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Advent of selfhood

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Who are apes - Who are we?

The self-evident physical similarities between human and nonhuman apes [1,2] have long fascinated us. When confronted with living gorillas and no bars, we are *literally* unable to take our eyes off them. Hence we pay thousands of dollars and hike steep slopes to encounter them with no bars between us. And these experiences change many who engage in them.

The strength and majesty of a gorilla observing you, from only a few feet away, screams "self-control and conscientiousness" – on the part of the gorillas. The gorillas don't attack you - they observe you back. The trackers and the primatologists label this "habituation." Why you wonder, do they have gorillas in cages in zoos? Can't they be "habituated" in zoos? "Habituation" seems odd to label the majesty of behavior you are observing. This is especially true if you are sitting next to female who happens to give birth, while a male is standing behind you and over you, just to make sure you do not interfere or harm or frighten the mother or baby. Why don't they just melt into the forest as they could effortlessly do? Why are they allowing you to experience the precious moments of birth?

And why are they observing you? Didn't you come to see them? They are astutely, magnificently, quietly, intuitively aware of everything you are doing. You realize they have managed the whole encounter. They have allowed it to take place - but why? They have decided to spend some time getting to know you, in an intimate sort of way, a way that most humans never get to know you each other. They had to take out from there daily travels to locate food to spend time deliberately sharing a real piece of their life with you. Why? No one pays them money. No one gives them food. It surely cannot be an example of "innate programmed evolutionarily adaptive behavior," a term so often used to explain every behavior in every wild being, except for that of humans reared by wild beings. In that case, we say the human was profoundly retarded, and learned from the animals. Of course, to learn from wild animals is not easy for adults,

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much less for profoundly retarded children.

Do gorillas per chance want to know something about we humans? Could they possibly hope to communicate something to us, just by their presence and demeanor? Observe the video on u-tube of a young adult gorilla communicating with human children, who are using the photos on their cell phones to communicate with the gorilla (https://youtu.be/vr8eMrnLLJo). This is clearly two-way communication between the gorilla and the children. There is no food reward for either species and no one trained the children to interpret the gorilla's gesture and no one trained the gorilla to gesture to the children.

Zoo's sometimes do not approve of this kind of behavior amongst gorillas in their collection, because it causes them to appear "too human" and they tend to discourage it. But there are many u-tube videos of gorillas looking at the photos on the iPhones and iPads of guests. They especially appreciate seeing videos of other gorillas. It is wrong for two closely related species to desire to communicate? It may be that the gorillas interested in photographs The oral histories of many indigenous groups in Congo and in Mali, speak of time in the past when apes and humans communicated linguistically on a regular basis and even shared words in overlapping languages. Maybe the children in this video, who don't yet know that it is politically incorrect to do anything with apes that is not part of their "natural behavior," are starting to break down the human/ape barrier. They may be harkening back to an earlier time when communication between us and them was part of the "natural behavior" of both species. Of course it would be possible for zoos to set up an electronic means for apes and visitors to begin to learn how to talk to and another and for gorillas to communicate by video with gorillas in other zoos and even in the wild.

The ungulates, the tigers, and the birds don't seem to be observing you in the zoo or in the wild, though they keep an eye on where you are, just in case you become unpredictable. And tigers sometimes eat you, but they don't become "habituated," to you. Nor do they recognize themselves in mirrors or display attempts to employ mirrors to see inside their mouths - as apes and children do. Monkey's also don't seem to spontaneously use mirrors in a way that suggests they have a concept of the "self" in the mirror. These other species also don't ask to watch the videos on your iphone. Nor if you show them the videos, do they watch.

But apes can come to know themselves and human children can come to know themselves. Both species are able to become aware that they have individual minds with knowledge, thoughts and experiences that are not identical. Thus they and we make deliberate intentional gestures which we employ to tell each other about the contents of our minds. These can be as simple as "show me more of your pictures" or "do you want to see this one?" These gestures can become "signs" or "symbols" that are much more complex as in "Do you want to watch the video we saw yesterday?" Or "Shall we make a new video for Kanzi?". Of course those in the field of ape language have been attempting to tell us that apes have these capacities since the 70's [3-5]. But linguists have vociferously objected. Wanting language to fall within the domain of humans alone, linguist have found reason after reason to claim whatever apes are doing it cannot be language [6].

Not only do gorillas watch videos, they watch the humans hiking up muddy slopes for hours - for a brief glimpse of them. You (a civilized human with senses dulled from a life bounded by objects) never really know where the gorillas are till suddenly you see them, but they always know where you are, long before you see them.

And, in addition to majesty of the wild gorillas, what about Kanzi, the bonobo on television who builds camp-fires, makes tools, paint pictures and makes music - not because he is taught to do so, or asked to do so, but because he finds these things interesting to do? He not only understands how mirrors, gestures and words act as means of self-expression, but uses Skype talk to children in Japan with a board filled with symbols? And why would an ape want to talk to children in Japan? [7-9]. Why would Kanzi go to the screen and kiss a child who is crying on the other end? Can he see the intelligence and kindness that is there in a human child and he realize that adults don't understand and can he wish to comfort a human child on the other side of the world he has never see? Certainly that is how the child interprets the behavior and the child is comforted.

A salient factor - overlooked by those who would harshly critique the language of apes as being different from human language - *is that interpretation matters*. If any ape or human is placed in a languaged world where their acts of linguistic intentional communication are given no credence and intent is not presumed, they cannot develop language. Language is two-way street. This simple aspect of language is something that all human children understand — but many adults - having long employed language as a "voice in their own head," have forgotten this fundamental property of language. They will not extend it to an ape, even when that ape is speaking directly to them. Languaged apes understand this reality quickly upon meeting such a person. They have no desire to speak to them.

And why would a gorilla save a human child that fell into a moat at a zoo unless he cared about a child he did not know? And why would a gorilla care about a child he has never known? And why would the zoo kill a gorilla who had just saved a child? It was not because the gorilla would not return the child. The gorilla was locked out and given no way to return the child. The gorilla felt the child needed to be watched and protected and the gorilla was absolutely correct. The gorilla saw the mother had been distracted, and the child could drown in the moat. Zoo officials, afraid that this "beast" was unpredictable and that they might be facing a lawsuit, decide to shoot him. They talk of this over on their radios and come with a rifle. It is clear that gorilla knows this is about to take place. And being that is nothing that he can do, he simply waits to be killed, with dignity. Male gorilla's protect the young and the females with their lives and in this case, a member of the human species was protected by a gorilla.

But the humans can't see this because their cultural blinders prevent them from seeing. Yet the dignity of the gorilla's behavior is obvious to anyone who has managed to cross the human-ape boundary and who can be with apes without fear. Something has gotten seriously out of balance in our narratives about apes. As a species, we naturally feel confused about our relatives who live in the forest, with no clothes. We think of them as ignorant, because that is comforting to us. It validates our choice of a material existence. National Geographic used to show us Koko and her kitten, and told the world that Koko likes to look at photos also, through a "slide master," as then there were no cell phones. Now National Geographic magazine has decided to remind us instead that ape are dangerous. We are even told - Steve Ross, curator of the Chicago Zoo - that chimpanzees are the most dangerous of animals, they "sit around

plotting how to kill us." Why would they want to kill us? Have we done something to them we should not do? We see Jane Goodall touching them in National Geographic films but then hear rumors that they attack her when she is at Gombe and that no one touches wild apes any more.

In zoos humans used to be able to see apes walking on stilts, riding motor cycles through rings of fire, wearing clothes, and moving their lips as though they were talking. We are now regularly informed by internet blogs that the behavior of apes is programmed by instincts. We are told that when they grow up they will inevitably become so strong and that they must be "put away" or they will not harm the humans who reared them. Of course as human toddlers grow up they become very strong as well and adults regularly obtain access to weapons. Yet they don't automatically kill others simply because they are strong and want their own way. Through language, they adopt the moral values of their culture. And in human cultures there are certain circumstances in which killing is permitted. The same seems to be true of chimpanzees, but not bonobos and gorillas, they are pacifists. There are instances in which chimpanzees reach adult hood and do not become dangerous. In most such cases they understand language, have had very loving care and exposure to many aspects of human culture.

Maybe some trainers are as evil, as was the father of the chimp trainer's daughter. But this is simply was not be true in all cases. When the first author was five, she saw a chimp show at zoo. Chimpanzees were doing things so human-like that she found it difficult to believe that they were not a type of human being. Her 5 year old mind was reeling at the fact that they were presented as "animals" but they were not behaving as animals as she could discern. The "chimp show" was certainly nothing like the "big cat show." Cats were clearly been told what to do and they often did not like it. They growled at the trainer and at each other and whips were employed. The chimpanzees looked happy and eager to ride bicycles and walk on stilts. Was that a mirage?

She asked if could go behind the stage afterward, to meet the chimps and try and understand what they were like when they were not in show. She asked these trainers how the chimpanzees came to do the things she had seen, such as riding bicycles. The trainers said they simply showed them. They sat them on the bikes and gave them a push and helped them stay up till they got the hang of it. This is how many parents taught their children to ride bikes before there were training wheels.

She asked the trainers if they had to give them food to get them to do those things and they said no, we all eat together afterward. And then the trainers and the chimpanzees sat down at a long table and the trainers called to some other chimpanzees that came walking out bipedally with plates of food for everyone and served the people and the chimps. This was not part of the act, this was just how they ate together. Then the trainers showed her how they played with the chimps and it was clear the chimps loved to play with the trainers. Was she told the truth?

Later as she grew up she met many many chimpanzees at the Primate Colony of the University of Oklahoma. This colony was directed by a clinical psychologist, William B. Lemmon. It contained chimpanzees reared in human homes as human children from the day of birth, having never seen another chimpanzee. It contained chimpanzees reared in rodeo's and zoos by trainers who clearly punished them in order to get them to do tricks. It contained chimpanzees just our of the wild and others reared in the wild till age two or three. It contained chimpanzees reared in a children's zoo who interacted with children all of their lives, and chimpanzees reared in zoos without any human interaction. And it contained chimpanzee's who have been in biomedical labs and one chimpanzee - Bruno - who had been reared by Herb Terrance in ape language project which failed, before Terrace decided to rear Nim. All of these chimpanzees were very different. The first author lost part of her right finger to a circus reared chimpanzee. She lost many of the functions of left index finger to a rodeo chimpanzee by trying to make friends with her across the period of a year. Were these chimpanzees dangerous? Yes they were. Did these chimpanzees sit around plotting how to kill people; no they were capable of deceit however and they took advantage of the slow reactions and slow perception of their behaviors by human beings. Where they "made bad" by zoo and circus trainer's; perhaps. Were they equally "bad" to other chimpanzees, no they were not. *They reserved their deceit for human beings*. Were ALL chimpanzees in the colony of more than 30 like them. No, they clearly were not [10]. Did rearing matter. It was obvious that it mattered made far more difference than species. It was difficult to find any kind of "commonality" among all these chimpanzees.

According to the "chimp trainer's daughter," all chimps grow up to be bad adults and therefore have to be given away and taken to other locations. This person has generalized from her experience in one setting, with one father, to the entire species of apes and to every other family who has a chimpanzee member. Human families are very different and it is not possible to generalize from the problems of single family to all others.

There were adult chimpanzees in the show at the Saint Louis Zoo. The trainers were not beating them as the chimp trainer's daughter described. These trainers emphasized that the chimpanzees were part of their family. This took place in the early 50's, long before National Geographic illustrated Jane Goodall's discovery that chimpanzees make tools for termite fishing in Gombe. It is also long before it became politically correct to eschew all humanape interaction as "improper." And long before the daughter of the bad chimp trainer encountered her personal traumatic experiences and sought eagerly to generalize them to every other human/ape relationship.

