselessly pace, ungulates repetitively chew nothing or chew inedible items, rodents somersault and pull out fur, primates cling to themselves and rock back and forth – and once they develop, they tend to persist even if the animals are placed into more enriched environments with a potential for social interaction.

With social behavior, for instance in rhesus monkeys, much of the damage resembles the stunted acquisition of chaffinch song or human language. If reintroduced to other members of its species after being raised in social isolation, a rhesus monkey will display species-typical social behaviors, such as aggression, without it having been elicited by observation of or interaction with others. However, depending on the duration and particular form of isolation, aggression can reach hyperactive levels or be suppressed below typical levels. Normal social and sexual bonding will not occur. Animals raised in isolation for the first three months of life, despite exhibiting considerable distress, are able to integrate into social life when introduced to others. Animals raised for six or twelve months in isolation, however, show no such capacity to cease stereotypic behavior and learn the socially appropriate function of their innate behavioral repertoire. They are also sometimes subject to persistent, aggressive persecution by their counterparts that grew up with social contact (12).

If social deprivation of infant monkeys is not adequately emotionally disturbing, there is also, appallingly, information on the effects of social isolation on human infants from Communist era Romanian orphanages. 'Communist era Romanian orphanages' is not a phrase that immediately induces happy associations, but in this case the degree of callousness exceeds even what a fairly cynical observer of the human condition might expect. Developing infants were confined to cribs for up to twenty hours a day without substantial human contact, and the effects, as with the other animals just discussed, manifested not only in stunted behavioral development and repetitive, purposeless behaviors (rocking, hand movements while staring at the hands, self-injurious behaviors such as head banging

and eye poking) but also in reduced cranium size (13). Environmental conditions not only influence behavior, but the gross anatomical features that produce it.

Given only cursory consideration, this fact might be misinterpreted as an argument for the absolute significance of the environment in shaping behavior. But of course, saying that environmental conditions can induce behavioral and morphological abnormalities is not the same thing as saying that the behaving organisms are infinitely malleable to whatever shape the environment wishes to impose on them. Barren, socially deprived environments can not make an ungulate pace or a carnivore somersault (at least not nearly as often as carnivores pace and rodents somersault). If the minds of any animals were truly blank slates, rather than highly structured, atypical conditions during early life would not result in a diminished capacity to learn normal behaviors later on, nor should atypical conditions be experienced with any subjective sense of adversity, as the animal would have no innate criterion for defining conditions as atypical or adverse. Few can doubt, however, that depriving a baby human or monkey of contact results in suffering, and that individuals have an inborn expectation of social contact by which appropriate behavior can develop. It may be best to say that much of the most significant, fundamental behaviors of a given animal species are not really learned, in the sense that they are developed purely by processes of association, but acquired, by mental modules designed specifically for the acquisition of a given behavior in the environment a species has evolved in. Functional, species-typical behavior can not occur without the appropriate environment, but no environment will create a behavior that there are not genes for.

Stimulus Substitution and Modern Social Structure

An important consequence of this mental architecture, of inborn mental templates that require some input from the environment rather than being absolutely specific in every detail, is that it should be possible to, from the perspective of natural selection, 'fool' such modules. That is, it should be possible to substitute a biologically relevant stimulus, that has engendered cognitive adaptations, with an adequately similar stimulus. Such substituted stimulus will produce some version of the biologically relevant response, even if this stimulus is something that has never existed before and has had no role in evolution. In a coarse sense, the stereotypies previously referred to might be considered an example; the evolutionarily novel environment of a cage in which there are no conspecifics engenders behavior that, while clearly based on innate procedures for some essential action the animal would normally perform, has never existed before the development of cages.

This point is of the most fundamental significance. When we observe bears relentlessly pacing or rats climbing to the tops of their cages to back flip to the ground over and over again, we are witnessing behavior that the species did not evolve, *per se*, but that evolution has made inevitable under the circumstances. We may still speak of a biological fixity to the behavior, or at least a very strong biological basis, even if it in no immediately apparent sense resembles any evolved behavior. Precisely what behavioral procedures are being invoked, in extremely novel form, by these environments is not a matter of great certainty at present. Obviously, in natural settings, carnivores spend more time walking and ungulates spend more time chewing, but a more detailed picture of how fundamental behaviors are elicited in novel form is lacking, particularly with activities that bear a less obvious resemblance to characteristic activity in the wild, such as somersaulting.

While clearly novel behaviors with a fundamental evolutionary basis, stereotypies are fairly simple, and have a conspicuous quality of stuntedness to them. But unprecedented stimulus and environments

can result in more than simply frustrated and apparently purposeless acts that look like degenerate repetitions of more functional behavior. The ability of animals to learn complex, functional tasks in laboratory settings is the result of dedicated cognitive domains for performing biologically relevant behavior responding to substituted stimulus. A relevant example comes in the form of research on the learning potential of rats. The research demonstrated limits to what rats could learn based not on the limits of their cognitive capacity in general, but on how similar the associations they were making were to associations they would make in the course of typical behavior. It therefore contradicted essential notions of domain-general learning theory, where an organism has an equal potential to learn any given task of equivalent complexity, and was initially received very poorly (14).

Rats were easily trained to associate a sound of a certain frequency with an electrical shock, and perform an avoidance response, in this case pressing a button. They were also easily trained to associate and thus avoid a taste, in this case saccharine in water, with x-ray induced nausea. However, attempts to switch the two sensory modalities with which the associations formed were not successful. 'Bright-noisy' water, illuminated with red lights and accompanied by sound, could not readily be associated with x-ray induced nausea. Nor could a painful electrical shock be associated with the taste of saccharine (15). If anything, these results are in themselves not terribly surprising, arguably far less surprising than the fact that they would have contradicted psychological and learning theory so profoundly in the first place, and thus taken so long to find publication and acceptance. The frequency used in the experiments, while not a sound made by any particular predator, presumably can be associated with sudden pain because sound is commonly associated with predators, and predators with pain. Likewise, while saccharine is not specifically a taste that evolution has taught the rat to avoid, it has given rats the capacity to associate taste with nausea. Thus, a totally novel behavior with a clear purpose – pushing a button or avoiding a certain, usually harmless, taste – is created by substituting biologically relevant stimulus with something adequately similar.

At still another level of complexity and integration, novel environments can cause innate social behavioral procedures within populations to run unprecedented courses and produce entire new social roles and types of society. An example comes from John Calhoun's paper *Population Density and Social Pathology*. The experiment housed rats in an enclosure where resources were provided abundantly and the population allowed to increase indefinitely; the only limitation was space. The population exploded and then declined to extinction owing to a number of behavioral anomalies that emerged as a result of ceaseless social interaction; for instance, maternal care for newborns was greatly diminished and cannibalism of infants was rampant. However, the effects were not limited simply to an increase in some behaviors already within the species repertoire, and a decrease in others, with the net effect being population decline. Unprecedented dynamics emerged. Females exhibited unusual levels of aggression and novel sexual roles developed in some individuals. Many of the rats became subject to a compulsive need to be together, so that they confined themselves to central areas of the enclosure, ignoring altogether food and water in peripheral areas of it. A separate caste tended toward the opposite extreme and ignored social and sexual activities entirely, confining themselves to solitary behaviors such as eating, sleeping and grooming. These were dubbed the beautiful ones by Calhoun, as their coats were sleek and lacked the scars of combat injuries visible on the others (16).

The next level of complexity and innovation of purpose occurs in humans. In this case, the novel environments to which our inherited behavioral protocols are responding are not something we are subjected to by some externality, but what we create ourselves. When we see a dog stop on the street as an ambulance passes by to howl in response to the siren, remembering the ancient protocols of the

pack, we laugh. But of course, our lives consist largely of similar responses to substitutions for biologically relevant stimulus, as the environments modern humans occupy were not anticipated by evolution.

In his book *Human Universals*, Donald Brown uses the term implicational universal to refer to a phenomenon that, while not ubiquitously distributed throughout all human populations ever recorded, occurs in every documented culture in which a given condition is met. When assessing the conditions found in the modern world – that is, among people possessing a high level of technology – a great deal of conspicuous uniformity prevails in all societies. These are implicational universals, the condition for which is technological sophistication. For instance, all modern peoples share the same very basic level of organization into nation states, and these nation states internally consist of different social classes which possess a number of distinctions from one another, one of which is always that some social classes possess more material wealth than others. Assessed only in terms of their immediate vicissitudes, it may seem that the brutal Chilean military dictatorship of Pinochet, the Roman empire under Caligula, and Britain's liberal democracy under Tony Blair bear little in common, and therefore suggest little in the way of inevitabilities in social structure under certain technological conditions. But addressed more fundamentally, all of these entities can be commonly understood to be manifestations of something called government, as an entity that provides binding resolutions on the conduct of a society, and enforces these resolutions with the capacity to use more force than any one individual constituting the society has the means to. In other words, someone from 1970s Chile could find themselves in Britain in 2004, and observe obvious distinctions. They could find themselves relieved, for instance, that Blair's government was not detaining and executing students *en masse* for their political convictions. But they would understand this deference from mass execution as variable behavior on the part of an entity, government, that Britain had in common with Chile.

Statehood, in all its many permutations, involves many complex characteristics, like jurisdictional conflicts between different law enforcement agencies, economic embargoes, and clandestine operatives stationed at embassies, that most assuredly have no precedent in ancient human history. It may be somewhat puzzling, therefore, to think of this social structure as in any sense being determined by evolution. However, its ubiquity in all human groups in which the criterion of adequate technology is met, considering the hypothetically infinite set of possible alternatives (no coercive relations or binding resolutions on conduct existing, laws existing but promulgated exclusively at the level of the city block, the promulgation of laws being the exclusive province of groups of people who intended to directly enforce them, etc.), gives every indication that the evolved structure of the human mind is at work.

One possible source of objection to this would be the notion that the limiting factor in the diversity of modern social structures has actually been time, or momentum, or people's inventiveness, or some combination thereof. However, the last few centuries are notable for their vast profusion of disparate political ideologies, for which much blood has been spilled in order to institute radically opposing social structures. And, despite all these efforts, for the remarkable consistency of certain human group dynamics that has prevailed. For instance, statelessness was briefly achieved by anarchists in significant portions of Spain in the 1930s. Such a scenario might on its surface be seen as an argument against the fundamental, evolutionarily prescribed role of states in modern life. However, its sheer novelty and ephemerality argue the opposite. 1930s anarchy in Spain indicates that people most assuredly have used their capacity for reasoning to formulate the appealing notion of a stateless society and have organized and fought bravely to achieve it. There is no convincing sense in which the ubiquity of statehood in modern social structure is the result of a lack of compelling thinking about its

alternatives. We may postulate an endless series of social configurations that might seem desirable, but it seems very much to be the case that human behavioral tendencies continue to orient towards certain conditions.

The other ubiquitous modern condition referred to was, within a given nation state, the existence of different social classes that possessed the distinction, among others, of differential ownership of resources. To some extent, this is actually something that exists in the majority of social groups, whether they possess sophisticated technology or are organized into nation-states. The degree to which resource allocation is skewed in a given society seems to be roughly proportionate to the surplus that is available, so that one sees increasingly distinct economic classes emerging in the archaeological record with increasing technology, culminating in the fabulous excesses of wealth in industrial civilization, with small numbers of hyper-wealthy individuals possessing resources many times in excess of what is necessary for their survival and reproduction. In other words, a cognitive rule seems to be in place telling people to try to acquire more than other members of their society possess, as such an approach led to greater reproductive success throughout our evolution. And there appears to be little in the way of a threshold within this cognitive rule that tells someone to stop acquiring in excess of their peers once a certain reasonable security has been achieved. Presumably, such a threshold was not an adequately useful or relevant aspect of the Pleistocene environment to be incorporated into the pattern of the human mind.

The exceptions to economic inequality are to be found in cultures that persist in extremely resource-limited environments. To some extent, of course, this is an inevitable expression of physical fact; if resources are terribly scarce, it is unlikely that any one person or group can acquire vastly in excess of what they would need to survive. However, in such scenarios, where scarcity may present such a significant peril to any given individual that they can benefit more from assistance by their neighbors than they could ever really hope to by competition, cultural standards of collectivism and economic egalitarianism do indeed emerge. For instance, the Dobe !Kung occupy the Kalahari Desert, where resources hardly occur in any great excess. There is little in the way of conspicuous inequality in resource allocation among them; food is shared among members of a given group. Meat is the property of the hunter, but this seems largely to confer the right to distribute it rather than exclusive access to it. Reciprocal distribution of meat is somewhat formalized by the practice of *hxaro* exchange, where gifts are given with the understanding that, at an indeterminate point in the future, a gift will be received in turn. Arrows are widely circulated within the *hxaro* network, and a common form of reciprocation for the gift of an arrow is to give some of the meat that is hunted with it. A group occupying the land around a waterhole, a *n!ore*, are thought to collectively own it. Neighbors may come and ask to hunt on a *n!ore* when times are difficult on their own, and in most circumstances permission is granted. An implicit understanding exists that such a favor will be granted in return if it is asked. Finally, there are cultural conventions among the Dobe !Kung intended to diminish perceptions of prestige and status for achieving surplus, in direct contravention of cultural standards so often observed elsewhere. The custom of insulting the meat is noteworthy, requiring a hunter, regardless of how profitable a kill he has made, to dismiss it as frivolous and barely worth the expenditure of energy made dragging it back to camp. This is not to say that the !Kung are selfless utopians. Practices like insulting the meat are specifically designed to diminish people's innate tendency to seek out status higher than their peers. As Richard Lee says in his book *The Dobe !Kung*:

"*...the living group pools the resources that are brought into camp so that everyone receives an equitable share. The !Kung and people like them don't do this out of nobility of soul or because they*

are made of better stuff than we are. In fact, they often gripe about sharing. They do it because it works for them and it enhances their survival. Without this core of sharing, life for the !Kung would be harder and infinitely less pleasant..." (17)

This sounds like a fairly sage interpretation of the facts, but for many, the temptation to interpret modern wealth disparity as a result of alienation from nature, and our historical modes of subsistence, has been overwhelming. In this interpretation, hunter-gatherer life is always free of conflict and inequality. There is little indication that, economically egalitarian or not, hunter-gatherer societies are necessarily free from violent conflict, but the problem even with the purely economic elements of such a primitive utopian scenario is the relative lack of adequately marginal environments in which it could possibly flourish. Benedict's description of the Kwakiutl of Vancouver Island provides a case in point. While *Patterns of Culture* is often cited as an appeal to absolute tolerance of other cultural standards, a sort of paramount document of cultural relativism, it is somewhat difficult not to discern a number of inevitably severe judgments throughout the work, such as when she says "*The object of all Kwakiutl enterprise is to show oneself superior to one's rivals*", or describes the behavior required of a chief as arrogant and tyrannical.

These hunter-gatherers lived on the Pacific Northwest coast, where abundant marine resources provided the material for an economy of great surplus. The highly stratified society that resulted had copper money with little intrinsic value, a widespread practice of loaning at interest, a complex system of titular nobility, and a slave class. Titles were simultaneously inherited and purchased, and their acquisition was a consuming obsession. An individual of means would acquire numerous titles throughout life. The accumulation of great surplus wealth, and the titles that could be purchased by it, functioned not only to confer higher status in and of itself, but to allow for numerous practices intended to shame one's peers. A Kwakiutl saying is recorded, 'We do not fight with weapons. We fight with property.' At potlach feasts, chiefs would attempt to undo their rivals, who were also their invited guests, by two means. One was to give more to them than they could repay at the great interest rates that were the culture's standard; to refuse the gift or to be unable to pay at high interest was considered defeat. The other was simply to destroy wealth, which also required reciprocation on the part of the guest. Massive quantities of candlefish oil would be burned. In some cases, canoes would be thrown onto the fire as well. Finally, in a move that could conceivably make even the greediest modern industrialist blush, slaves would be killed purely as a display of the wealth their owner could afford to waste. Effigies of the guests were erected in potlach houses showing them with protruding ribs, to emphasize their poverty, and speeches ridiculing them were delivered:

"*I am the great chief who makes people ashamed.*
I am the great chief who makes people ashamed.
Our chief brings shame to the faces.
Our chief brings jealousy to the faces.
Our chief makes people cover their faces by what he is continually doing in this world,
Giving again and again oil feasts to all the tribes." (18)

Clearly, then, it is not civilization that is the crucial variable in deciding egalitarianism or inequality. The key issue seems to be resource abundance, and most environments, and the technologies that exploit them, provide an adequate abundance for conspicuous stratification of some degree. Of course, modern civilization, Kwakiutl society on the Pacific Northwest coast, and !Kung culture in the Kalahari are all fairly recent innovations, that deviate environmentally and technologically from the Pleistocene

conditions in which humanity developed. The Kwakiutl less so than industrial society, and probably the !Kung somewhat less so than the Kwakiutl, but none of these societies lives in precisely the environment, with precisely the technology, of early hominids (I should probably be careful to note here that I am not trying to imply that humanity evolved in a static environment, with a static technology, but this does not make the statement that no modern culture emulates these early conditions any less true).

Of course, people living absolutely anywhere on the globe, when possessed of modern technology, interfacing with modern economies of tremendous geographical scale, may be said to occupy highly abundant environments. Las Vegas, Nevada may have been adequately marginal that hunter-gatherers would have found little surplus on which to base a society of stratified wealth. But modern Las Vegas most assuredly can provide copious opportunity for individuals to display their abundant material resources. As such, all modern societies possess economic inequality. If differential economic status, and nation-states, are in fact based on evolved cognitive mechanisms, it is pertinent to ask what, exactly, these mechanisms are, how and why they functioned throughout evolutionary history, and what possible courses they can take in different environments. This is particularly true as both of these conditions may be seen as troubling phenomena in and of themselves, or at least to certainly manifest themselves in a troubling manner a great deal of the time.

Inquiry into the origin of social structures that feature coercion and inequality as primary elements takes us into the murky territory of the behavioral ecology of our early hominid ancestors. Archaic lines of hominid evolution no longer populate the earth; we can not directly observe the lives of *Australopithecus* or early *Homo* to discern their social groups, and how behavioral tendencies toward coercion and inequality are fostered within them. We have at our disposal only scattered fossils and stones, and these are fairly silent on such matters. By and large, conclusions about social structure in our early ancestors must be made by inference. The best possible source of such inference is essentially by looking at our evolution as a blank space, with the behavior of our closest relatives, chimpanzees, with whom we share a common ancestor 5-7 million years in the past, on one side, and modern humans living hunter-gatherer lives on the other.

By such methods, we would come first of all to the conclusion that early hominids were in fact group living animals; modern humans and chimpanzees both share this characteristic. The duration of habitation of any given site no doubt varied greatly over time and between regions; probably early humans found themselves sometimes sleeping in new places nightly and sometimes stationed at one site where resources were abundant for an entire season or more. However sedentary or mobile within a given area, it can be inferred that early humans thought of their area as a territory, belonging to the group they were a part of, distinct from the territories of neighboring groups. Again, this is the condition that prevails among modern hunter-gatherers and chimpanzees. Because a territory is a resource potentially of value to a neighbor as much as it is to an occupant, trespass must have occurred, with associated violent conflicts between members of different groups. In chimpanzees, this takes the form of border patrol activity. Border patrols consist of multiple individuals, mostly males, traveling along the periphery of their own territory, and sometimes deep into neighboring territory. Their demeanor during such forays starkly contrasts with that of group foraging and sexual activity, when vocalization is loud and frequent. During border patrols, chimpanzees maintain vocal silence for hours, move in single file lines, and stop frequently to listen for the sounds of neighbors and inspect their environment, often showing intense signs of fear. When neighbors are encountered, the result will vary depending on the size and composition of respective groups, but whether parties attack or retreat, they

are always hostile encounters. In Gombe, Jane Goodall describes a series of lethal attacks on lone males that were made by parties invading from a neighboring territory to the north, until the southern group had been annihilated and their territory annexed. In contrast, while intragroup aggression is common, and sometimes quite serious (particularly in dominance conflicts), she observed no case of it being fatal (19).