However this, is not to argue that humans never mistreat apes or that apes never become dangerous. *Many humans do not treat apes appropriately*. They fail to engage in two way encounters or even to perceive that they are possible. Precisely because they are afraid of apes, they treat them as lessor beings. In Africa, apes are regularly hunted for meat. Clearly recognizable ape body parts are sold smoked in open markets, in all large cities. But in many rural areas, apes are still revered as brothers and hunting is avoided. Naturally apes react differently in different locations to human presence. In some areas, where there are no humans, apes even approach those rare adventurers who dare to go these remote area. In these area, they have no fear of people killing them. They want to find out what these beings that look so like them, are actually like.

In the US, chimpanzees have been found in road-side zoos eating table scraps and chained to a post has if they were a dog. Alternatively they been raised in families as true member of the family - eating at the table, sleeping in a bed, playing with their human brothers and sisters, watching television, picking up their toys, cleaning their rooms and, well climbing trees and going fishing. They acquire language and they stay within physical

boundaries defined for them and explained to them. They don't harm anyone. But humans remain afraid of them and they are not allowed to become participants in human culture in modern American. However in some African villages apes are said to have become participants in human culture (Lingomo, personal communication).

But regardless of whether we have seen them do "human things or ape things" - when American and European tourists come face to face with them in the wild - they cannot help but realize that they are very like us. They are a different sort of human than we are. They are a form of us that has not surrounded itself by clothes, field-glasses, back-packs filled with food and water, or paid jungle guides. They are a kind of human that is able to live on what the jungle offers up each day. But they are not homeless or miserable. They are not hurried, and they do not appear "poor" though they lack pans, pots, clothes and all other signifier's of wealth among African communities. They have no need to rush to work. They have no need to exercise each day, but they are in perfect shape. They don't try to trade us for our clothing or any of the other material objects we carry with us.

Aside from these cultural differences, and their physical appearance, they seem human. They seem, in point of fact, so undeniably human, that we find ourselves wanting to reach across the gulf that seems to separate us. It is as if we realize we could be them, we *could* live as they do — but we have long been taught another way of life. And that other way of life, as encoded in our language, has left us apart from nature. We are fearful of depending upon the bounty of the forest and in need of many things for our survival. From the simplest of stone tools to the latest Nike shoes. We need things. Our bodies are made to need things. Their bodies are made to do without things, and this has caused us to look down upon them and to view them as simple minded. But in their actual presence, with no bars, in the forest world they have mastered, it is not possible to think of them as simple minded. It is not possible to believe that they are not aware of everything around them and the relationship between intention and action in the minds of their human visitors [11,12]. They are gauging your every intention - even though they don't know you. It feels almost as if they are have some means of reading your mind, or at least you every emotion. They are neither conditioned nor habituated. They have made a decision to let you see them.

Yet still many scientists visit upon captive apes - the ultimate of discrimination in the name of "best possible treatment." Their very housing conditions suggest that we view them totally incapable of self-control, completely unpredictable and ravaged solely by primitive emotions. Steve Ross, of the Lincoln ParK Zoo observes that, "Chimps have to be one of the most dangerous animals, they are inventing in the head ways to kill you." He fails to note that if his statement is true, then chimps are planning ahead and using representational strategies to do so. He also fails to realize that while this may true of the chimpanzees he was worked with in Chicago it is not true of chimpanzees everywhere. The second author has found that chimpanzees who are characterized as "killers," behave very differently when treated with respect and when encouraged to engage in bidirectional communication. Ross may be unwittingly treating chimpanzees in a way that produces frustration at the inability of surrounding humans to communicate with them, to display respect, and to engage in two-way dialogue. And thereby creating conditions in which chimpanzees, feeling a lack of respect, become aggressive. Respect is important in chimpanzee communities and showing respect is essential. The male's charging display is intended to command respect, and when it is not shown, the individual becomes irritated at what can be perceived as an intentional insult.

By any rational criteria, apes would have been placed in the genus *Homo* long ago. For political reasons and linguistic reasons they are "left out" of the family of man and placed in three separate genus, *Pan, Pongo* and *Gorilla*. When the anatomical similarities of humans and apes were first discovered (that is discovered by nonAfricans), placing them in *Homo* would have meant placing an "animal" in the same family as ourselves. No animals could be in *Homo.*

But anatomically apes belonged in *Homo*. And this has created a quandary that continues today. While scientists no longer argue that man is unique in being created by God, they do continue to argue that man is unique. What matters is not actually how we became unique, but that we became unique [13]. But once the genomes of chimpanzees, humans and bonobos were sequenced, there was even more reason to place them in *Homo*. And with the rise of genetic classification and genetic time-lines, it was clear that *Homo* did not have sufficient to evolve from "animal" to human. This means that many of things humans have attributed to human uniqueness are capacities that exist in apes but have gone unrecognized, or that apes have potential to do many things but don't develop that potential. Scientists have assumed that apes are animals. Scientists have assumed that all "animals" lack language. Scientists have assumed that they therefore lack the capacity to reason, to engage in planned causal behaviors toward one another with an understanding of the outcome. They lack self-control, self-management and self-mastery. Scientists view animals as being unable to reflect on their actions, they just act. Thus if a person's dog attacks and kills them, the dog is not accused of a premeditated act. The dog is not punished, though it may be removed and caged. Scientists similarly do not view humans as responsible for their actions while they are very young or if they lack the mental capacity to think ahead and anticipate the outcome of their actions.

And thus the presence on Earth of ape beings is mysterious. They don't behave as beings who are unable to think ahead. They appear to behave as we do, or as we surely would if we lived the kinds of lives they live in the wild. And the fact that they learn to behave as we do when they live the kinds of lives we live in modern cities, is unsettling to many. Especially to those who would declare them dangerous and unpredictable

Of course we can prevent them from behaving as we do, by how we rear them and what we allow them to learn or not learn. And we know we can do the same with children, if we engage in such practices we produce "wild children," or children who refuse to accept the normal practices, inhibitions and acceptance standards of human culture [14]. Thus it is not easy to determine who apes are or who we are, or how either of us came to be what we are. If we are anything at all, we are "learners," and we learn most rapidly what we see those about us doing. Humans or apes can grow up to be killers or to be peace-makers, it all depends upon those around them and their experiences. For the most part, apes are traditionally peaceful and live small groups. For the most part, humans live in large groups and have - throughout history, engaged in war and killing. Humans have focused their expertise on developing weapons of war, from stone tools to high tech drones that kill and

vaporize the enemy.

Could it be that wild gorillas are are conscious of us in exactly the same way we are conscious of them? The impression when one is in the forest amongst them is that they are. It is not possible to be around them, next to them, literally amongst them - with no bars or glass - and not take note that their every action is purposeful, intentional, deliberate, performed for a reason. You might not know what that reason is, but you really cannot doubt that it exists the way you can in zoos where there is a barrier between you. In a zoo you do not feel compelled to rivet your attention upon them, and since you are one of thousands going past, they do not feel compared to rivet their attention on you.

In zoos, with all the wires, moats, and hundreds of people - there can be no deliberate watchfulness, no dance of mutual awareness between you a gorilla as you each become intently aware of what other is doing on a second by second basis. You are very aware in the wild - that for this encounter to even happen - both sides must extend trust. You can't simply pay a fee and go to an enclosure where a gorilla is waiting to be watched because they have no other choice.

In their forest, you extend trust by believing that they will not employ their over-powering strength or canines to kill you. They extend trust by believing that you will not employ you over-powering rifles to kill them. You both, so to speak, lay down your weapons, you make peace and begin a dance of mutual awareness. Of course it is not totally fair, because your weapons, even if carried by a guide, are far more devastating than theirs and they know this. So wild gorillas must make the far greater effort toward trust, and they are also aware of this. Yet they allow you to see them in their home. You knock (so to speak) and they permit you to enter.

Someday, zoos will seem as primitive to our children as hunting gorillas for their pelts now seems to us. We will look back on how we treat now other members of Homo as excessively cruel. In zoos, gorillas are "watched" all day long by roving groups of people eating food the gorilla's cannot have, and going places the gorillas cannot go. Indeed, only the people have the option of going places. The gorillas must stay in one place. They can't meld into the forest, they can't watch you coming and they can't decide whether they to allow you to see them or not. It is in zoos that gorillas must truly become "habituated" to people. They cannot mesh into the forest. The are "locked out" and "on display." You will read the printed signs, instead of reading their behavior, and the signs tell you that the gorillas are dangerous. You will see 'animals' whose anatomy amazes you, but rarely will find that the gorillas engage you.

Gorilla's were said to be fearless according to the first Europeans who hunted them for their pelts in the 18th century. Drawings of gorillas picking up hunters, stripping them of their guns and breaking their bones, led us to marvel at the bravery of those who shot them with guns. Now they sneak up behind we tourists and look at the pictures tourists take of them with their cameras. Have gorilla's changed? Have humans changed? Have both of us changed? What determines behavior anyway? Was their previous aggression really innate? And do they sit around and plot how to kill human beings as National Geographic recently told us? Are all nonhuman apes cute babies, but methodological killers when they grow up, interested only in a thing we call dominance? Or could this be National Geographic's patriarchal extension of racism to our next of kin?

Could we be finding in nonhuman apes different things because we are seeking different things across time? Both species are learners par excellence. As we begin to truly encounter each other across the vast expanse of time and culture that has moved us apart during the last 4 million years, it seems obvious that the behavior of both will change. It can only remain the same if we move all apes back to Africa and we do not interact in any way with them and return things to the way they were on the African continent before the 1800's.

But long before we learned that apes existed and long before we learned that we did not have to kill them, we could just "observe them," and long before we decided that it is politically incorrect to allow them to engage in any human behavior - according to the oral histories of many places in Africa, humans and apes lived humans and apes lived together in the forest as brothers, and they had languages that shared many words and we accepted them as our brother beings (Lingomo, personal communication). Today, humans who live near bonobos in the forest in Iyonjde still accept them as brothers. They do not kill them, they do not eat them. They attribute to them an intention to live a different kind of life, one that does not depend upon villages, fire or swidden agriculture. They attribute the capacity for religious belief to them and language. They do not see them as a form of animal. They see them as humans who arrived at the party of creation a bit late - after God had passed out all the beautiful faces - and so they got the ones left over, the ones that humans did not want. Animals were created much later and do not possess the same kind of knowledge about life as do humans and bonobos. It is the responsibility of humans and bonobos to care for the forest. It is said that when humans invented fire, the bonobos explored fire also, but they always decided to let their go out and to travel on. The humans wanted to keep their fires going and so they began to find ways to cover fires during rain. They began to bring food to eat around the fires. The fires comforted in them in the dark, kept away wild animals, and warmed them in the cold, and they began to build their lives around fire. Sometimes bonobos came and lived in villages with humans and the humans protected them. And the bonobos often helped the humans out and protected them when they went into the forest to forage. Even now they will drop food down from trees and share with humans if asked to do so. So the original relationship was one of shared responsibility and linguistic communication. And in a sense the conflicted relationship that now exists in the mind of modern mind reflects these different kinds of relationships that are possible.

And so - when we look at gorillas in their world - sans bars —we cannot take our eyes off them. All these questions float around in our heads, perhaps not consciously present, but nonetheless present. Why are they living in nature and why are we living in cities? Why have they created a mode of life that is sustainable and we have not? Why are there 8 billion of us, and not even one million of them? It may appear that we are the success and they are the failure, from this decision made many generations ago.

Language some have said bootstraps the brain into a "runaway state of mind" So what do scientists have to say? Can apes really talk? Can they really think? Are we really their cousins? What does it mean to be human? Can they be part human? Must there be a human/animal divide? And how was this divide created? Did God create it or did evolution create it? [15,16]. A being such as a God would seemingly have the power to create it, but a random chance mechanism - such as evolution would

be limited to shuffling the previously extant genes to produce new traits. Such random shuffling should not, by any reasonable definition of the Darwinian process, be capable of suddenly producing one species that defies all the traits of all other animal species, past and present. It should not be capable of producing on species that eschews all programmed innate behavior and that bursts suddenly upon the scene of life as the "learner" par excellence an the only being capable of language. Genetics doesn't work that way. And in fact, the genes of all great apes are so similar to ours that they also have to be *learners par excellence* as well— simply because we humans are learners par excellence and we share the same genes. They to have to found ways of eschewing programmed innate behavior to the same extent that we have done so, but in a way that does not depend upon objects. There is really no other option for them because they don't have enough genes that are different ours to program them to do much of anything else - if the current scientific account of how genes work is accurate [17].