This is noteworthy as all known peoples have some form of prohibition on violence and rape within a social group, at least in certain situations (although such prohibitions are never entirely successful; in contrast with the absence or great rarity of lethal violence within chimpanzee groups, no known culture does not sometimes have internal homicide). Universally, these standards of conduct are different with respect to individuals from other social groups, with the conditions under which violence is permissible expanded (20). This dynamic in chimpanzees may be viewed as the behavioral inclination out of which grows the sense of a band or tribe in primitive peoples and of a nation in modern ones, with its internal standards of conduct that differ from acceptable conduct with members of other nations (for instance, laws prohibiting homicide internally, but with war being waged against other nations). It is noteworthy that increase in territory size has been observed to result in increased reproductive success for a chimpanzee group. The likelihood of border patrol activity being initiated is significantly affected by the number of males in one another's presence at a given time. In Kibale National Park, where the Ngogo group verges on a chimpanzee empire with approximately 150 members, John Mitani and David Watts observed as many as ten border patrols in some months (21).

The stratified nature of chimpanzee social groups can also be used to make inferences about intragroup inequality within early humans. A given chimpanzee group is subject to a fusion-fission dynamic, where on any given day an individual of the group may or may not be in the presence of any other individual. Often times, large congregations form around abundant food resources or estrous females. When desired resources are more scarce, smaller groups will typically form for more diffuse foraging, or any individual (or mother-infant pair) may venture off on their own. When multiple chimpanzees are in the presence of a desired resource, access to the resource may be determined by the relative status of two individuals. Higher or lower status, particularly in males, is determined by fighting. In addition to food, the desired resource may be a sexually receptive female. Maintenance of the dominance hierarchy may be contingent on coalitions between males, so that a chimpanzee who is able to dominate the alpha alone may still be subordinate in most situations, as the alpha is often in the company of another strong male who will come to their aid in fights. While it does not compose a particularly large part of their diet, meat is the most valued food resource. When it is successfully hunted (or stolen from baboons), complex begging and sharing behaviors occur (22).

The first notable adaptation evidenced by early hominids in the fossil record, before there is any indication of increased cognitive capacity or behavioral sophistication, is bipedalism. Whatever the reasons for this change, this more athletic physique, suited for things like long-distance running, could have aided hunting behavior greatly (23). Hunting provides a great concentration of calories, but its acquisition is far more variable than that of calories from plant foods. Therefore, an increased reliance on hunting could have been an important basis for the evolution of greater social intelligence, as fitness was increasingly determined by access to meat, which was shared via the matrix of social alliances and reciprocities of the group. In addition, hunting prowess likely conferred greater status on males, further contributing to fitness. It has been noted in a number of hunter-gatherer cultures that the acquisition of plant foods provides a considerable majority of caloric intake, but that the men in such cultures prefer to pursue the prestige-enhancing possibility of killing large game (24). For instance, among the !Kung,

plant foods were observed in one study to provide 70% of the calories (25), but it is around successful hunting that the practice of insulting the meat, intended to negate a sense of differential status, forms.

Whatever the details of early human foraging ecology, the important variable for our discussion is the social dynamic that forms around it. The units of caloric intake can be fruit or meat, meat can be hunted or scavenged; the critical issue is whether members of a group had different statuses, that conferred differential access to resources. This dynamic clearly prevails in chimpanzees and in humans. A continuous inheritance through the intervening generations between ourselves and our distant common ancestors is a far more parsimonious explanation of this fact than that every society has randomly structured itself in a way to resemble the societies of other, closely related animals. We may as well posit that, while all humans have hearts, and all other mammals have hearts, ancestral hominid evolution did not in fact involve this vital organ, and that the circulation of blood in humans is a purely cultural invention, which could be readily replaced with any other arrangement were the appropriate conditioning to take place.

It is worth asking what, exactly, happens when evolved cognitive procedures relating to group structure and interaction with other groups encounters the evolutionarily unprecedented stimulus of modern technology, with its novel possibilities such as massive social groups. In other words, what exactly happens when we go from an alpha male, or a tribal leader, to a dictator operating death camps, or a billionaire oil magnate? To a fairly large extent, the result seems to be that existing behavioral tendencies are not fundamentally changed, in the sense of some major alteration of their basic structure, but simply amplified in scale. This indicates that behavioral tendencies to seek things like high status, or success in intergroup rivalry, are based on cognitive templates that have no upper threshold. This would be because, in the environment in which natural selection formed such cognitive templates, it was not often enough the case that it increased fitness to ever terminate the pursuit of something like greater wealth. Natural selection had only to specify the rule 'seek more than others', and never found a basis for creating another rule like 'stop seeking more than others when you have approximately twice as much as you'll need to survive'. Cognitive templates that know no upper threshold in scale are well known in other species. A particularly notable case is the behavior of birds who have had eggs lain in their nest by other species for them to care for, a phenomenon called brood parasitism. When the young hatch, they present physical characteristics that are a greater intensity of the characteristics the parent would use to recognize their own young. As a result, parental care behaviors like feeding are increased beyond what they would be if directed to their own offspring, in some cases the parent working in a frenzy to feed a juvenile bird that is actually larger than itself (26). Likewise, the phenomenon of fighting fish responding with greater than 'natural' aggression to large red objects passing by their tanks – objects larger than any fighting fish – has already been discussed above.

In the above discussion of early hominid social structure, I focused on chimpanzees as the sole non-hominid of comparison largely for the sake of simplicity. While many behavioral dynamics exist somewhat uniquely within chimpanzees and humans, or within humans and other primates exclusively, territoriality and hierarchy are not among them. To seek a deeper understanding of these ecological dynamics, it is necessary to look at why social groups form in the first place and what their consequences are. We take for granted what is most familiar to us. We are social animals, we feel social inclinations tremendously and are damaged by being deprived of contact with others, and so sociality may seem such an obvious or inevitable phenomenon that we may be disinclined to seek out a basic understanding of why it exists. But everything that seems inevitable in our perception or behavior seems that way precisely because it we are specially designed with such a powerful bias to perceive or

behave in that way. Discerning basic properties of the physical world, such as the boundedness of objects and the emptiness of the space that surrounds them, is something we can only do without effort or conscious deliberation because our cognition is specifically structured to operate in this way (27).

The Evolution of Sociality and Its Consequences

Individuals of a hypothetical solitary species occupy an environment where resources are abundant enough for them that their ability to intake calories, find shelter, and otherwise successfully exploit their ecological niche are not as limiting of factors in their fitness as mortality from predation. If a mutation occurs that creates a tendency for a member of this species to spend more time around others of its kind, the consequences could be varied. When being stalked by a predator, either of them could notice it and flee, and this could, however inadvertently, inform the other of danger, thus saving their life. Even if neither of them does notice it before it attacks, if they are close together and they both flee, the predator will have a harder time catching either because it will be more difficult to select a target. Also, some of the reduced availability of resources from two animals occupying the same niche in close proximity may be offset by foraging success on the part of one being communicated, again however inadvertently, to the other. While limiting the actual available calories available at any given site, the time spent searching for said calories may be reduced. If the combined benefit of two animals being in close proximity outweighs the detriments, than the one with the mutant gene for being in the vicinity of conspecifics will likely outreproduce alternate genes in the population, and grouping spreads. It is important to note in our scenario that the animal with the grouping mutation spends time with a number of different members of its species, as any one of them lacked the behavioral inclination to stay close to it. Thus, any grouping benefit was conferred on them only temporarily, while the one who actively sought out conspecifics received the benefit its whole life, thus reproducing at a greater rate.

As grouping becomes an undeniable success in the population, predictable drawbacks emerge. First of all, the benefit is not infinite. At a certain size, a group of animals may have substantially reduced its risk of predation, but also reduced its ability for any one individual to derive adequate sustenance from the environment to such an extent that fitness declines below what it would be if the animal was alone. Therefore, another mutation, this one that tells an animal to leave a group after it reaches an approximation of optimal size, rises in frequency in the population. The animal still has the inclination to group, but it will leave an area and find or form a different group if the one it is in gets too large. However, as time goes on, group identity begins to form, and simply wandering into the territory of a neighboring one becomes a less and less viable prospect. This is because within any assemblage, over a sustained period of time the benefits and costs of any given individual being in the proximity of any other achieve a rough equilibrium; individual A has spent enough time looking around for predators while individual B was eating to make it exactly worth B's while to be around A, even though A eats some of B's potential food. If an outsider, individual X, wanders into the region occupied by A and B's group, X may consume their resources without having provided adequate offsetting benefits for it to be as beneficial to them to allow X's presence as it would be to expend the energy to drive X away. Thus, genes for doing precisely this emerge, as well as for recognizing outsiders by a variety of cues, some perhaps based on individual recognition, some on more general properties, such as a characteristic smell the unique diet provided by the group's territory gives to all of its members. Thus, not only does grouping evolve, but so does territoriality.

Our hypothetical species has evolved these traits, and now lives in somewhat stable, territorial

aggregations. Within any one of these aggregations, a tremendous selection pressure has been exerting itself all along, which is a differential receptivity on the part of the group's females to mating with the males. Even before grouping evolved in this species, it was certainly males who had to convince females they were suitable candidates for reproducing with. The female makes the far greater investment in reproduction, with her egg, which is so much larger, rarer and more physiologically demanding than cheap and plentiful sperm. Every female of the species agreeing to mate with a single male would spread his genes to ubiquity, but if every male of the species agreed to mate with a single female, she is still limited by her small number of eggs. Also, since this species is a mammal, with internal gestation, she will have to make the investment of bearing the offspring to term. Finally, she will have to care for them until they are independent. Males of this species long ago 'realized', in evolutionary terms, that they could simply leave after insemination and still assume their genes would persist in the population. This is because, if the female wants her genes to also be represented by future generations, she really has no choice but to raise the offspring when they are born a few months later and he is nowhere to be found.

Therefore, it has always been males who had to convince females to reproduce with them. But with the advent of grouping, this has become far more difficult and complicated than it was previously. It used to just require being in the right place at the right time, appearing reasonably healthy, and being able to successfully perform a courtship display. In the diffuse population, the number of males a given female would encounter was relatively low, and so it benefited her to choose one rather than try to compare a vast number. But now she can do exactly that. A strong pressure is exerting itself on the males of the population to appear more attractive to a potential mate than their peers. For instance, this species has a tuft of bright red hair on the top of its head, and females have always evaluated males, when making mating decisions, to determine whether his tuft was vigorous, thick, and adequately long. This was simply an indication of whether he was in good physical condition, which was a useful indication of whether her genes would be likely to survive if they were mixed with his. But now, tufts are getting much longer. It turns out that females of the species just had a simple cognitive rule that told them the longer the tuft, the healthier and therefore more suitable for reproduction the male. The rule did not involve any threshold beyond which tuft length was regarded as excessive. In fact, tufts have gotten so ostentatious they have become expensive, cumbersome features to maintain, and therefore actually diminish an individual's chances of survival. But this diminished survivability is still offset by the sexual attractiveness of tufts. In other words, if a female breeds with a male with a smaller tuft, who will produce offspring with smaller tufts who are therefore somewhat more likely to survive, other females are less likely to reproduce with these offspring, and therefore small tufts do not spread in the population. However, tuft size ultimately reaches equilibrium; eventually mutations begin to create tufts so outlandish in size that it reduces fitness drastically to possess them. Such individuals do not survive, and so female's cognitive rule does eventually incorporate an upper limit.

Other forms of competition are somewhat more direct. Certain of the males long ago took to the simple expedient of aggression toward sexual competitors; the winner of such fights simply drove off their rival, as well as indicated to a prospective mate that they were, in fact, the more physically fit of the candidates. Now, this has become somewhat institutionalized, and aggression is inextricably linked with mating. This, of course, also reduces survival probabilities, and again, if a female were to select a mate that was most likely to live a long life, she would choose one that had a small tuft and an aversion to fighting. But such offspring, while potentially living long lives, would not be sexually attractive, and her genes would perish as a result. Fighting, too, has reached an equilibrium. At a certain point, ceaseless and wanton aggression toward other members of the group reduces survival probabilities to

such an extent that fitness declines regardless of sexual attractiveness. For this reason, it is not the case that no holds barred combat takes place before any episode of copulation. When fights occur, they tend to settle things for a little while, and whoever has beaten the others is understood to have preferential access to a female when he is around, without actual conflict every time. The person who has beaten everyone but the foremost male has preferential access to a female when his dominant is not around, and so on. A challenge may rise up at any point, but there is a measured pace to how often they actually do, and a hierarchy may remain relatively stable for months or years at a time.

Although it inevitably becomes a factor in sexual selection, there is another dynamic that has developed in our group that has fundamentally altered the behavior of our hypothetical species. The cost-benefit ratio of group living is not the same for every member. This is because, long ago, some of them also learned that they could use aggression to ensure preferred access to resources for themselves, thus negating some of the costs of social living while still deriving all the benefits of predation avoidance and the greater efficiency of group foraging. The extent of the inequality is checked by a threshold below which it would be more advantageous for animals low in the hierarchy to simply emigrate from the group, or engage in a savage fight to the death with those above them. In other words, while resource allocation is skewed in favor of dominant individuals, it is not skewed so much that it is usually beneficial to subordinate individuals to deviate from their roles.

Like fights over sex, aggression over resources has become somewhat institutionalized, and individuals have priority over other individuals at feeding sites without everyone having to actually fight every time. Of course, having preferred access to the group's resources is highly attractive to a female, as offspring who behave this way will survive far more than those who don't. In practice, actually, while emerging from two separate behavioral motivations, there is no difference between the hierarchy of sexual access and the hierarchy of resource allocation. There are not separate fights pertaining to these two matters; when someone is beaten, they are beaten. For this reason, fighting doesn't necessarily occur, and place in the hierarchy is not necessarily decided, when breeding or feeding is occurring. It has become an innate tendency of the species to engage in combat, regardless of whether there is an apparent reason, and the outcome determines the roles individuals play in the society on a long term basis.

In this scenario, we have gone from solitude to sociality, and in the process developed a number of social roles and dynamics that did not exist when individuals of the species spent most of their time alone. One important point to be made here is that, while reference to differential reproductive success was ubiquitous in the discussion of how behavior evolved, the happiness of any given individual (or the subjective sense of well being of any individual, if 'happiness' sounds too much like something that should only be used to describe humans) was nowhere to be found. As we observe all these transitions, it seems entirely possible that navigating the tense, unequal, and chronically violent society they live in might place considerable strain on any given individual. If the first animal of this species that ever fought within its group for access to a little more food could see into the future, where such fights, and their likely victors, are ubiquitous considerations in all interactions between individuals, perhaps they would decide they were venturing down a poisonous path. Perhaps such an animal would decide that his action was not going to make himself or his future descendants happy, and this would be all the reason in the world not to take it. But representation in future generations, relative to alternative designs, is the one and only basis of natural selection. From the point of view of evolution, a life of ceaseless, hysterical grief that produces many children is vastly preferable to a life of contentment that produces one or two.`

Because of the dazzling complexity and functional integration of life, because we are awed by its myriad workings beyond our comprehension, it is easy to forget that all of evolution happened entirely by accident, and that nature does not have a purposeful wisdom behind its design. Any number of random deviations in behavior other than grouping, or other changes in an individual, say in anatomy or physiology, could have skewed reproductive success and created a different evolutionary direction in our hypothetical species. It could have begun burrowing underground to avoid the same predators it began avoiding more successfully by grouping. It could have developed hard scales, or a bigger body, or become a marine mammal. But that is not, by random errors in the transcription of DNA down the generations, what happened. If at any point the animal could have evaluated its ecology and made informed decisions about it, perhaps it would have acknowledged the limitations imposed by grouping in relation to the benefits, and contrived an entirely different scenario for its existence. Perhaps limited group size would have been maintained by an annually shifting entitlement to reproduce for 10% of the population. Not only could this potentially greatly reduce stress, by eliminating sexual jealousy and the dominance hierarchy, since everyone would eventually get a chance to reproduce an equal amount, but it might make the species more fit overall. Perhaps, for instance, their fights are noisy, and attract predators. But evolution does not endow species with a general drive to attempt to maximize reproductive success *per se*, but rather with psychological mechanisms that direct them to behave in ways that are most likely to maximize reproductive success. This is clearly true of humans, where adaptive mechanisms like sexual possessiveness and a tendency to seek high status are universal, but conscious, active consideration of how to have the maximum number of offspring is rare or nonexistent. If we were endowed with a more general psychological disposition simply to increase our reproductive output, as Donald Symons aptly notes, "*...opportunities to make deposits in sperm banks would be immensely competitive, a subject of endless public scrutiny and debate, with the possibility of reverse embezzlement by male sperm bank officers an ever-present problem.*" (28)

Intraspecific Behavioral Rigidity

In the modern world, our inherited psychological dispositions are evident in a proliferation of entirely novel, and often somewhat bizarre, manifestations. Men perform status displays using powerful cars as substitutes for, or extensions of, powerful physiques. The inclination to accumulate greater wealth than other members of a society has taken on an unprecedented scale with the increasing scale of economies that sophisticated technology enables, so that lone individuals possess a wealth of such a vast surplus that it could sustain them for thousands of lifetimes. Natural selection seems to have specified some behavioral protocols with greater rigidity than others. The basic tendency to rise in the hierarchy, to accumulate at the expense of others, seems to have few contingencies by which it is terminated, presumably because it was almost always relevant and beneficial for an individual to think in terms of ascending in status throughout evolution. But the actual currency, or material, of the hierarchy is a far more deliberative and modifiable domain. Presumably, throughout evolutionary time, it sometimes befitted individuals to think of status and wealth as deriving from hunted gazelle, sometimes from antelope, sometimes from perforated shells or pieces of incised red ochre.

Humans find themselves in an awkward position. The more plastic parts of our nature, the domains of our cognition that have more capacity for modification through experience, allow us to assess our ecological condition and make determinations about our optimal behavior. There is no reason that inequality, or strife, or any other aspect of the human condition one finds undesirable inevitably must exist. The entire human species could, quite literally, have some enormous collective conversation and

make a series of binding proclamations about the future. The primary limiting factor on our population would of course be the environment, and an ideal population size could be determined and reproduction collectively planned to reduce our current numbers to this level and sustain it there. Wealth could be distributed equally among everyone, as it would be acknowledged that within a population of the ideal size, in the diverse collection of environments known as earth, everyone would be able to survive comfortably with an equal distribution of wealth.

We are, after all, a species with the potential for far more security than any other. The last four billion years could be reasonably characterized as a contest between different sequences of DNA, in which there was no clear victor until very recently, when the characteristic sequence of humans, so subtly different at the biochemical level than that of chimpanzees, became ascendant. Our technological innovations have virtually guaranteed that we will not perish from predators or starvation or any other such factors. The only meaningful threats we face are from ourselves. In other words, the capacity to survive and reproduce is no longer our fundamental preoccupation. We can survive and reproduce. Our fundamental preoccupations seem to be what is subjectively, emotionally, intellectually desirable and what is not. Modern societies are not concerned so much with whether its members can continue to exist as what their existence will be like; accepting heartwrenching brutality as the social norm because it increases the likelihood of survival may have been perfectly reasonable in the past, but not so anymore.