Chimpanzees have had 4 million years to take another path, it would be foolish to assume that as learners par excellence, they did not change while we have not only changed ourselves but the entire globe. Yet this is the standing assumption, namely that apes represent what we used to be and that they lack the traits of the "uniquely unique species, *Homo sapiens*." Those traits being art, music, literature, opera, politics, science and religion according to [15]. We also have the following "traits"; overpopulation, selfishness, deceit, raising and killing of animals in large numbers, planetary wide pollution, planetary wide raping of minerals, never ending wars, the creation of weapons capable of killing all life, and societies in which many members of our species are treated as inferior and have very little to live on. The fact that humans have employed high levels of cooperation as one human group has competed against another group is suggested as one mechanism that made us *behaviorally different* [15]. Another is that language ran away with our brains and allowed human creativity to remake the world [16]. The things that ALL such theories have in common is that they assume:

a) that apes have not changed much at all

b) that apes currently display no art, religion, music, writing, political skills, etc.

The only basis for this widely accepted suppositions is that no one has seen these behaviors in apes. However, apes able to vanish at any time they so desire. When one sees them only for relatively brief period of time as they are resting - but there are nearly always traveling and one is nearly always following. Sounds can be heard between them, especially if they are in large groups up in the tree, but it is impossible to decipher these sounds. Without becoming a member of the group, there is no way to determine what the group is thinking, planning, doing or communicating about until an event actually takes place. This limits the type of questions to those typically addressed by field researchers, which include habitat use, dominance, mating strategies, travel patterns, tool use, coexistence with humans in the same habitat, dispersal of cultivated crops, hand preference, infanticide, etc. Attempts to understand the group, as would be undertaken by an anthropologist investigating a human group *always* begin with language.

Thus it is repeatedly and erroneously concluded that only humans are capable of language [18]. And it is said that without language we would not have fire, stone tools, agriculture, industrialization, technology and now genetic modification. It is repeatedly and erroneously said that apes lack the entire suite of preverbal communicative abilities including joint regard, pointing, theory of mind, and imitation [19]. This is based on the capacity of human scientists to design test of these abilities that only human children, with human rearing pass. Of course it is quite possible to also design tests of these capacities that only apes reared in a bicultural world would pass and children would fail. *This would be a valid scientific exercise only as long as rearing were the dependent variable and were manipulated in the same manner for both species.* That is not what Tomasello and his colleagues have done however. They have intentionally ignored rearing and designed culturally biased tests to cause apes to appear as lessor beings by failing to equate the key independent variable of rearing. It is easy to take apes reared in zoos and children reared in human homes, design a test around the normal cultural environment of the child and prove that these beings differ. One can do it over and over and over, with a slightly different test each time and conclude that there are differences. It would be odd to assume the null hypothesis, i.e. that there are no differences. But this is what was done and widely accepted because of humanity's anthropocentric need to believe that we have moved far away from our relatives in every basic way. We have moved far away culturally through a focus on material things. However far we have moved does not address, in any way, how far apes may or may not have gone in another direction.

The idea of determining how far apes could go into language was never needed intended include causing apes to behave like children, think like children or be like children [20,21]. Rearing them with the love, commitment, patience and care that human children receive, while their own mother Matata did the same, with the assistance of human aunts and uncles, was conceived as means of validating their culture and bonoboness by every behavior and every interaction. "Tests" of the human children reported by Tomasello are the tiniest portion of their lives. It is their lives the constitute the background for the test. And similarly it must the lives of apes that constitute the background for the tests of Tomasello and his colleagues.

Following decades of research, Call and Tomasello report apes do understand that others see, hear and know things [22]. How could it be otherwise? Does not every mammal see, here and know things? The degree to which we hear, know and see precisely the same things and interpret them in the same manner depends upon the similarities of our cultures. That is the role and function of culture. Culture builds and binds groups of beings together in ways that allow them to function as a group by seeing, hearing and interpreting the world in common ways.

The fact that at the zoos and primate centers where Tomasello works, apes are incapable of these so called human abilities for theory of mind, imitation or any other early "cognitive skill" is a function of their rearing not their biology. *The very attempt to compare species whose evolutionary strategy has been to maximize learning, requires comparative rearing*. However, since apes lack the capacity to speak in the human register, when they do speak, we cannot understand them. Thus we are not able to behave toward them as we would behave toward children. This is our deficit not theirs, for they CAN understand our speech. But human's, in their intense focus on themselves, overlook the fact that apes have a greater range of ability to process signals that do we. Human researcher's focus solely

on the inability of the ape produce speech within our range of hearing and processing. Thus do we find our species demonstrating anthropomorphism in the the extreme whenever attempts are made to determine language abilities in apes. See Shieffelin, [23] and Ochs & Shieffelin [24], for how language in acquired by human children and for aspects of human-rearing that the Kanzi effort attempted to encapsulate, and which are do not exist in zoos and research laboratory's where culture, kinship, expression of thought and freewill are prevented from manifesting.

Were human children reared as the apes in the Call and Tomasello's studies were reared, they would be adverse to his tests and do poorly on them. Human culture, especially once we start school, teaches us to cooperate with strangers and to do things on demand. Clearly apes reared in zoos do not receive this type of enculturation, yet Tomasello's methods of testing for any capacity are exclusively human centered.

Tomasello [25] not only fails to address the issue of rearing in his own studies, he does the same when he reviews studies of apes reared in a language world, where they are not only treated as though they can and will be able to understand language, but where they are also provided with an output mode for language since humans cannot understand their utterances. Tomasello is well versed in the issue of rearing. He previously tested apes reared in an environment designed to maximize their opportunity to acquire language. From this collaboration with the first author, he concluded not only that environment mattered but that it was the key dependent variable. "Results showed that in immediate imitation the mother-reared chimpanzees were much poorer imitators than the enculturated chimpanzees and the human children, who did not differ from one another. Surprisingly, on the delay trials, the enculturated chimpanzees significantly outperformed the other 3 groups. We conclude from these results that a human-like sociocultural environment is an essential component in the development of human-like social-cognitive and imitative learning skills for chimpanzees, and perhaps for human beings as well [25,26]". The enculurated chimpanzees in this study were Panbanisha and Panzee.

It appears that Tomasello deliberately elected to ignore the environmental variable once he joined Max Planck. And journal editors, have accepted his practice simply because it fits within a general desire of many scientists and linguists to set themselves above apes in every possible manner. Additionally, by deliberately ignoring this variable *one is certain to find humans superior to apes in every dimension in which Tomasello has sought to collect comparative data.*

The original idea of determining how far apes could go into language never required causing apes to behave like children, think like children or be like children. The goal was never to make them into humans through language or to recreate every facet of human language. The goal was to determine what the capacity to communicate between species could reveal about each species to the other. Rearing them with the love and patience and care that human children receive, while their own mother Matata did the same, with the assistance of human beings, was conceived as means of validating their culture and bonoboness through every behavior and every interaction. "Tests" of the human children reported by Tomasello are the tiniest portion of their lives. It is their lives the constitute the background for the test. And similarly it must the lives of apes that constitute the background for the tests of Tomasello and his colleagues.

When reared in bi-cultural bi-species environment built around love and respect between both species, all things change. When mothers are not removed from the babies, but added to with aunts and uncles from a different culture and when language is not taught but used every moment to convey real information, things change. When the ape mothers themselves have real language and a forest to travel in, things change. Apes acquire the proverbal skills thought to be important for the emergence of language and they begin to comprehend language. They also try to speak but the transition time between their vowels and consonants is so rapid that the human brain cannot typically detect speech in their utterances [26,27]. They can however learn to use printed symbols and to spell words that they hear and know [28]. They are even able to acquire multiple human languages [29]. Spelling is particularly helpful because it allows them the capacity to produce any spoken word they understand. Lacking this capacity their production is limited to the symbols or signs that humans have decided they should acquire - which might not be the ones they wish to have. Bow, is the only language competent chimpanzee to have been reared by a linguist and the only language competent chimpanzee to be co-reared with a human sibling. Katz began her work with Bow by using printed words on cards and then advanced to spelling those words by touching the letters. Bow currently prefers to hold Aya's hand as he spells words, and for this reason the work has been preemptively dismissed because of the potential for cueing. However Bow understands both Hebrew and English at a high level though his comprehension has not been formally tested.

As apes acquire a human system of communication they also begin to pass these abilities along to their own offspring (Personal observation of Panbanisha). Thus apes can and do acquire humans modes of communication within a single generation and they naturally transmit what they have learned to their offspring [30-32].

Tomasello [25] begged to differ with own assessment of the bonobo's capacity following his relocation to the Max Planck Institute. With each report of Kanzi's language ability, Tomasello found that, in some way, it was not precisely human like. Indeed, it would be a great disappointment if it were totally human like. If that were the case there would be nothing of Kanzi's own creation in his communications, they would all be learned platitudes, nothing real, but all according to human pattern. Tomasello's current view is that Kanzi is not able to ground his reference acts for the listener. "That is to say, they do not have noun phrases with things like articles and adjectives that help to specify which ball or cheese is wanted." (p.101). Kanzi is clearly able to understand noun phrases that specify which ball or cheese is wanted [33,34]. The symbols on Kanzi's keyboard did not include those that would allow him to produce the kinds of utterances that Tomasello's feels are essential to human language, until 2004, following the relocation of the project to Iowa. This was because the nature of the keyboard is such that if communication is not elliptic the board became to cumbersome and to difficult to use for normal humans adults. Also, until it was clear that Kanzi and the other bonobos readily comprehended complex English sentences of this sort, there was no reason to put them on the keyboard. Because they found them too difficult to use on the keyboard.

Kanzi and the other bonobos did begin to acquire and employ them though only the authors and Liz Pugh employed these symbols in conversations. Kanzi and the other bonobos can

readily comprehend and respond to sentences such as "Where is it?, Where did you put it? Do you want this one or that one? Did you leave one of them outdoors? Can you show me where we left it? Let do it now. Did you want to watch the same one we watched before? Don't do that, please do this." When engaged in a conversation with turn-taking, they have no difficulty determining the referents of words such as this, there, that, it -even though those words which reference items mentioned many turns earlier in the conversation. The auditory mode of communication make it easy to insert these kinds of grammatical markers with a speed that fits the flow of action. The keyboard makes it difficult to do this at any speed that fits the flow of action and it distracts from the flow of action. For this reason Kanzi and the other bonobos did not employ them in many sentences where the nature of the grammatical connection was self evident. Their use of the keyboard was elliptical. However it is not correct to say that could not form such sentences. They formed then constantly in the vocal mode. However our capacity to translate the vocal mode into English was interrupted by the termination of the research trajectory following the relocation to Iowa (see Addendum for explanation).

These findings with captive apes suggest that some form of language must exist among them in the wild, but scientists have failed to recognize their sounds as words. Apes are more prone than humans to be silent than humans in many situations and this has been taken (wrongly) as an inability to acquire language. No researcher has yet attempted to integrate him or herself into a group of apes as a matter of participatory ethnography. Indeed, primatologists now consider it 'nonscientific' to do so, for fear of contaminating apes with any aspect of human culture. This professional ethic acts to make certain that the current extremely limited knowledge of what bonobos are doing in the wild will remain in place. It is also being employed to discourage ethnographic investigations of chimpanzees in Mali, where chimpanzees, like bonobos reportedly previously lived in regular communication with humans in the past (Roffman) Ethic not withstanding apes may watch humans in African if they wish. This seems to happen rather often in bonobo areas. According to the oral histories from the Peace Forest, humans and apes shared a cultural history in the distant past. Thus the behaviors we now observe may have been affected by previous interactions between apes and humans, long before Europeans arrived.

It is our common human cultural experiences which define the capacities passed onto human infants by our species-wide *acquired* styles of maternal care. They are not exactly the same around the world, but there are sufficient commonalities, that humans share with each other, but not with apes, to set our infants off on different trajectories. These early trajectories begin to determine many other aspects of group life and behavior much as water rolling down a slope finds a path of least resistance, carves an indentation, and the water coming from behind follows the same path. Initially there are multiple paths available, but once one is chosen - the number of alternative reduces to zero unless there is a change in the terrain.

Cultural effects are transmitted cultural rearing styles which define how the transition of acquired behavior takes place between generations. Additionally our cultural ways of doing things are designed to interact with our anatomy. In a sense our anatomy is similar to the terrain over which the water running downhill initially flows. It produces some definite constraints but many paths are possible at first. Later, the water can carve a deep gorge which allows no other path to intervene in a similar way. Once a certain set of behaviors begin to define how we interact with our mother, the rest of our behaviors follows that trajectory and build upon it. We are limited, in a very real sense by the initial set of reflexes we bring into the world, our anatomy, the anatomy of our mother and the interactions between these factors that must inevitably take place if we are to survive.

Thus infant apes and infant children have the potential to be bipedal or quadrupedal. Many human children go through a phase of quadrupedal location before becoming bipedal and if raised in families who are quadrupedal, they remain quadrupedal. Many ape infants go through a phase of bipedal locomotion and if they are encouraged it - as human children are - and help ed to walk upright, and if all their models are bipedal, they can become bipedal as well. However there are biological anchors that then to push apes toward quadrupedal behavior and humans toward bipedal behavior. And there are reflexes that act in a similar manner. The ape's hip is not as suited to bipedality as the human hip. The feet of the infant ape are programmed to cling to the hair of the mother and thus the infant ape tends to support itself as the mother moves. Its hands cannot be used for pointing and its fingers tend to move together in order to get a good grip. Its legs are bowed by holding around the mother and its feet become like its hands once it reflexively grips the mother. This allows the ape mother to move high in the trees without putting the baby at risk. Unless an ape mother has males to protect her, she is a great risk from predators shortly after birth and she needs to be in the trees. Gorilla mothers have immense males ready to protect them and all infants. Orangutan mothers do not and they even give birth in trees. Gorilla mothers give birth on the ground. Gorilla infants do not cling at birth and may not cling for several months. Orangutan infants must cling at once and must not let go. Thus orangutan and gorilla infants come equipped with a different set of clinging reflexes.

Human infants have very different reflexes at birth. Human culture depends upon objects and the ability to carry objects. Thus it requires us to be bipedal. It is nearly impossible to cling to a bipedal parent and so the feet of our infants have lost the clinging reflex. The hands retain it, and as we retain hair on our heads and/or wear clothing or beads, human infants have something to cling to with their hands but they are not required to support their own weight. Hence they can add fat both before and after birth, because they are carried. Ape infants must stay thin or they will not be able to cling.

But when humans rear ape infants they can carry them. And if these infants are not treated as pets, buts as children who can and will begin to communicate, then, like children they begin to point spontaneously at an early age. By the third or fourth generation of bicultural rearing the clinging reflex in the feet vanishes. Because they are carried, they learn to engage in joint regard and joint referencing very early. Thus Tomasello's question about whether apes lack the preverbal skills that precede language is meaningless, because he overlooks the kind of rearing the infants of each species typically receive, and the effects of comparable cross species rearing [31].

Most things we have thought of as "innate" in learners par excellence can be much more effectively understood as the result of interaction between early reflexive patterns, the anatomy of the species and the cultural patterns of those rearing the infants. "Innate" is simply a grab bag for behaviors whose origins we cannot yet explain. It is most unfortunate that it has

made scientists lazy and allowed them to conclude that most behaviors of animals are programmed somewhere in the genome, while human behaviors are not. This was possible to assume prior to the sequencing of genomes. It is now clear that behaviors are not lodged in the genome in some fully innate form. They are linked to anatomy and to the patterns of behaviors and the environments inhabited by members of a species. As such they seem to replicate but they can take very different forms depending on rearing, what appears to take place is a form of very rapid learning with the youngsters becoming sensitized to attend to behaviors of the parents from fertilization forward, and to copy them. This is true not only of animals but of ourselves. We are sensitized to sounds, movements, electromagnetic fields, lights, population density effects, etc. as the nervous system matures. We are able to learn many things in a single trial as are other mammals, but the things we learn are different because the worlds we experience are different.

Each way of life tends to replicate itself in the next generation but learners *par excellence* also have the option to change this at any time they so chose.

In so doing, very rapid transitions in both behavior and biology can take place. As we humans, some four million years ago began to place greater and greater emphasis on material culture, lifestyles evolved around bringing objects and food to the nest or the hut, rather than travel from location to location. To travel from location to location, one must develop and constantly update an extremely complex map of fruiting trees and one must arrive at the right time and leave at the right time and head in the right direction to reach the next patch of available food. To bring food to one location one must keep the location clean and free of the clutter that inevitably arises. One must develop means of storing food and carrying food. These basic patterns lead to different ways of organizing updating knowledge in the brain. And they lead to different consequences relative to sound production. They require different kinds of learning capacities and different patterns of brain organization. The assumption that human learning is far advanced is correct only for certain kinds of tasks. It is incorrect for others as Matsuzawa has eloquently demonstrated by showing the chimpanzees can identify and replicate the location of sequence of objects on a computer screen with an accuracy and speed that humans can neither understand or match [35-37]. Most scientists have been looking at apes through a myopic cultural lens. And our captive rearing practices have been maintaining that lens by failing to allow the true intelligence apes expression through the normal pathways of learning; kinship, culture, language and self-management.

This is why many in science were greatly surprised to find that our genomes were so similar.

Rethinking "Selection" -What Is being "Selected?"

How we differ from apes is not viewed anthropocentrically, it is also viewed through the lens of selection. However we don't have a good explanation for the rapid selection of language, music, art, literature, politics, religion, etc. in our species. Possibly we need to review the idea of "selection" itself.

Twenty years on from sequencing the chimpanzee genome – it appears that genes do indicate degrees of relationship between individuals. However, it is less clear that they design us or our behavior without some assistance. We now know that genes require the help of "ride along's," such as enhancer's or silencers, or epigenetic markers. These markers tell them when to turn off and on, and what to do. The markers are inherited from the parents, and they can be shuffled following conception. *They are linked to the experiences of the parents, and to the environment of the embryo. These epigentic markers are not randomly shuffled about due to selection.* They affect behavior, phenotypical expression, memory and learning in a trans-generational manner [38].

Research has linked these markers to such things as a mother's exposure to pollution, her intake of vitamin D, the father's diet, long term memory modification, immune disorders, learning disorders, etc. [39]. It is difficult to trace the precise effects of these markers and much of what we know is attributed to correlation studies. To fully understand what these marker's do, requires the sequencing of protein expression in single cells,- because cells with the same genome do not transcribe that genome in the same way, either during development or post development. How a cell makes decisions about what to transcribe, is not yet understood. For some time, we have know that one genome results in liver cells, heart cells, neural cells, etc. However it was long thought that a master program guided the differentiation of the body from stem cells, and that once the body was formed, the DNA shut down, each part simply did its job, without any feedback between the cell's current environment and the DNA.

Now we know that epigenetic markers can and do change the pattern of gene expression, throughout the lifetime of the organism. And they can do so in response to the effects of light, temperature, population size, and the experiences of the parent. *These markers are priming the offspring in certain ways, yet they are not undergoing reproductive selection through mating.* In one sense it could be said that the parents are undergoing selection by having survived long enough to reproduce (and hopefully to rear their offspring) but the things that they pass on via epigenetic markers are reshuffled anew each generation. They are designed to prepare the offspring for expected environmental events, and those events can be cultural events. Thus through culture the behavior of each generation is shaping the biological programming of the next, without any kind of "random" selection. All markers are added through the actual experiences of individuals and they tell the "gene kit" what to do. These markers not immutable, therefore what is being passed on is some aspect of the parent's experiences and environment that prepares the offspring in a way, possible good or possibly bad, depending upon the actual encounters and experiences of the offspring, but what the parent has passed on can be changed in the offspring [40].

Epigenetic markers affect gene action but their presence or absence in the population does not arise from the fact that individuals with certain markers become more prevalent in the population across time. In fact most markers studied to date signal physical problems, though this likely an artifact of the funding constraints on basic research. It is probably that epigenetic markers channel many behavioral sensitives. Thus markers can encourage such things as fat storage because a parent - even many generations back - experienced famine. The markers, in these cases, are preparing the offspring to use the genome it has in a different way in order to better tolerate the environment its ancestors encountered. Thus preparation most likely affects all learning, both conscious and unconscious and prepares the body to respond to some things quickly (as in allergens), and the nervous system to do the same, thereby pro-

moting one trail learning in many ares as well as a degree of fixedness on certain areas. Extreme fixedness occurs with stress and may well led to what, in humans is termed "autism," but in apes is termed lack of creativity and/or flexibility.

Thus we find the traditional picture of evolution being upended by the rise of epigenetics. We don't yet know how many markers are passed on and/or how they interact with different historical information coming from different parents, or what takes place when markers are removed during embryogenic development and replaced, thereby allowing the immediate biochemical and electromagnet environment to affect the development of the embryo. We also know that the windows of time for activation of various biochemicals are extremely narrow and they can be affected by a wide ranged of things, chemical, hormonal and behavioral.

Thus through epigenetics, life as we know it, has a way of keeping track of the experiences of each generation and passing some component of that (often in terms of a readiness to respond in certain ways to environmental stimuli) to the offspring. Life is not about simply selecting the fittest in every new generation. It is about passing on a readiness to its offspring to respond in certain ways. As the environment is constantly in flux, that readiness also constantly changes. Life is affecting the evolution life all over the planet in a constant give and take that varies from generation to generation. And at least amongst those species who have become learners par excellence - the particular experiences that those individuals encounter - triggers the production of genetic markers that themselves have the power to determine which genes are accessed as well as the conditions under which those genes are accessed.

Reproduction is thus as much about the organism preparing the next generation for what they are likely to encounter as it is about passing on the 'best genes.' In fact, it is beginning to look like the DNA is more or less a giant tool kit of building blocks. Some of which are needed at one moment in the life of an organism or a given cell within that organism, but not at another. And many of which may not be needed at all during the lifetime of the offspring, but are carried forward to other generations just the same.

Each set of DNA may well hold information, in terms of markers, about the entire history of the organism. It may be that the organism inherits a wealth of sensitivities and options that have the ability to enable it to change both its anatomy and behavior to adapt to different conditions. The priming of the physical system per se can come about in the form of sensitives to certain sounds, patterns of sound, movements, rhythmic patterns of movement, lines, orientations of lines, etc. It can also come about by experiences from past interactions with the mother that primed her attention orienting system. Thus if one comes into a world where the mother lives in trees and one could fall from the mother every moment, one can only attend to holding on. It would be good to have one's attention prepared to orient toward a fear of falling…which human infants do not develop until they are able to crawl, but which apes must have from birth. If one is not in constant fear of falling, one can then orient one's attention to what the mother is doing and begin to map her behavior, at a time when the differentiation between the body of the child and the body of the mother is only just beginning. If an infant ape learns though it interactions with human beings that it has no need to fear falling because it is supported and loved, then it to can begin to learn from observing those beings instead of clinging to them,

In species such as apes and humans, who have become learners *par excellence*, it is culturally created conditions to which they must respond, not conditions of nature which may requires something like a longer or shorter beak. Thus Darwinian selection has morphed silently into something very different from "natural selection." And the transmission of information from one generation to another is taking place by mechanisms not envisioned by Darwin, by mechanisms not envisioned in biology even 20 years ago. Theory has not yet caught up with fact.

The view of one gene, one protein - with each protein determining development in a specific manner is no longer viable. There are not enough proteins in the human genome to account for what we view as our "specialness" nor that which separates from apes which we have long thought of as part of the animal kingdom. We apparently are not our genes, at least we not our genes if we are looking for particular proteins to explain our behavior propensities. This does not mean that absence of certain gene or protein in our body cannot produce extreme problems. Clearly this can happen, but is it not the explanation for why most things take place in a living organism.