But of course, anyone who reads this utopian scenario may be willing to acknowledge that it is possible, at least in the sense that it is not physically impossible, but that it is inconsistent with human nature. A vast collective conversation in which we decided to distribute resources perfectly equally would not last long because someone would cheat, because cheating increased fitness in the environment that made us. Even though overpopulation does, in fact, present a grave threat to the survival of our planet and ourselves, this logical understanding seems to be doing little to reduce the increase in the human population. Being able to understand an optimal population size does not override the inherited behavioral tendency to have babies. In this particular case, it is worthwhile to note that the behavior is not even necessarily 'selfish' from the perspective of any given individual's genes in future generations. Indiscriminate reproduction and its concurrent unsustainable resource consumption ultimately will only produce an increasingly hostile environment for our offspring. But such considerations were apparently not adequately prevalent in our evolutionary environment for our reproduction related psychological mechanisms to readily change in acknowledgment of this circumstance.

Thus, we are faced with a world of violence and inequality, and while evolution has succeeded in making us geniuses in innovating new means of manifesting these dynamics, from the VIP room of night clubs to the cluster bomb, we seem thus far to have been less able to simply stop them. This conclusion may be easy to accept logically but somewhat more difficult to accept emotionally. Thinking along these lines, and a discomfort with accepting the burden of a seeming biological inevitability to our behavior, has been a primary impetus for social scientists and political ideologues to ascribe the conditions encountered in any given society purely to processes of conditioning. This has been the motivation for the proliferation of doctrines stating that culture is a phenomenon accountable only to itself, irreducible to explanation within the framework of a universal human psychology and biology, a thing uncreated and inscrutible within the physical laws that apply to the rest of the universe. Such doctrines, while possessing considerable emotional appeal, lack the essential characteristic of objective truth.

There is no science but natural science. There is no such thing as a physical world and a separate mental, cultural, or spiritual plane of existence, with an unrelated set of laws. First, there was a nothing, or something we do not comprehend at all, then there was an expanding universe. Physical laws took shape, the constituent materials and forces of the universe took on properties based on the conditions that birthed them. In certain environments, complex molecules formed, some of which possessed the property of replicating themselves out of the raw materials around them, and the ones that did this the best outreplicated the others. This became life. After many developments, life took on some of the common features of social organization being discussed here, and in one pioneering species, the cognitive ability to reflect on these features of social organization and argue about where they came from. There is no separate, parallel universe out of which social processes and cultural phenomena emerge. Nor, for that matter, is there a separate plane of reality out of which god creates this one, according to laws and dynamics not perceptible here. Such stories may be intriguing, or aesthetically appealing, but they are not true. Everything is integrated and continuous. The ability of objects to exert an influence on other objects through the force of gravity, the selective permeability of the plasma membranes of cells, and the contestant selection process for celebrity dance competitions are all aspects of the same nature, which possesses only one vast set of laws.

Evolutionary tendencies in behavior and cognition may in and of themselves explain why they haven't been acknowledged as the basis of culture and behavior. Our species may be less capable of objectively perceiving itself than other elements of the world. Konrad Lorenz writes about this in his paper *Part and Parcel in Animal and Human Societies,* where he observes that intraspecific behaviors, such as courtship or aggressive displays, exhibit a far more rigid and 'instinctive' quality than the behavior of animals directed at the external world at large. Writing during the harrowing early years of the cold war, he says:

"*Man is the creature of reason. But he is not exclusively a creature of reason; his behaviour is by no means so thoroughly determined by reason as is assumed by the majority of philosophical anthropologists. There is a far greater degree of influence exerted by innate, species-specific action and response norms than we usually like to believe and accept. It has been stated above that in animals of advanced intelligence behaviour towards a conspecific is controlled far more by innate components and far less by higher intelligent functions than behaviour towards the extra-specific environment. That this is equally true of human beings as well is crudely expressed in the incongruity between man's mastery of his external environment and his stunning inability to solve the intraspecific problems of mankind.*

This is by no means due to the fact that these intraspecific (in the broadest sense, social*), problems are in any way more difficult than those of the external environment. The opposite is true. The fission of the atom, without a doubt, presents the human mind with far more difficult tasks than the question of how one can prevent human beings from wiping one another out with the aid of atom bombs...Despite the enormous difference in conceptual difficulties between these two problems, mankind has solved that of atomic processes within a few decades, whilst man is today even more helpless against the danger of self-destruction – which emerged with the invention of the first weapon, the hand axe – than at the time of Pekin man!"* (29)

The idea that natural selection has been far more specific in providing templates for intraspecific behavior, because it has been able to be, than in programming interactions with the less predictable

external environment, does a tremendous amount to explain inconsistencies in human knowledge. If we are subject to a more rigid behavioral protocol with regard to other members of our species, with less capacity for insight and modification through experience, than it is perhaps no wonder that we are able to calculate the amount of dark matter in the universe, or unify all the seemingly disparate elements of string theory into one mathematical model, but seem so terminally incapable of understanding ourselves. Physical science in the last century has discovered a vast number of laws that, while they may be elaborated by future insight, will remain fundamentally true forever. It is hard to say if many of the most prominent ideas promulgated by the social sciences, diffuse and mutually irreconcilable as they often are, will endure in such a manner. Moreover, beyond our ability to explain or understand our behavior, greater intraspecific behavioral fixity would help to account for our behavior itself. It would explain why societies are able to do distinctly modern things like send people to the moon, or transmit messages through the air using electromagnetic waves, but that said societies are organized according to the Pleistocene protocols of territoriality and the dominance hierarchy.

While Lorenz has ultimately contributed greatly to the modern understanding of animal and human behavior, it has become something of a convention to dismiss his work as too focused on rigidity and instinct. This seems to stem from some terminological sloppiness on his part, and most certainly from his positing a physiological mechanism for behavior which is incorrect; namely, a build up of instinctive action energy in the nervous system. This inaccuracy in his proposed behavioral mechanism, however, does little to negate the fundamental point that the actual behavior he observed and documented did in fact occur. His essential insight into species-typical behavior emerging by a means other than environmental induction remains, and a more recent review, while voicing standard criticisms, has found no reason to revise the observation that intraspecific behavior is more fixed than other behavior (30).

Another, more pertinent, source of objection to this idea may be in taking it to imply that natural selection operates at the level of the group *per se*. The idea of group selection, and the consequent notion that behavior may evolve that attempts to promote the survival of a population, or an entire species, has certainly been advocated, but it has not met with approval (31). Because genes need to pass from the body they occupy to persist, the pressure of selection exists at the level of the genes and the individuals they inhabit. If an individual possesses a mutant gene that directs it to behave in a manner beneficial to its species, and it does not successfully reproduce as a result, then the mutant simply dies out. Lorenz did in fact subscribe to a group selection perspective, notably in *On Aggression*, and may have been thinking along these lines in discussing intraspecific behavioral fixity. Again, however, an incorrect theoretical framework does not render an actual, empirical observation null. It is clearly possible for selection pressures operating at the level of the individual genes, and the temporary assemblage of genes that any given individual represents, to direct evolution toward behavior with individuals bearing similar assemblages of genes in mind. This may be observed in the fact that genes do not simply transmit indiscriminately between all biological specimens, but rather, that there are distinct species, within which genetic reproduction must occur. Moreover, such species may engage in coordinated behavior, such as living and foraging together. Clearly, selection at the level of genes can determine coherent behavior at the level of the group.

The distinction between our murky understanding of human nature and our powerful and detailed understanding of so much of the external environment did not always exist. Our accounts of the nature of the universe used to be as inconsistent, and demonstrably false, as so much modern social and political thinking. If one is to accept the idea of a linear evolution in the accuracy of our understanding

of the world (which is no doubt a troubling proposition for some), one can perhaps get a sense of where humanity's understanding of itself presently lies. On one end of the continuum, there is the state of some hypothetical mythology, with Yahweh making the world with words, or a primordial man making the world out of his dead twin, and angry demons living under local volcanoes. This mythology may have some universal, recurrent features, but will in many respects vary drastically from place to place. Moreover, it is not a proposition, or a source of debate, but rather a paradigm that is simply embraced.

On the middle of this continuum, there is the phenomenon of natural philosophy and speculation about the nature of the universe. This is perhaps first documented in ancient Greece, but it is probably ultimately as old, in some form or another, as the human species itself. For instance, Empedocles might posit that the world consists of the four elements of fire, air, earth and water, or Heraclitus might opaquely tell us that all things are born of strife. Much as with the mythological approach, these scenarios are not born out of any observation of the external world. While ostensibly about it, they are actually the products of purely internal deliberations, of an intuitive exploration of the human psyche unaided by investigation of their subject matter. A thought process about some observable phenomenon is occurring, but the conclusion about it is largely based on what simply *feels* true. Such speculations do, however, bear one very important distinction from mythologies. They are postulates, rather than unconditionally accepted truths. In other words, they are conceived of as attempts at understanding, and other parties may accept, reject, or modify them. They may be the subject of fervent debate. In this sense, they may be regarded as comprising half the method of scientific discovery; the argument without the investigation.

At the end of the continuum is the modern scientific method, which some people claim has diminished the sense of wonder in the world, and which other people claim has greatly increased it. The conclusions of science are unique among explanations of the world in that they duplicate the existing structure of the universe. If everyone stopped believing in fairies and all stories containing references to fairies were forgotten, there would be a substantial sense in which it could be said they had ceased to exist. If a similar oblivion to, say, the DNA molecule were to take effect within humanity, it would still be there.