It is our behavior that defines our existence and our human uniqueness. Our human behaviors are acquired, or least that is how science views them and it is what so many have dedicated their efforts to explain [13,15,16,18,37]. And without exception, ALL of the previous efforts to explain the rise of human behavior assume that ape are lessor versions of ourselves who have changed little in 4 million years. None have seriously entertained the idea that apes have been evolving as well and have developed nonmaterial cognitive skills and social structures that elude our ways of thinking and classifying our own behavior. Without exception, ALL previous efforts to explain the rise of human behavior have built their case on the weakest of facts regarding wild chimpanzees, facts collected in a manner that no anthropologist would find acceptable for exploration of a previously uncontested human culture. And we have repeatedly employed laboratory and zoo apes - reared under conditions of stress and deprivation- as our comparison population with no regard for the massive body of data demonstrating that stress and maternal deprivation produce abnormal behavior in primates [41-46].

Instead of attending to the effects of laboratory rearing on the cognitive comparisons between ourself and apes, we constantly reaffirm we are the wise species, the one capable of learning and altering our behavior. Yet our eminent scientists fail to equate what they know to be the key development variables in both apes and humans.

By contrast with apes, we have a body that is not particularly adept. It is easier for us to get and to metastasize cancerous tumors than it is for them. Indeed, chimpanzee tumors don't metastasize. We lack the genetic variability that apes possess, having gone through some kind of bottleneck that reduced our numbers approximately 70,000 years ago [47]. There are large segments of our population that can be traced to a few male ancestors ancestor who apparently had many wives and it is currently thought that our last common ancestor with apes arose perhaps 3 mya, but that we can all trace our current degree of human relatedness to set of common ancestors from around the world to 300,000 years ago. Instead of increasing our genetic variability, we have tended to hold it constant. This is surprising since we have developed so many different ways of living. Thus each generation is compilation of genetics, genetic

markers and the behaviors of its parents and its culture. And genes are not what we thought they were. A very small percentage of them (approximately 2%) do produce proteins, but the one gene one protein model no longer exists. The same gene can produce different proteins. And the timing of the gene's expression of the protein varies throughout development and adulthood - determined by factors beyond the gene itself. These factors can be other noncoding stretches of DNA, chaperones, the thermodynamic environment, the electromagnetic field, light, experiences of the parent, etc. And to make matters more complex proteins themselves can switch from one folded structure to another quickly. And their structure determines the kind of receptors to which they can bind. Some proteins are managed by "chaperones" which tell them how to fold. We still know relatively little about the structure, function and folding of membrane proteins. We also know very little about the ensembles and functions of intrinsically disordered proteins, even though nearly half of all eukaryotic proteins contain large large disordered regions. The body is primed for flexibility.

If, during development, a particular "gene" is selected, this may or may not tell us much of anything about the person carrying that gene. Other genes can express the same proteins. These proteins may fold the same way or different ways. A single gene can have a wide range of effects. These can differ because each gene can also interact with many different genes, how it does so determines what it produces and when. Thus the idea that selection can act on any one gene and select for a particular trait or behavior, is not wrong, but it simply is not the case most of the time.

Each organism does contribute half of some component of its genes to the next generation. But the genes it contributes to one child can different dramatically from those it contributes to the next child. Thus the fact that two parents have survived and are passing on a portion of their genes - does not mean they are passing on genes that were successful. They could be passing on genes that led to problems in the past, but don't do so when they are combined with other genes in new ways. Or they may be passing on genes whose function is overridden by epigenetic markers. Or they may be passing on "bad genes." The idea that all of this somehow balances out in the end because:

a) those who don't have sufficiently good genes to survive or reproduce fail to pass their genes on,

b) those who do pass them on do so by randomly selecting which genes to provide to their offspring,

c) thus those genes that are passed on undergo random shuffling and eventually, across time, on the "good genes" raise to the top,

becomes increasingly difficult to maintain as general explanatory mechanism for what has already been documented to occur in the past 20 years. It is not that the things above cannot happen. They can and do. It is rather that these assumption are longer an adequate theoretical explanation what is taking place most of the time.

We actually don't know that genes are shuffled *randomly*. We only know that it seems random, but without sequencing thousands of sperm and all of the fertilized eggs we cannot know this. We don't presume any other key and important process in the body to be random, so it is odd that we should presume that the selection of genes is random, simply because we have no means of predicting the selection process at this time. We do know that the attachment of epigenetic markers to the genome is not random. If this process, which is equally important (if not more so to the survival of the next generation) is not random, why should the genes themselves be randomly distributed? And recently it has been found that genes have jumped between species or have been horizontally transmitted by some yet not understand method, perhaps insects. This mechanism is present in all species and causes areas of genetic commonality between species that are not otherwise related by genetic standards. We don't know how the genes are guided to produce another body, but we do know that patterning of the enhancers and silencers affects the production of the body. The production of a body must be a tightly controlled event or the offspring will not survive. The complexity of the instruction system for making even the simplest of bodies is currently beyond our ability to compute, if we accept the current linear limited causal models of behavior and development, in which each sequence in a causal chain of biochemical events sets up the next biochemical event. The use of the concept of "innateness" to explain all animal behavior, but no human behavior [48] simply has to be incorrect, because bodies can't possibly work that way if they have very similar genomes. Since multiple genes can make multiple proteins, those genes which should rise to the top are the ones with greatest flexibility and functionality. This seems to be the trend since those organisms that have the less ability to learn and change, tend have larger genomes, such as the cockroach which has the second largest insect genome [49].

And no matter what the genes may tend toward, the markers that get attached to them can change their function. Thus the mechanism of transference is not biased toward the genes that were successful; it is biased toward giving the offspring information of some sort about the environment it is likely to encounter and how to employe the genes that it is has. And that information is nontrivial in the extreme. Additionally this information is not subject to the process of selection as it normally understood. The conclusion that over sufficient time all of this balances out and selection still operates, it incorrect. It is not selection per se that is laying down the markers on the genome.

Let us take, for purposes of example, the fruit fly – with over are 400,000 enhancers and silencers [50]. These determine when genes are turned off and on during development. Each one may act many times during development and each time in a different pattern and in a different combination with others and with the genes. Determining what is going on by sequencing the gene expression activity in each cell on a moment basis is not really a feasible proposition. Even it this were known, determining what is guiding the pattern of activity would remain elusive. Humans have approximately 50 times more enhancers and silencers per gene than do fruit flies, *though we have about the same number of genes*. Enhancers and silencers operate on more than a single gene and each may turn a gene off or on thousands of times during embryogenesis in a complex pattern. When 400,000 or 400,000 x 50 of these work together to produce complex rapid patterns of protein activation and deactivation - an organism is produced. These markers do not undergo sexual selection. Similarly the mitochondria do not undergo sexual selection.

In a sense scientists are in the same position they in were before they discovered DNA as the master molecule of inheritance. The DNA passes along a recipe for constructing individual proteins, but the recipe for the organism itself - if it resides in the DNA is not easily located. As DNA sequencing techniques

became common, it was found to be filled with 'junk' - or with sequences of amino acids that do not code for proteins. It was initially assumed that they were "junk" that had managed to insert itself into the DNA solely to hitch a ride to the next generation,

Thus 98% of the genome may be controlling the 2% of the genome that codes for proteins complex ways - but there is no easy way to determine what it does, at least for now. Cells express proteins differently even though they all have the same genome. And while the expression of genes is therefore thought to determine the form and function of each cell, the expressed portions themselves can change their shape which determines which receptors they can match with. And it is we humans who pass on far more epigenetic markers than fruit flies even though we have about the same number of protein expressing genes and many of these genes are similar. We need a far greater capacity for learning, which appears to reside in a more plastic nervous system and a more plastic genome packaged together. Thus the basic "toolkit of biology" is conservative and the homeobox tool kit, the one which initiates development of the body segments, is even more conservative. Humans have employed this plasticity to develop a material culture and have, very rapidly, become entirely dependent up it. Should it not be sustainable, because humans are no longer evolving in co-ordination with the rest of the planet, large numbers of humans will die because of the functional fixedness which they have placed upon material culture.

If we define evolution as a form of co-ordinated change across time in a vast array of forms of life, the above factors suggest that evolution may actually be attempting to leave very little to chance. It could be giving each organism some very basic things, a specific bodily form and specific sensitivities that it predicts it will need. And because all forms are co-evolving at once, the process must be co-sensitive, since survival of given organism often depends on the presence of many others in any stable ecosystem [51-53]. And for those who depend on learning the most, it provides 50 times as many tweaks to the genome to guide the organism toward rapidly acquiring the skills is it going to need. Overall the evolutionary process seems to be providing a very flexible basic toolkit that it is able to program behavioral sensitivities and proclivities - in remarkable ways - across generations, depending upon the experiences of the previous generation.

It may well carry within it, a entire series of epigenetic markers that have helped the organisms to survive in the past, and that under changing conditions it can prepare to be activated. What we perceive as different species, such grizzly bears and polar bears, could really be just different expression of an underlying species plan that is differently activated in different circumstances. Dog, wolves and coyotes may represent the same thing. The different conditions can be behavioral, environmental, cultural or all three. This may be why, across time, species morph into larger smaller versions of themselves as elephants and mammoths have done. It may be why it is possible to produce hybrids between horses, zebras and donkey, nearly all members of the large cat family, between buffalo and cattle, between species of sharks, and many other organisms that share a similar genus, but not between members of different genus. It may also why the genetic data tells us that humans and chimpanzee continued to interbreed after the time at which we supposedly split apart. We also interbred with Neanderthals and Denisovans.

Tools to determine what each gene does and when are elusive, and we getting no better at this effort after 20 years of effort. Nonetheless, the patterns blinking off and on in complex arrays on a second by second basis, present a level complexity that defines the relatively simplistic Darwinian models of selection. Even if we know which genes are turned off and on on a second by second basis, we still will not understand how the orchestration of genes is taking place.

Something seems to guiding development in a way that cannot be reduced to the known process of protein expression. The fertilized cell is a complex array of parts. There are many interacting organelles which are passed along to the offspring, along with DNA. They produce products that interact with the DNA. Each cell is also an electrical entity and molecules within it react to the electrical fields within and around cell. These fields are difficult to measure and have thus been ignored as determiners of cell function. However new circuit boards that have the ability to move one molecule at a time, have now been created. The electrical components of a living cell are constantly active and have the capacity to orchestrate development if they were changing in a highly systematic manner, but so far nothing has been found within the DNA itself that would cause this to take place.

When a cell divides not only does the genetic material copy itself but the other organelles in the cell also copy themselves so that both cells have a full component of all organelles and are functional entities. Additionally the life force, which is electrical in nature, is extended and expanded such that there are two living cells, then four, then eight, then sixteen. These expansions are perfectly timed and coordinated within the cells. These group of cells soon begins to order itself from cephalic to caudill, in a manner that is not identified with a particular protein, an enzyme, a lipid, etc. Epigenetic markers can be added or removed at this stage in the formation of a new organism. We know some of the chemical agents responsible, but not what controls them.

Viewed in this way, the entire process of fertilization, embryogenesis, implantation and development begins to takes on a strong non Darwinian character. The ordering of a set of amino acids provides proteins. But these proteins do not create bodies nor life. They do not determine the organization of the body, though they do determine segmentations and the cephalic/caudill arrangement as the body follows the sequence of genes on the DNA that produce the Homeobox. But for the developmental pattern to manifest, something else must begin to act. And part of that process relies on the history and experiences of the parents -particularly the mother. It also relies, on the environment, the epigenes and the electrically balanced life force that is transmitted from the fertilized ovum.

It also depends upon constant communication between these parts. A kind of communication that cannot be electrically bootstrapped, but which nonetheless depends upon electronic currents generated by the life force organizing the electrical fields, currents, and chemicals within itself. There is no simple "electric charge" from which cells can be made to orchestrate themselves into development. Currents of electricity can be added to provoke division. If that were the case we could grow cell cultures from nonliving cells. We can keep living cells alive in a culture with a mixture of nutrients but we cannot take cells without the life force already extent, add electrical force and produce life.

If Darwinian selection is operating on enhancers and silencers, it is operating on bits of the genome that are intricately tied to many parts of the genome and that co-construct the organism. If Darwin selection is operating on the genes --- what the genes do is not determined by their presence but by their enhancers. This means that selecting for, or against, a particular gene, or enhancer is not the same thing as selecting for or against an particular shortening of the nose, lengthening of the legs, etc. When each trait is determined by multiple genes, enhancers, and silencers, all acting on multiple traits, exactly how is differential selection for a trait taking place? Selecting for a single enhancer or gene or silencer would affect many traits, many behavioral abilities and many development programs.

The reductionist approach to biological phenomenon also faces the challenge of the interconnectivity of the brain, the micro-biome and its changes on the genomic expression in the gut - which can be affected by the micro-biota of the gut itself. Thus our genome is not simply self-activated and controlled, nor it is activated and controlled by feedback loops from our body, it can also be activated and controlled by outside organisms that co-exist within us which can lead to global histone crotonylation in our colon [54]. In addition there are enzymes that activate chromatin in a genome wide manner, thereby affecting not only gene, or even a few genes, but the entire genome. This leads to a "dynamic view chromatin organization" [55]. Without increasingly powerful computers it would not be possible to even attempt to predict how any of these systems would perform in isolation, much less how they interact in real time in a living organism as simple as the fruit fly. Add to this the new discovery of horizontal gene transfer and it becomes clear that biology desperately needs new theoretical guiding models. Beyond such models, when we consider the value of attempts to model complexity mechanistically - at the cellular level - in a self-reflective being, that is, in a being who can think about the '*self' and thereby affect the operation of the body* - the mechanistic approach begins to appear impossibly far away from resolving problems such as cancer, Alzheimer's, or autism through gene therapy. Additionally in self-reflective beings the placebo effect is often as significant as drug, revealing that the mind contains the power to elicit a cascade of physical events not unlike those of chemical agents, electrical currents and photo optical devices.

The fact that dog breeders select a specific trait by mating two dogs who noses are shorter (for example) -- was the impetus behind Darwin's model. We now know that nearly all the major dog breeds have been created in the past 200 years, and -- they share nearly all of the same genes and many similar traits. In a very basic way, "dogness" is not changing even though developmental programs are turning off and on certain characteristics (such as length of legs, nose, etc) at different rates. What changes with «selective breeding» are the «dials on the knob» so to speak, but the knob, and what it controls, remain the same. It could argued that these controls that are being selected, if not the genes and that some aspects of dog breeds are passed along in the genes.

But the problem is two-fold, first it is *very difficult to identify dog breeds on the basis of nuclear* DNA as there is a high degree of variability in dog DNA, and second it is not only the desired traits that change with selection but many other associated traits well, many of which are not visible but which cause medical problems that come to be characteristic of the breed. This raises the question of how "natural selection" can possibly operate without the same kind of effect? It has been suggested that the huge degree of visible anatomical variability within dogs (which is greater than the variability across the entire Canid family) results from a relaxation of constraints because dogs are fed and sustained by humans. However a remarkable degree of variability also exists in the ancestral wolf population and it is difficult to separate wolves from dogs on the basis of nuclear DNA. It seems clear then, that within 200 years remarkable bodily changes can be produced in dogs *without correspondingly large and obvious changes in the nuclear DNA.* These suggests that selection (this case selection by humans for visible traits) is not having the predicted effect at the genomic level.

In order to study this researchers have looked at the maternal DNA (the only DNA active prior to implantation of the fetus in the lining of the womb.) It is assumed that deleterious mutations increase more rapidly whenever constraints on a species are reduced, thereby providing more variability in the genome but conversely less variability in the phenotype. Of additional importance is the fact that while it is difficult to separate wolf and dog linages for nuclear DNA, the mitochondrial lineages are clearly distinguishable. Additionally studies of "human mitochondrial DNA have shown the selection may have shaped the pattern of variability observed today.

These tests showed no variation in the mtDNA mutation rate between dogs and wolves and no variation in the CN or number of sequences that have been copied. Moreover dogs did not have a tendency to accumulate more radical or damaging changes that wolves. The authors suggest that this because radical or damaging changes are not passed on in either group. However the fact that "selectivity" for survival is greatly lessoned in dogs compared to wolves, would predict the opposite effect. And the literature is replete with the "defects" in modern dogs that supposedly result from inbreeding. It appears that wolves underwent a "bottleneck" effect which greatly reduced their genetic variability shortly after they separated from dogs. It is tempting to speculate that we humans had a hand in this, in a effort to keep "domesticated canids" from breeding back with wild canids. Additionally the fact that the changes between dogs and wolves, as well as between different varieties of humans, show up in the mitochondrial DNA in a clear manner, rather than in the nuclear DNA, suggests that something about what the mother is, does, or experiences in her lifetime is being passed down to her offspring in both wolves and dogs - as well as in human beings [56], and possibly in many mammals. As evolution moves toward a greater dependency or rapid learning, it is reasonable that mammalian mothering would assume a more prominent role in the survival of the organism (Also to the degree that patterns of maternal care overlap, different mammalian species will be become increasingly to understand the behaviors of intentions of one another, and to develop means of co-operation).

This does not mean that there are no corresponding changes in the nuclear DNA, only that they are difficult to locate and none have been found. However, in dogs, wolves and humans whatever the male contributes via the "fitness" of his genes, has to pass through the selective sieve of pregnancy and maternal care. If the infants do not receive the required care during this period their potential does not matter. Thus what we recognize as visible variability and what we find encoded as genetic variability can both be located in the mtDNA where the changes seem to take place first. Survival of the genes in the mtDNA is

not a population parameter, but an individual parameter since each female's genes are either passed on or they aren't.

Thus the observable differences that have arisen in dogs - but not wolves - during the past 200 years, are associated with human selection in the case of dogs. However mtDNA has changed in both. And because it is not the case that mtDNA mutations in dogs, are more deleterious than those for wolves, it cannot be assumed that human selection for specific traits is affecting the way mtDNA follows models of population drift and random mutation. Epigenetic changes accumulated during the lifetime of the mother can affect gene expression in the offspring and they are not due to random drift. And mtDNA can affect methylation or the epigenetic markers on DNA. To the degree that maternal genome determines which genes in the paternal genome are expressed or not expressed, the traditional models of Darwinian selection are clearly affected.

The maternal genome is not acting on the paternal genome via features of 'genetic selection' inherited from her parents, but rather according to life experiences and environmental factors that have occurred during her lifetime. Thus the action of her mtDNA on development means that each organism is, in a way, a culmination of its mtDNA, its nuclear DNA, its experiences, and the effects that these experiences have left upon its DNA [57]. Since a great deal of DNA that is not being used in its particular lifetime, is still being carried forward, evolution appears to be building, across time, a genome plus a group of markers telling it how to operate under a vast array of conditions many of which may not be extant today, and so those areas of the genome appear to have no function.

Since (in mammals) the number of eggs is set early in life and stored in an undeveloped state, eggs have the potential to accumulate some record of these changes. The sperm, by contrast are manufactured anew each day, and may be sensitive to the experiences and environmental changes that are in effect at the moment of their creation. They contain epigenetic markers which apparently can be overridden my mtDNA. Thus the value in sexual reproduction - something still not well explained - could readily lie in the differential manner that the sperm and egg are able to encode life's events and needs into the activation of the genome for the next generation. Eggs are able to record changes over the lifetime of the organism while sperm are able to record immediate kinds of things, those that will most likely remain present in the physical and cultural environment when the baby is born.

It is of course, self-evident that individuals who do not reproduce do not pass on their particular genes, but it is not self-evident that they do not, though interactions with others, pass on anything that could not be epigenetically encoded into the genome of others. Indeed, they pass on many things that are epigenetically encoded. It is also not self-evident that there are no means of passing on sensitives of behavior from one generation to other by some other means of cellular or extra-cellular transmission. The difficulty with Darwinian theory is not that it focuses on selection per se, but:

a) that selection is smeared across many things

b) that selection is dependent upon gene expression

c) that genes code for many proteins and there are many patterns of protein expression

d) that single physical characteristics (such as intelligence) do not associate readily with genetic variation

e) that the great number of disease based associations with DNA or epigenetic markers are based on correlation, and nothing else. Yet they are presented to the public as causal factors, because they raises money for future studies, to find the genetic "cause of X".

When the entire genome of 1000s of individuals was reviewed, many individuals are found with supposedly deleterious genes or markers on those genes - but these individuals were perfectly healthy [58]. Thus the entire practice of taking diseased individuals and looking for genes that are correlated with the disease is a skeptical practice. As the proponents of these models know - as correlation is not causation. The correlation genes may have *something* to do with the disease, but we do not know what. In a similar way, AI programs find linked events and use them in models to make predictions about successful program outcomes. However the actual causal effects predicted by some programs - we find - cannot be the real cause. What works - in the sense of probability may be unrelated to cause. Yet causal models are required for Darwinian theory to be of real predictive value in our modern world and they don't exist. Both in medicine and computer science we are increasingly looking to "predictability" in computer based AI models to solve problems for us. These models - without causal understanding - can only be good as the data they are allowed to process, and since we employing them because we lack a causal understanding of certain phenomena to be begin, we can always leave out important data.

Rather than random genetic drift - what appears to be actually taking place is that each generation is attempting to ensure that its offspring survive by passing onto them some prepotent mechanisms for dealing with the future they are likely to encounter. And many of these mechanisms like sickle cycle cell anemia, have a double edged sword. They buy one thing at the expense of compromising others. This is not the kind of process Darwin envisioned when he first applied what he saw as the variation in dogs to the panorama of life. These 19th century views are holding modern biology back because so much of what is being found is being crammed into model that allows only for an 'after the fact' explanation, and an explanation that views genetic variability as random rather than causal. The vast array of genetic information is being used at present to divine times of divergence, but those dates can all be thrown off by any significant degree of cross-breeding between two different linages. And unless a very large number of individuals are sequenced (1000 or more), it is very difficult to determine any kind of population level events with precision. The data analysis techniques make it seem that this is possible, for example by looking at CNV, because the number of CNV's may vary greatly within a population as well as between populations.

The idea that we can resolve the questions of speciation, embryogenesis and find easy "genetic cures" with DNA is becoming, without much fanfare, increasingly remote. While there are some diseases and a few physical traits that can be linked to a gene; there are no genes that provide for the specific abilities we attribute to "humanness," in the way that blue eyes or brown eyes can be traced to particular genes [59]. Small changes in the amino acids of one gene (FOXP2) does lead to a more fluent capacity to produce vocal sounds, but this gene alone cannot account for language - because this gene operates in a similar way in many species. It is unrelated to the cognitive

aspects of language, if affects only for the fluent production of sound - essentially it release the constraint on sound production prevalent in many animals [60].

Humans, by adopting large groups and base camps began to provide the cultural conditions under which the pressure to limit vocalization to specific situations, could be released. Infants who cried were no longer likely to predators quickly to the scene. Infants who babbled also were no longer likely to bring predators quickly to draw the attention of predators. Vocal sound became ubiquitous in human villages as did fire. Thus babies in villages could cry and babble away with no risk of being consumed. The production of sound per se was not something that resulted in a rapid proliferation through out the population. Instead, the proliferation of sound coupled with the village way of life, allowed sounds to become are more complex expressions of thought and the expressions themselves began to have feedback on the thought. The nature of inter-individual inter-actions changed, as more expression of thought became employed to establish expected behavioral patterns. The lifting of the constraints on the production of vocal sound also came with an increased prevalence of certain diseases but overall, the ability to produce sound freely must have had a huge impact on the development of human language.