On such a continuum, I would place much of social science, and virtually all of political ideology, squarely in the middle. That is to say, if one observes a contention being made about the human condition, whether in an academic journal or by a political candidate, one is not witnessing the articulation of a paradigm that is unconditionally accepted by all other members of a culture without recourse to investigation or evidence. However, much as one can only assume Empedocles conceived of his four elements simply because they felt true, one gets the distinct impression that strong convictions about human affairs, convictions which people might actively argue their whole lives or even die for, are born largely out of their individual, intuitive psychological appeal rather than out of meaningful assessment of evidence in their favor. The greater behavioral rigidity of intraspecific behavior seems to manifest itself in strong emotional dispositions to form conclusions precipitously and to use argument and analysis more as a means of validating them than to determine if they are true. Our investigation of the external world proceeds at a much greater pace.

For example, in my own city of Oakland, California, there are presently people camping out in an ongoing protest called Occupy Oakland, as part of a coordinated effort involving cities around the globe, which all stem from an initial protest/occupation of Wall St. in New York City. Occupy Wall St. and its many local counterparts protest, in fairly general terms, the gross inequality in the distribution

of wealth in this country and the world at large. Protests are tense and exciting places to be, the feeling of momentum seems limitless, and it is likely for these reasons that some people have claimed the Occupations represent an irreversible step in the direction of an economically egalitarian society. Of course, if one wanted to go by the numbers, it would have to be acknowledged that the Occupy movement represents a far less sustained and dramatic effort at egalitarianism in modern history than the various permutations of Marxism. Two conspicuous facts about Marxist politics seem worth mentioning. The first is that, while such ideology did most certainly succeed in dominating the political arena in large parts of the world throughout the last century, it has come to an end in most places where it ever held power, and seems virtually everywhere else to be in decline. The second is that it never succeeded in creating an egalitarian society anywhere.

The reality of evolution, and the behavioral tendencies it produces, was available for both of these movements to incorporate into their framework of understanding of social and economic conditions. But while believing in evolution as a fact unto itself, the fractious political ideologies of either of these movements more or less function as if it did not exist. Instead, social systems in and of themselves are given a sort of disembodied, animate, intentional existence. Perhaps there was a point when people talked about things like the clash between capitalism and communism, as if they were sentient entities, or perhaps monstrous deities, competing for human devotion, with the understanding that it was a figure of speech. But such speech truly does seem to have progressed into a more literal convention, presumably because it reflects a way that people actually think about the world, possibly a way of thinking that is also reflected in mythology. Ideologies do not wander the earth looking for people to cause suffering or bring joy. They are created by humans, who are created by natural selection. People may talk, as loudly as they want and at as great a length, about why societies are structured in the ways that they are and what alternatives to these structures exist. But such discussions that do not give a primary role to psychological mechanisms, inherited through the generations, shaped by differential survival and reproduction, is like a discussion of organic chemistry that does not mention carbon. My intention in critiquing the analyses of such efforts is certainly not to dismiss their general aims. There is no doubt that people's tendency to accumulate wealth is highly destructive in many of its modern permutations, and that alternate modes of behavior are desirable. My intention is simply to state that such efforts have frequently not accounted for the most relevant facts that concern them.

This tendency of social thinking to exhibit a greater degree of emotionality and instinct than thinking about the external world in no sense implies that we are not capable of coming to terms with ourselves. One need only reflect on our record of doctrines about the external world; for instance, that people faced very real persecution by the Catholic church for suggesting that the earth might revolve around the sun. Or that, despite most Christian's apparent acceptance of heliocentricism in the modern age, many of them still insist the world was created a few thousand years ago. In other words, the scientific community has been able to travel all the way along this continuum, from mythology to speculation to fact, in its understanding of the workings of the universe, but everyone else most assuredly has not joined them there. Time, technology and our cognitive abilities have not been the only limiting factors in discovering the deep laws of physics or reconstructing evolution from fossils. There has also been our resistance to objective understanding at every step of the way. But the fact that people who put their minds to it were able to overcome it and find meaningful answers to fundamental questions should be a source of great optimism about our prospect of someday doing the same with regard to ourselves. And presumably, with science both physical and social, if there is really a difference, eventually everyone else will be persuaded. There must, after all, be a certain inevitable tedium involved in clinging to a doctrine when you are surrounded by convincing evidence of its falsehood.

Altruism and Human Solidarity

The question is, does an acknowledgment of evolved human nature simply imply that we are accepting all of the ills of the world as inevitable? Here is where a curious hole in the dialogue emerges. Nature vs. nurture, in all of its infinite permutations, has often been seen as a proxy for ruthlessness vs. benevolence. Our foregoing discussion of inequality and coercion as biological phenomenon is a case in point. But it seems to require a remarkable gap in analysis to never stop and think that, if evolution generated our tendencies to fight or exploit each other, it must have also produced our desire for a more harmonious state of affairs. Biophobia in the social sciences has long existed as a fear that child soldiers, religious wars and brutally abusive prison systems are expressions of our nature. But the existence of homeless shelters, donation drives for victims of natural disasters and movements to abolish things like war and the death penalty seem to engender no corresponding biophilia.

Differential success in survival and reproduction is the only basis on which natural selection proceeds. But it is most certainly not always the case that, in every ecological situation, greater fitness is achieved by doing harm to, or even behaving neutrally toward, others. The blood sharing behavior of the vampire bat is an example. When they return from foraging, an individual who has been unsuccessful in feeding throughout the night may beg during the day from other members of the group and be rewarded with regurgitated blood. The benefit to the recipient is very high; starvation is a very real prospect. The cost to the donor is not terribly severe, the small amount of blood regurgitated does not substantially increase the risk of starvation. But of course, the risk of starvation is increased somewhat, and so if the act existed in social and ecological isolation, sharing would not be a viable trait in competition with a genetic design for pure selfishness. Sharing benefits the donor when it can be reciprocated, which is made possible by the group cohesion of vampire bats. The donor decreases their fitness slightly by dispensing blood but increases it greatly by creating the means to be the recipient of blood later on that will prevent it from starving. The benefit exceeds the cost. In an experimental setting where bats from two different colonies were housed together in a laboratory, and some bats were deprived of food, 92% of successful begging was from a member of the same wild colony (32). Thus, altruism can spread through a population, so long as there is some means of ensuring that altruism is dispensed only to individuals who have an adequate likelihood of reciprocating.

In his 1971 paper *The Evolution of Reciprocal Altruism*, Robert Trivers discusses the conditions that facilitate the evolution of this sort of direct reciprocation; adequate life span, adequate group cohesion for individuals to be mutually present, and therefore in a position to perform mutually beneficial acts over a lifetime, and the ability of individuals to perform acts of roughly equivalent benefit. These conditions are all met in primates. Alliance formation in fighting is an example. Vervet monkeys will come to the aid of others with whom they have formed social bonds during violent conflicts, at no small risk to themselves, and therefore have allies in their own fights, and baboons will do so both in intraspecific conflicts and in fights with predators (33). Having allies is not just a means of protection from potential harm, but often a necessity for ascending the dominance hierarchy. The matrix of benevolence and animosity between individuals is a vastly complex and ever changing one in many primate societies, and the animals in question are acutely sensitive to changing relations and power balances between not only themselves and others, but between all other members of a group as well.

For instance, chimpanzee A may be subordinate to B, and consistently help B in conflicts, allowing B to maintain alpha status. In exchange, B helps his subordinate A in conflicts. Both risk harm to

themselves, but the net effect from this reciprocal exchange is increased fitness for both. But then C, A's younger brother, begins to mature and become a respectable fighting force. A and C realize that they can, with their combined efforts, defeat B, and do so. Now A is alpha, and his relations with B range from tense to overtly hostile. Now that he is not alpha, B makes friends with his former rival for alpha status, chimpanzee D. When A's brother C, who has been essential to his maintaining dominance, dies from intergroup aggression, the deposed B helps his former archrival D in a contest against A that puts D at the top of the dominance hierarchy. B's fitness may not be as great as when he was in that position, but being the close ally of alpha D is more beneficial to him than being the enemy of the alpha A. Over time, of course, B and D's alliance may dissolve, and other friendships emerge.

In some animals, therefore, reciprocal altruism does not function according to a very coarse behavioral template, which simply instructs it to perform a certain type of altruistic act in a certain type of situation, because such acts have increased fitness throughout evolution. In other words, it does not work like a predator avoidance mechanism might, which has never required more complexity than a simple rule like 'if you see something that has a scaly bumpy surface, or something that is long, assume it is a crocodile and get away from the water'. Rather, in some species, a dynamic equilibrium has always existed between the greater fitness achieved by 'honest' reciprocal altruism and the even greater fitness achieved by 'cheating' in altruistic situations, where one derives a benefit but does not compensate. As a result, sophisticated mechanisms for evaluating the behavior of others, thinking about their intentions, and predicting the likely effects of events on another party's behavior have developed.

The role that this sort of social calculation played in creating more complex brains in the human species is likely tremendous. For instance, in his book *The Language Instinct*, Steven Pinker discusses how much more sophisticated and powerfully expressive a tool our innate language mechanism is than would be necessary to communicate essential information for use in solving immediate adaptive problems like food acquisition. If humans wanted to use language as an adaptation merely to coordinate a more effective hunt, grammatical capabilities that allowed one to say something like 'bear track, follow' would probably be more or less adequate. It is difficult to see how the linguistic capability to write *The Odyssey* was really necessary to communicate adequately for a group of people to successfully negotiate the external Pleistocene environment. For this reason, he argues that the selection pressure that produced our language mechanism could have been from within the species itself. If favorable relations with others, in a ceaselessly changing social environment, was a significant factor in determining survival and reproduction, then communicating effectively and persuasively was likely a trait of paramount significance. If one says 'bear track, follow', then all of the relevant information that is not spoken is still implicit between two members of the same species with shared understandings of the world. They both know the bear is their prey. They also both know that the bear will not want to die, and is a formidable animal, and therefore will be dangerous. These are not conditions that will change day to day, and do not need to be explicitly articulated. However, if one wants to communicate that they saw a man's sister copulating with someone other than who he promised her in marriage to, but that no one else knew about this so that man could decide whether to punish them or deceive the man she was promised to and proceed with the marriage, there is really no way to do this but to come out and say it.