Developmental genes tend to operate as interconnected sets (sometimes called the "homeobox") that regulate broad patterns of change throughout the body. For such a group, timing is everything. Thus these genes are"conserved,"(not selected against) because they are a method for building many different bodily types and associated behaviors with a similar basic plan. This renders the sorting out of "humanness as determined by genes" an inevitably an increasingly complicated affair [61], though an very active endeavor. It is now being replaced by studies of the patterns of protein activation during development, since it is known that protein activation can affect the homeobox leading to altered morphology.

Thus we find that genes function more like a "tool kit," or a group of building blocks whose function is to provide many of the elements needed to construct a body, but the tool kit lacks the complete "code" required to precisely and completely assemble that body [32].

Two percent of the human genome actually codes for proteins. The rest of genome is transcribed, but it contains RNA that is noncoding and that can be transposed back into the genome near genes, either damaging them or adding new functions to them. There are more than 1 million copies of these pieces of RNA that tend to jump around, in less than predictable ways. Given that these pieces of RNA move around in unpredictable patterns and have unpredictable effects, and that there are so many of them, we might ask — is the genome sufficiently stable for selection to operate in the manner currently conceived? Or does the genome hold some parts very stable and does it encode environmental and behavioral events from the lives of parents, grandparents, etc. in a way that passes along certain sensitives - not by selection - but by adding them as "gene flags.

Some parts of the body do seem to self-assemble according to DNA. Each organism gets its initial basic body segments from the physical order of the genes in the home box. But then the developing organism begins to *receive input from parts of the body part that has already been constructed, or that is in the process of self-construction* During development, the "primary neural induction" of the first neural fold is from the dorsal lip of the blastopore. However the source of this induction is unclear and thought to be generated by a "wave" that spreads through the tissue. Gradients induce the development of additional neurons and guide them to their destination. The expressions of gradients are due to genes, but the mechanism underlying the precise dispersion of the gradients is not clear, and is not unrelated to the body and the electrical fields that are induced by the body, and the weak electrical fields in which all bodies reside.

Thus the instructions for what to build arise from 'gradients' or concentrations of certain chemicals whose distribution is guided throughout the development of the organism by mechanisms not yet understood, but which incorporate extracellular guidance cues. The weather, the altitude, the population, the socio-cultural development and behavior patterns of the group all can potentially affect how the DNA tool kit functions during development following birth. *Additionally spontaneous - "self-generated" wave activity can propagate throughout a developing neural system such as the retina*. This activity carries patterned information capable of guiding the activity-dependent development of complex intra- and inter- hemispheric circuits before the onset of vision, but we do not know how it becomes self-generated.

But it can be said that the brain is able to "develop itself" through spontaneous generation and propagation of wave-like electrical patterns. Not understanding the causal factors involved in the "spontaneous generation" of these patterns, we are in similar position as we are in not understanding the spontaneous generation of the heart beat. We can specify what is required for these spontaneous electrical processes to occur in the body, but that is not same as knowing what actually generates them, perpetuates them and controls them. Whatever the ultimate cause, we can be sure that it is reacting to factors external to the group of cells as well as internal factors within the cells. The organism is constantly adjusting to its surround either by behavioral means, biochemical means, and/or some form of bio-electric means. These micro adjustments are taking place every moment and the capacity to consciously reflect - can affect them, in human beings.

It is not often stated that not only DNA and organelles are passed from the parents, but "life" that is passed on from the living egg. Indeed all factors of the cell beyond the DNA arise only through the contribution of the mother (the cell wall, it organelles, etc.) who gives, along with so many other things "life" to the cells that they might divide into another being. When the egg cell divides - everything that is doubled, apart from the DNA, is based on the mother's contribution. We do not know what life is or how to "find" it, so the effects of it are studied in detail but the process itself remains mysterious to modern science. And because of that, is not often mentioned though everything else that is studied under the rubric of biological processes, depends upon life.

During early embryogenesis, it is the mother's RNA, the life in her egg, the cell membrane of the egg and the egg cells spatial configuration that begins the process of division. DNA from the father do not affect the process of embryological development until after the cell has implanted in the womb. The many organelles, mitochondria and all other cell components come from the mother during these original divisions and all following divisions. Thus each offspring receives both greater component cellular products, it's cell members, and its electrical activity of the flow of the life force from the mother.

It is often stated that complex life requires a constant mixing of DNA from two different sources to promote diversity and thus sexual differentiation arose to promote this. However bacteria are able to promote genetic diversity by horizontal transfer. And there are organisms who gain the ability to clone themselves and are then so successful that they rapidly became an invasive species. There are many theories as to why sexual reproduction is necessary (novel genotypes, increases resistance to parasites, deleterious mutation clearance, DNA repair, etc), however none are completely satisfactory. Also none of theses theories deal with why sexuality becomes associated with - in-most species - two different body types. Technically speaking, any of the reason's offered above for the evolution of sexuality could have worked just as well with one body type. Why two? And why - when there are two, do different individuals of one body type begin to diverge with their own set of behaviors peculiar to their body type? In some cases the sexual divergence is so extensive that it is difficult to recognize that members with different body types are actually all one species.

As massive whole genome sequencing proceeds for humans and other species, a far better understanding of what DNA is doing will arise. Rapid whole gene sequencing has already allowed researchers to look at the alleles that parents pass onto the offspring and those they don't. Much to their surprise alleles that are not passed on still *correlate very highly with certain behaviors or conditions found with the child, as though they had received those alleles*. This took place for some things thought to be influenced by parental environment, such as level of educational attainment, but also things presumed to be influenced only genes, such as growth, health, height, weight, body mass index, use of glucose and fat metabolism and the number of cigarettes smoked. This finding cannot be neatly packaged into a Darwinian model and suggests that we are overlooking mechanisms of transmission that are environmentally based but may be interacting with the genome and the processes of organelles that we have not heretofore considered.

We also know that the variability between the reference genome and any particular individual can be quite high even though, as a whole, the variability within the entire human population is low. For example the sequencing of Watson's DNA produced 3.3 million SNP's that did not match the reference DNA and 1.4 million SNP's that could not be matched at all.

The process of information transmission across generations is far from the simple inheritance picture biology has always envisioned since Darwin. Thus biologists are now turning to massive data bases which are storing ever increasing amounts of data about the genome, the micro-biome, and the connecttome.

What can be learned from any one individual's genome, biome and connecttome is sufficiently complex to take decades to sort out. And that individual will differ in many ways from other individuals. Additionally, if a developing mouse neuro-system is exposed to human bone marrow cells, the mouse brain guides that tissue to service the mouse brain, even though the DNA within those cells remains human DNA.

How could the mouse brain possibly hijack human DNA to do its bidding if, inside the human DNA itself, were packed "all" the instructions needed to make a human-being -- and inside the mouse DNA were all the instructions needed make (and operate) a mouse? If the instructions were only in the DNA, human cells could be "pluripotent" to become other human cells, but there would be nothing to tell them what to do in a mouse. However, once a "mouse brain is in the making" it appears able to take human DNA and use it for "mouse brain," just as a human brain would use it for "human brain," (as opposed to using it to make a heart, or a kidney, etc.). Thus the the fate of this newly created neural tissue is being determined by something outside itself, not by something inside itself.

Right now science is not looking for anything beyond DNA. It is a if science is explaining how the engine of car works without a driver. Cells must build and operate a body, but it is the neural system that is "telling" the body what to do. The neural system is taking in information from the environment, making decisions and measuring the results of those decisions. The neural system is also taking in the formation from the body itself and integrating the body with the surround, while storing some kind of information about both. Thus one might view neural systems, even primitive ones as the master controllers — but the nervous system - for the most part in all social mammals, is attempting to integrate the individual's interactions with others. It is especially doing that in our own species and in other primate species. And it our species it is doing that consciously because we have developed the capacity to be conscious of being conscious. We have a nervous system that is able to constantly and consciously contemplate the self, the body, the world, etc. And in so doing it is able to control its own attention and direct it where it wishes.

These simple facts raise the level of mechanistic determinism beyond that of the organism and what it inherits, to a different level, one in which it is clear that all information cannot be stored in the DNA. There is a level a level of inter-locking that is constantly taking place between the organism, everything around it, including the behavioral inter-actions between the organism and the events and the environment surrounding it. The DNA is something that this higher level of organization employs in a manner that is amazingly complex, and carefully orchestrated. Moreover it is able to use the same kind of coding system to build proteins and to do many other things -- the things that orchestrate the complex inter-cellular function of the body with itself and the body with its surround.

The idea that we are precisely the information located in our 20,000 to 25,000 genes is beginning to give way to the idea than we need our genes, but genes alone cannot be determining everything we become. Nor can selection be operating in the manner attributed to it since Darwin. When one set of genes (taken from a number of different people) is adopted as the 'reference standard' for the human genome, you (and everyone else will differ from that reference genome at by 3 to 5 million sites. Seventy-four million variants exist in the human population with a frequency of less than 5%. This means that if each of these variations correspond to a trait (or genetic function of some sort) which could be selected for, the odds of individuals with similar variants reproducing are quite low and in fact the study concludes that there is little evidence within the human population as it now stands of any kind of selective genetic sweep being underway.

Thus even though the overall variability in our genome is low by comparison with other species (suggesting a recent bottleneck) the variability which is present does not show much overlap. Of course any rapid significant reduction in the overall population size can greatly reduce the variability without selection. An event such as a flood or volcanic eruption would reduce the variability in all species.

But the bottlenecks encountered by Homo sapiensare not found in apes and are possibly the result of warfare, or agricultural famine resulting from warfare or other recent self-imposed limiting events. Why would a species impose upon itself, events that limit its reproductive potential? Darwinian theory does not tell us why, but allows us to bring forward after fact explanations. For example, it could be argued that wars allow the fittest humans to survive, thereby sorting out the weak amongst us. But there are many species that don't conduct internecine warfare and get along just fine. In fact such warfare is common only among chimpanzees and their closest living relatives, *Homo sapiens*, and *only Homo sapiens* we have invented tools to do this on a population wide basis. Thus it cannot be a requirement for dispensing with less fit individuals. But still we find this kind of Darwinian thought permeating much of the geopolitical modern world.

We do not suggest that Darwin's evolutionary theory *per se* is incorrect, but rather that modern science is leading to the inevitable conclusion that the Darwinian model of selection, with or without the 'modern synthesis' is fundamentally incomplete and non-predictive. It has allowed us to address biological questions that could never have been asked by those who accept creationism and the world.

Built as it was upon ideas prevalent in the 1800's, and the observation that breeders of dogs could "select for" given characteristics by mating two dogs with those characteristics again and again, it is now outmoded. Indeed, the selective breeding of dogs is only about two hundred years old, though domestication of dogs occurred approximately 10,000 years ago. In the past two hundred years the amount of variability breed into dogs using this technique is quite extraordinary. However no progress has been toward moving beyond dogness. More to the point however is that studies which attempt to look at the traits that appear to have a genetic component one finds things that were NOT selected for by those breeding the dogs; gestation length, litter size, still birth rate, cesarean section rate, These factors seem to associate with coat color, coat curliness, tameness and barchcycephaly, or traits that were selected for. The co-association between intentionally selected traits and basic reproductive parameters are obvious in some cases, such as head size, but less so in others. However it is noteworthy that with the exception of head size, which results in the need for a cesarean section, the different breeds of dogs are not closely aligned with distinctly different genomes. Thus it appears that something beyond the genome is acting. As is the case with the human genome, the presence of absence of gene more likely to associated with a certain condition, does not ensure, in many cases, that the condition will be present. The increased sequencing of dog and wolf genomes have not fallen in line with the prior hypothesis regarding the evolution of either group.

Humans and Apes -Where Does this Leave Us?