The existence of specialized mechanisms for making calculations of social entitlement and obligation in the human species is born out by our differential performance in a type of cognitive experiment designed by Peter Wason. The Wason selection task is disarmingly simple; study participants are given a simple contingency and four cards and asked to turn over only those cards they must see the other

side of to determine if the contingency has been violated. For instance, in an imaginary clerical scenario in a high school, the contingency is "If a person has a 'D' rating, then his documents must be marked code '3'." Study participants are given four cards; marked D, F, 3 and 7. D needs to be turned over to ensure it has a 3 on the other side. Likewise, 7 needs to be turned over to ensure it does not have a D on the other side. There is no numerical contingency for F; it could have a 3 or a 7 without violating the rule. Likewise, there is no rule that cards with a 3 must have a D on the other side, only that cards with a D must have a 3. Therefore, only D and 7 need to be turned over. Success in this experiment is <25%, with most people turning over only D or D and 3. Performance can be improved somewhat by making the content less abstract, and describing familiar circumstances, for instance "If a person goes to Boston, then he takes the subway" or "If a person eats hot chili peppers, then he will drink a cold beer." However, accuracy does not generally exceed 50%. When a structurally identical problem is presented that describes a social contract and its violation, accuracy increases notably. For instance, "If a person is drinking beer, then he must be over 20 years old", with cards labelled 'drinking beer', 'drinking coke', '25 years old' and '16 years old', elicits a successful performance 75% of the time. Detection of social contract violations is just as high when they are described from fictitious cultures with exotic customs, such as "If a man eats cassava root, then he must have a tattoo on his face", where it is indicated that facial tattoos signify marriage, cassava root is a powerful aphrodisiac, and this culture's sexual standards dictate that unmarried men have no business consuming powerful aphrodisiacs (34).

The discussion thus far has been limited to scenarios in which altruism is dispensed between two parties who expect direct reciprocation from one another. A brief examination of human behavior bears out the assumption that, if such a mechanism did evolve, it should be evident in the modern world; people are certainly more likely to be of assistance to, or come to the defense of, those they have close social ties to. But when someone stops to give directions to a stranger on the street, or stands outside of an embassy demanding that a remote foreign country release a political dissident from prison, they are acting on behalf of people they have no reasonable basis to assume will ever be of benefit to them.

There are clearly evolutionary scenarios in which altruism increases fitness even if it is not directly reciprocated by the beneficiary. For instance, Trivers discusses the phenomenon of predator warning calls in birds that do not live in stable groups. Warning calls alert other birds in the vicinity of the presence of a predator, thus reducing the risk that they will be killed. But the call attracts attention to the caller, and thus somewhat increases their likelihood of being killed. The calls have acoustic features that make them difficult to locate as a defense against this happening. With birds that do not live in stable aggregations, and thus can not reciprocate by calling, thereby benefiting a caller later on, this may appear to make no evolutionary sense whatsoever. Now that it is a stable trait in a population, calling may be a lesser cost than it is a benefit. But how, as a behavior initially existing in one individual as a result of a genetic mutation, could something that benefits every other bird, to the detriment of the one giving the call, possibly spread through a population? There must be a direct increase in the caller's fitness that is greater than the decline, whether its act is reciprocated or not. Predators become accustomed to particular prey, form search images of the species they are accustomed to, and frequent locales and habitats that they have had success hunting in previously. Therefore, warning calls benefit a bird simply by preventing future predatory efforts that might result from a kill being made.

Recalling the ecological pressures that facilitate group living in the first place, even within stable aggregations where reciprocation would only seem 'fair', there could be numerous benefits to

performing acts on behalf of an individual in the group without any expectation, or even possibility, of direct reciprocation. While there is always competition between group members, expressed in the dominance hierarchy, every time an individual dies in the group it decreases somewhat the remaining individuals' protection from predators, defensibility against neighboring groups, and enhanced foraging capacities. To some extent, the vitality of a group is indeed a measure of an individual's fitness that lives within it.

For instance, male adult baboons will vigorously defend against predatory attempts on infant baboons by chimpanzees (35). Being of fairly similar size to chimpanzees, they are at very little risk from actually dying in such confrontations, but they certainly are at some risk of being injured. The benefit, however, is greater than the cost of the male, or perhaps the male's descendants, living in a greatly diminished population. This is not to say that male baboons are ubiquitously benevolent towards infants. When they have recently entered a group, and thus are not represented in the young generation, they will sometimes kill infants in order to expedite females becoming sexually receptive and therefore mating with them (36). Having a larger population in the future is not as large a benefit to them as having a population that carries their own genes.

A hierarchy of values have influenced the course of evolution where action on behalf of an individual is of variable value. First, of course, taking measures to secure one's own welfare is of paramount significance in being represented in future generations. Next, close kin, with whom one shares a great deal of genes. For instance, if one sacrificed their life for the sake of their three siblings, who all have half of the deceased party's genes, they are still genetically better represented in the population than if they had survived at the expense of the three siblings (37). Thus we find the enduring traits of family groups and greater bonds of altruism between closely related individuals in animals human and nonhuman alike. Finally, for social animals, there are other members of a group, with whom their fate is somewhat entwined. Thus we should expect to find a tendency to act on behalf of group members, possibly at the expense of, or in conflict with, members of other groups, and we do. While it is always beneficial for an individual to reproduce at a greater rate and have more access to resources than other group members, it is also necessary that the other members of the group continue to live. In practice, one could expect some overlap between the second and third factor. Group membership may function as a sort of approximation of relatedness. For instance, in chimpanzees, while competition for mating access is expressed in a dominance hierarchy, it is not an absolute one, and copulations with multiple males is a status quo for a female. Thus, any individual male can not be certain of the paternity of a child (38). Group size being fairly small, defending any infant may function as an approximate means of defending offspring.

With regard to the human species, the definition of the group warrants special attention. Just as with the definition of wealth, evolution has facilitated group identity being determined by highly variable characteristics. Physical features and language certainly played a role, but of course, not every small ancestral human society looked or spoke different than its neighbors. One must assume that a vast array of features were accounted for; for instance, aesthetic tendencies, beliefs, and cultural conventions. The result is that modern humans are capable identifying with groups of remarkably plastic characteristics. Catholics may feel animosity toward Protestants, or they might identify with Protestants as fellow citizens of Europe and Christians, united against Muslims. Someone else may feel animosity toward all citizens of Europe, immigrant or otherwise, on behalf of the people who form the vast complex of languages and cultures in the entire third world. Both the affinity and the animosity of group identity seem equally variable; some people feel hatred for their neighbors for having different physical

features, some people feel compassion for strangers suffering famine on other continents.

When people fight in wars between modern nation states, the evolutionarily novel stimuli – of competing nations, conflicting ideologies, global political machinations – are functioning as a substitute for biologically relevant stimulus, and producing the intergroup aggression response that has contributed to greater fitness throughout the history of our species. Likewise, when people feel horror at the human lives lost, or the orphans created, in the same war, they are also responding to a substituted stimulus with an adaptive behavior. Fearing biology as an explanation for human behavior because it might account for people's brutality toward one another is an incomplete response to the circumstances we find ourselves presented with, as it fails to acknowledge that biology is also the source of that fear.

It is not enough to say that if the adverse parts of our nature are inherited, so are the favorable parts. The only reason that any behavior can be evaluated according to criteria of desirability is precisely by inherited, evolutionary protocols for experiencing situations as 'good' or 'bad'. Cultural relativism correctly concludes that there are no objective, universal criteria of right and wrong. There is nothing externally, objectively immoral in the wanton slaughter of innocent and unarmed people, the sexual abuse of children, or anything else we perceive as terrible. In stark contravention to the tenets of cultural relativism, however, it is not the case that something only becomes good or bad by the arbitrary standards that any culture happens to generate, out of an infinity of possibilities. Rather, something is universally good or bad according to definite parameters produced by natural selection. However difficult it might be to see in a modern context, our actions are born out of psychological mechanisms that were crucial determinants of survival and reproduction in the past. If we were a different species with similar cognitive capacities, we might be subject to an entirely different morality. If we were an animal whose intraspecific contact was largely limited to mating and parental care, with little in the way of evolved altruistic behavior, we may see nothing wrong whatsoever with, say, indiscriminately killing other people to appropriate their resources. Rather than living in a world without brutality, we would live in a world where brutality did not seem unacceptable according to evolved criteria. There would then be little convincing basis for classifying such behavior as immoral. But we are not such a species. We are a territorial, group living, highly socially complex animal, and both our harmful and benevolent actions towards others are expressions of our biology.

This may be a source of confusion as it classifies two apparently conflicting types of behavior as part of the same innate repertoire, and nature is so complex and functionally integrated it is difficult to imagine such inconsistencies in its design. But, as discussed before, different behavioral inclinations may create a subjective sense of conflict, but functionally combine in such a way as to optimize survival and reproduction. Human sexual behavior, with its perennial conflict between monogamy and promiscuity, is a good example. *Australopithecus* males were far larger than females, a dimorphism also found in gorillas, and characteristic of societies with a single dominant male who exclusively monopolizes sexual access to the group's females. With the emergence of *Homo*, differences in body size between males and females decreased greatly, a situation found in species such as the chimpanzee, which have a dominance hierarchy but not one with exclusive sexual entitlements for a single male (39). Chimpanzees are considerably more promiscuous than humans. However, males will often lead females away from social contact with other members of the group to copulate exclusively with them for a few weeks during their fertile period, and dominant males will show possessive behavior of females at the height of fertility (40).

In a simplified scheme of things, chimpanzees are presented as promiscuous, gorillas as monogamous (for females) and polygynous (for males). These behavioral paradigms are seen somewhat in binary opposition, and human sexuality is assumed to biologically be a function of a similarly stable protocol. Male testicle size relative to overall body size is somewhat intermediate between chimpanzees and gorillas, indicating that, in ancestral human society, the selective pressure to impregnate a female who had been copulating with other males lay somewhere in between what we observe for these other two great apes. Human sexual biology is further complicated by the large parental investment made by the father, with long term obligations for a male to raise their offspring found in every society, a novelty among mammals (41). The point here is that it is not adequate to simply characterize human sexuality as intermediate, in terms of promiscuity, to chimpanzees and gorillas. At least not in the sense that we subjectively experience a behavioral inclination toward an intermediate degree of promiscuity and, should we achieve it, feel content. On the contrary, it is probably safe to say that our evolutionary history was characterized by conflict between these two states.

This is because, in evolutionary terms, it was likely to the benefit of both genders to cultivate relations that monopolized the sexual and parenting behaviors of another party while allowing freedom for themselves to deviate. For males, the benefit of sexual exclusivity is the same as for males of any other species that seek it; it guarantees paternity, and thus representation in future generations. Females in other species may not have such an incentive, but with the large parental investment made by human fathers, it is a crucial indication of a child's prospects that a male be dedicated to a given female. Sexual exclusivity is the criterion by which a female evaluates a male's likely parental investment. Thus, we find the culturally universal phenomenon of long term partnerships between males and females, with entitlements and obligations for both, or marriage. However, there are advantages to both genders for deviation. For males, it is the fairly obvious fact that infidelities can result directly in more offspring. For females, the reasons may be somewhat less apparent, but they are there. For one, infertility exists in males. Second, it may be an important mechanism whereby a male of higher status than a woman's partner, with whom she would not be able to marry, may nonetheless impregnate her and thus give her better genes than her partner would be able to (while she still derives the parenting benefits provided by the lower status male with whom she is in a relationship). Finally, even if no reproduction results from such sexual relations, indeed, even if sexual attractions are never consummated with copulation, they may have important social consequences for a female, putting her in more favorable standing with other males in a group.

The result is the familiar and confusing experience of human sexuality. People find themselves intensely emotionally inclined toward exclusive and permanent sexual relations with someone, but also find it hard to maintain such a relationship. Likewise, people attempt to have sexual relations without attachments, or at least without expectations of exclusivity, and find themselves jealous. Just as there is no culture without marriage, there is also no culture without jealousy and infidelity (42). In other words, standard human sexuality is not standard in the sense that there is a stable behavioral paradigm that is accompanied by a subjective sense of achieving an ideal. Typical sexual behavior is actually only typical when viewed statistically, where an average degree of fidelity and promiscuity is expressed as an ongoing dynamic shift in either direction. As anyone who has ever experienced jealousy, or boredom in a long term relationship, or confusion and loneliness after a long period of casual sexual contact with a series of partners, can attest, any given moment in the experience of human sexuality can feel excruciatingly like something is very wrong, but the basis for all these subjective feelings of conflict is that they they combined in such a manner as to optimize fitness in the Pleistocene. The point of this somewhat lengthy digression into human sexuality is to provide an

example of the type of conflict between different emotional inclinations that is also found in our simultaneous tendencies to brutalize one another and sympathize with one another. They are both products of evolution. Presumably, fitness was optimized in our evolutionary environment by simultaneous tendencies to further the welfare of others and to be ruthless to them.

Having engaged in this discussion of altruism, do we find ourselves back where it began, asking if this understanding simply means we must accept human behavior – in its dynamic combination of brutality and benevolence – as inevitable? Have we simply formed a more complex picture of our behavior, but ultimately acknowledged there is nothing we can do to modify it? The answer is yes and no. Our basic biology, and the repertoire of behaviors it entails, will not change any time soon. However, the environmental conditions in which it finds routes of expression can change, and is ceaselessly doing so at a dizzying pace, and this can have substantial effects on what behavioral protocols are initiated and how. At the level of behavioral inclinations, there is no significant difference between the biology of a population of hunter-gatherers in the Amazon basin, the residents of a particularly impoverished neighborhood of Detroit or Philadelphia, and the residents of a middle class neighborhood in Switzerland. For all that cross cultural universals among all these different people indicate fundamentals of human existence, there are, obviously, differences in how these populations behave. For one thing, the former two will most likely have higher rates of homicide than the latter.

In his 1953 book *Science and Human Behavior*, behavioral psychologist B.F. Skinner said:

"*Science not only describes, it predicts. It deals not only with the past but with the future. Nor is prediction the last word: to the extent that relevant conditions can be altered, or otherwise controlled, the future can be controlled. If we are to use the methods of science in the field of human affairs, we must assume that behavior is lawful and determined. We must expect to discover that what a man does is the result of specifiable conditions and that once these conditions have been discovered, we can anticipate and to some extent determine his actions."* (43)

Skinner, for all the reasons discussed repeatedly here, did not want to acknowledge even a remote contribution of inborn characteristics, save perhaps physical and cognitive limitations, in the behavior of an organism. He did not want to think that the unfortunate conditions he observed in human societies were expressions of our inborn nature. His writing at times verges on sounding like it is denying the very existence of an internal, subjective experience of the world, so fervent is he in his insistence that the external environment is the sole determinant of an organism's actions. While this obstinate aversion ultimately prevented him from formulating a convincing explanatory framework, Skinner's ultimate motivation of identifying environmental conditions that engender desirable human behavior is a noble one.

When we are free from the notion that humans are a blank slate, we can begin the daunting endeavor of determining how different environmental conditions interact with our highly structured behavioral design to produce different results. We can begin to assess what conditions in human society we would realistically find desirable and how we can achieve them. Modern humans find themselves in a novel position, in that there are already 7 billion of us on the planet, and maximizing survival and reproduction is no longer a laudable or plausible goal. Unique among organisms, other criteria have to be established for defining adaptive and maladaptive behavior (that this is the case is illustrated by the higher rates of population growth among the world's poor than among the world's wealthy, although no one would say the poor are in any sense better off, or succeeding in some essential capacity in which

the more wealthy are failing). The primary criterion that has already emerged for classifying conditions as favorable or adverse is the extent to which it accommodates our subjective sense of well being. For this reason, virtually everyone would define someone's life who traveled extensively, found love, made beautiful art, and had a single child a greater success than someone who, say, had three children before the age of twenty and then spent the rest of their life in prison.

This has, of course, always been the case; natural selection creates psychological mechanisms that increase fitness in the environment they develop in, not a general mechanism for desiring greater representation in future generations. People have always assessed a given circumstances in terms of its amenability to their subjective happiness. But now, it is not really enough to pursue what we are psychologically motivated to pursue, and, happy or miserable, have all our behavioral inclinations function as a proxy for increasing fitness. We are left in the novel, and perhaps slightly awkward, position of having the psychological parameters for defining good and bad circumstances that evolution has endowed us with, but also having far less of a good reason to achieve the maximal reproductive output those parameters were ultimately a means to. If the greatest possible perpetuation of our genes is off the table as a defining objective of life, I would add, in addition to simply making ourselves happy, another worthwhile goal for the human species. We can embrace the responsibility of being the only assemblage of matter on this planet – perhaps, for all we know, in this universe – capable of comprehending the mechanisms by which we and everything around us came into existence.

Animals confined at high population densities, as in intensive farming scenarios, develop more articulated status hierarchies with more severe agonistic interactions between dominants and subordinates. Humans confined at high population densities, as in jail, do the same thing. Animals form social groups and defend their territories against other groups. People all over the world are capable of identifying with a group based on highly variable characteristics, from political affiliations to the colors worn by a street gang, and treating people they perceive as outside of the group with great brutality. Males of many species compete for status and thus ensure sexual entitlements with a groups' females. Human women are more likely to have sex with men who are wealthy or famous. When we begin to treat the dizzying array of novel conditions human ingenuity has produced not as entities unto themselves, to be understood in separate terms from the rest of the universe, but as unprecedented environments that are interacting with inherited behavioral protocols, we will begin to come to terms with ourselves.

Doing so will allow us in some cases to begin to propose mechanisms for addressing some of the world's ills. For instance, it will allow us to see that, group identity being the highly modifiable cognitive domain that it is, increasing exposure to different people, increasingly 'universal' thinking, expands the sphere of characteristics one perceives as belonging to their group. At its terminal point, then, the 'friend' element of group thinking operates exclusively, encompassing all of humanity, and the 'foe' element finds no suitable stimulus to activate it (in some variants of this more universal thinking, people also identify as allies of other species of animal, or of trees). This is not to say the 'foe' element of group thinking has been eradicated *per* se, it is still latent somewhere in a person's psychological architecture; just that the environment no longer presents a suitable stimulus for it.

In other cases, understanding behavior in the modern world in evolutionary terms may do little to present a mechanism for solving a problem. Perhaps it can simply be agreed upon that there is little in the way of a compelling reason to 'do something' about women having sex with rock stars. But for matters of more gravity, such as people's often destructive tendency to accumulate a surplus of wealth,

it is worth noting that simply understanding the mechanisms that underlie such behavior is likely to have a significant effect in itself. When we collectively acknowledge the basis for our behavior, the behavioral dynamic has, by definition, been changed. At present, the findings of evolutionary biology, which presents the only remotely convincing account of the actions of our species, are numerous, well articulated, and obscure, so far as discourse on current events by policy makers or the public media is concerned. In the United States, for instance, the most powerful nation in the world, it is virtually inconceivable that evolutionary considerations would ever enter into a discussion of invading a foreign country or taxing wealth and redistributing it, despite that both scenarios are expressions of our basic, biological behavioral repertoire. This is as true for politicians who are fervent Christians, and thus do not believe in evolution, as it is for more secular politicians, who ostensibly do. There is no single, decisive manner in which acknowledging the inherited mechanisms at work in our actions will influence them, but I suspect strongly that it would do so in a number of ways. Intraspecific behavior might be more rigid than other types of activity, but I can't imagine that if two nations who were considering going to war had a dialogue that incorporated, as a prominent feature, an understanding of the intergroup aggression dynamic, it would have no effect at all. For all that we do to obscure or ignore it, evolution has produced an undeniable inclination to know the truth.

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