Because it is possible for some species to exist for long period of time without significant genetic drift poses difficulties for the genetic models that would determine the time that humans and apes split We simply don't know the rate at which our genes changed or the rate at which the genes of apes changed. Prior to 300,000 years ago there are no known human ancestral forms, but the DNA studies suggest inter-mixing with Denisovan and Neanderthal forms. Perhaps more puzzling is the fact There are also no ancestral apes - only ancestral Homo. Scientists suggest chimpanzee genes have changed very little since the separation from *Homo sapiens*, or for 4 to 6 million years. *Homo* meanwhile has inhabited remarkably different forms, forms that appear to have so called "primitive" characteristics appear, vanish and reappear. Thus our interpretation of the fossil record has been in state of constant flux, since Darwin first suggested that we evolved from an ape ancestor. Since we see human/ape characteristics morphing in and out across geological time it is quite possible that some of the fossils now assigned to ancestral humans were, in fact, ancestral apes - who became more like us across time.

Should we continue to find older and older populations of human and prehuman populations, as has been occurring regular for the past 2 decades, the interpretation of the fossil record will change again. Already the discover of the "hobbits," which appear strikingly human like, and are associated with tools and fire, but brains and bodies, 1/3 the size of our own, or the size of modern day apes, has raised many unanswered questions. The similarity between *Homo sapiens* and "hobbits," lies within the range of variation that can be observed in dogs today. As we look at all of these fossils, we do not know if we are seeing another version of ourselves or not [62]. But recent artistic renditions suggest that if we were to see a group of hobbits walking down the street dressed in jeans, t-shirts and tennis shoes, using Iphones and behaving like we behave, we would assume they were simply short people, maybe a bit odd looking but definitely like us. And we would feel certain they were 'us," if they dressed like us, employed technology like us, walked like us and spoke like. On the other hand if were to notice a being whose anatomy were very similar to own who spoke in a way that did not sound like language, who walked with a very peculiar gait, who eschewed all technology and whose dress was entirely different from any we would wear, we probably would not accord them any human rights.

Rather than think of the genome as being constructed of "bits" of things that we either need, or don't need, that are carried along on the DNA molecular chain, it is possible to conceive of the entire chain as containing instructions for how to interact with the environment under various conditions in order to build, maintain and reproduce a body or multiples bodies like itself. In looking at the process in this manner, bodies become repositories for streams of energy that inhabit different bodies across time. The noncoding DNA might code for a different type of body under different conditions, such as greater cold, larger number females and/or many other situations that a similar body has encountered across long spans of time. We know for example that under the current changing conditions where sea turtles are becoming fewer in umber, more female sea turtles are being produced. We know that polar bears are changing their diet and interbreeding with grizzly bears. Each species could have mechanisms encoded in the genome for rendering it more likely to develop, or not develop, and to engage in or not engage in certain types of behavior and/ or learning.

If so, in any given stable environment, it would need only a subset of its DNA, but to exist across much longer spans with lots of variation in the environment, it would require a greater variety of DNA. *The more any given individual is able to adapt to a new environment by changes through learned behavior, the less DNA it would require*. Thus a human being, who is able to employ acquired skills to adapt to a wide range of environments does not require much DNA and indeed we don't have many more genes that a fruit fly. We and other self-reflexive primates, such as apes may not require many coded instructions at all beyond, since one a species becomes symbolic and verbal -- the

behaviors that it needs can be passed on by a completely different means…language. Once that change takes place evolution can operate through language and consciousness alone. And it can operate by rendering the new organism differentially sensitive to certain kinds of environmental stimuli and thus rapidly prepared to acquire the behaviors of conspecifics to whom it is exposed.

Although we do not understand all the mechanisms involved, sensitivity to magnetic fields and their orientation, sensitivity to population density, sensitivity to chemical odors and substances as well as the gradients and densities of substances, sensitivities and allergies to certain foods, sensitivity to certain tones and patterns of tones, sensitivity to certain light rays and patterns of light, can all be programmed into organisms in a way that allows for rapid learning when an organism is exposed to conspecifics. In any given new environment the first level of adaption is going to be behavioral not biological. Therefore, it would be advantageous for offspring to more rapidly acquire the behavior needed than to go through all the steps the parents went through. But how could such changes be made?

It becomes easier to think about how this could take place when it is noted that although a given individual body stops functioning - its behaviors are carried on by a group of beings - conspecifics - and in their behaviors lies much knowledge to be transmitted to developing embryos around them. Thus the behaviors that once resided in that body stop but are carried on nonetheless. If a child has been sensitive to these behaviors and no others, it learns those behaviors very quickly upon seeing them presented once when he is engaged with another member of the species. Of course we can engage in slow prodding S-R acquisition as well, but most aspects of human culture are acquired during the first three years of life, and become practiced, intentional and deliberate with age.

Whether we think of wasps, fish, birds, dog, monkeys ape or humans - it is clear that each species comes with a prepared sensitivity to acquire the behavior that exists within and between the living individuals of that species. *For any new individual to successfully interact with other members of its own species it must inter-digitate its behavior with the behavior of others whose patterns*. It has time to acquire the patterns as it observes them, and/or hears them manifest by the next of kin. It does not need repeated exposure no trial and error when the attention is fully fixed upon a sequence of action. This can, in the case of some human children be song, which they can replay perfectly after hearing it only once. This can, the case of some apes, be the making of fire, after seeing this accomplished on television in a movie called “Quest for fire.” Such behaviors are not fixed within genes that code for proteins which then activate a neural circuit that was genetically mapped to provide for musical memory or to cause an ape to desire to acquire the capacity to build a fire. The events that drive behavior, desire, observational learning and language mapping are far more subtle than the fields of psychology and ethology have admitted.

As an individual being develops a sensory system that is attuned and sensitive to - the sights, sounds, smells, movement, patterns, etc. of its species is learning many of these things while the neural system is forming. Organisms have time to do this whether they are in the egg and in the uterus because the nervous system is developing in close proximity to other members of the species and is receiving sounds, chemical and electromagnetic input from them while it is being formed. The genes are interacting with these inputs as the nervous itself is being formed. And as the nervous system forms it creates far more neurons than it needs which are then pruned - presumably as function of use.

Thus do nervous system start with a plethora of options - behavioral possibilities for which the structure of the nervous system prepares the organism. By as that system is bombarded constantly with the sounds, sights, and electromagnetic fields generated by the life force within the bodies around it, it is pulled, literally molded in a sense, by the mechanical sounds, sights, forces and fields in which is is fully submerged. In the case of primates, who carry their babies as opposed to leaving them in burrow, a nest, the sand, or elsewhere. The opportunity to learn from the mother continues beyond birth in an intense constant manner. Only when we come to humans do we find mothers who do not carry infants, but instead invent objects in which infants can be pladdle placed. This results in a very early differentiation between the body of the self and the body of the mother coupled with very early eye gaze patterns directed toward the infant. It can also result in the infant being left safely alone for periods of time - an event that cannot take place in other primate species. As the mother is not in bodily contact, she often vocalizes to the infant. This sets up a pattern of vocal turn-taking that precedes spoken language.

Once the young organism has completed the developmental stage and begins to move, most movements are responded to by members of its own species. The shape of its body and that of its nervous system, as well as the connections that have already formed to prime it to react in certain ways to others. The learning that takes place can be rapid because the system is already primed and supersensitive to certain stimuli. In the case of young infant apes starting to move about on their on in captive environment with a wire cage just above their mothers, the infants clasped each other with feet and one hand, then moved about in this entangled manner with each holding onto the wire with one hand. This behavior pattern represented an extension of the clinging behavior directed to the mother, but adapted to the body of much smaller individual. Because they were intertwined they had to co-ordinate the action of the arms in moving about together. This became the initial preferred mode of location for all young infants in a group of six mothers and infants as they began to move about on their own in the Oklahoma Primate Colony. However, it was not innate, nor was it reported in other chimpanzees groups captive or free. It was a function of the particular style, hight and benched seating of the cages at the University of Oklahoma Primate Colony. Nonetheless it appeared quickly, without training and it characterized every infant in the group. It was not preceded by rocking or other indications of stress. The youngsters did not appear to be clinging to each other out of fright, but rather out of fun and because it was an extension of a kind of behavior they had already required. However in this case they did not support their weight by clinging to each other, but rather by clinging to the wire above them [63].

Thus do behavior patterns meld and morph into new ones both through observation and inter-individual inter-action. One of the infants in this group of six mothers began to walk bipedally far more than the others, in fact up until the age of two he nearly always walked bipedally. However his clinging pattern was also different than those of the other infants because his mother was sensitive to, and bothered by the clinging of his hands. She frequently pulled his hands lose when he clung and then supported his weight with her legs. She would

not have been able to do this if she were free and had to move constantly in the tress to locate food, but in this environment she was able to do so. When he began to locomote on his own, he was bipedal, just as are human infants who do not employ their hands or their feet to cling. The bonobo infant Teco, was born lacking a clinging reflex in his feet. When he began to walk, he also walked bipedally. Gau, a chimpanzee raised with a human sibling also began walking bipedally. In her case there were no quadrupedal models around her and the sturdy shoes she wore, not only gave her feet a very firm platform, they prevent ed her from using her divergent large toe for climbing. In a zoo in Mali, all three adult chimpanzees spend more time moving bipedally than quadrupedally, and when they do so, their gaits is characterized by straight lets and locked knees, rather than by the bowed legs and bent knees described elsewhere for common chimpanzee [64]. Thus it seems the change from a quadrupedal form of locomotion to a bipedal form can be affected by many factors.

It is a long way from locomotion to language but the same kinds of behavioral principles operate there as well, though they are less obvious. Additionally most language behavior has been studied as though it were the exclusive province of the individual. In reality, the main use of language is for dialogue and most all of one's oral language behavior takes place as a dialogue. Certainly language use is typically acquired through behavioral and verbal dialogues with others, although children and bonobos alike can acquire language skills by watching television and by interacting with an iPad [65].

Andrew Lock describes how these dialogues begin with humans during language acquisition in his beautifully written - but little studied book - *The Guided Reinvention of Language*. Here he explains first how simple glances and gestures between parent and child lead to the onset of intentional sound based communication and how that communication is guided toward what we call language by the process of interaction. He also describes differences in each mother-infant dyad which are likely replications of the way the mothers own communication system began with her mother when she was an infant.

Paul Thibault (speaks of a similar process) in a recent paper when he observes that:"Person's do not 'use' the forms that are said to constitute a pre-existing language system: they adapt and shape their bodily behavior, including their vocalizing in accordance with community-level norms and practices have historical continuity and thus define the cultural -historical traditions of a community. Individuals normatively orient to these continuities and self-reflexively engage in forms of situated appropriation of them as they flexibly adapt them to the requirements of situations in the pursuance of their goals…Infants don't acquire language, they adapt their brains and bodies to the languaging activity that surrounds them. In doing so, they participate in cultural worlds and learn that they get things done with others in accordance with culturally promoted norms and values."

With the emergence of language, be it in child or ape, one takes the very first step toward acquiring a system of thought and communication that allows one to increasingly step out of the consciousness of the here and now, and the need to respond to the here and now. One remains conscious of the here and now as one steps out of it and through the vehicle of language reflects back upon it [66]. And as one becomes able to do one begins to master the self, to manage the self and to use the language/consciousness tool to contemplate consciousness in all its dimension. One then begins to realize that consciousness of being conscious has the potential to allow one conscious control over attentional processes and even over biological processes that otherwise proceed along their causal path without much attention from the mind. One inevitably then begins to speculate on the properties of mind. It is clear that apes have the capacity to step our of the self and to contemplate the self [67].

From that beginning where have apes taken their nonmaterial cultures and their special processes of perception? We do not yet know, we have only begun to glimpse the real "inner" libes of apes. However what is clear is that the mind does have the power to affect the epigenetic processes within the body as do the experiences of the body. For a mind that is conscious of being conscious is the ultimate experience of embodiment and perhaps the singularity of experience for which all previous phases of evolution have prepared both ourselves and apes.

Addendum I

The original research trajectory was altered with the move to Iowa. The funding from NICHD did not transfer to Iowa because the purpose and function of the Great Ape Trust - which was initially to continue the research - became clouded when researchers from the National Zoo joined the organization.

The orangutans were presented as sharing the competencies of the bonobos in the public relations material, and NICH indicated that it was unclear whether the organization would continue to focus on research or become a zoo. The orangutans did not employ symbols for purposes of communication. Instead researchers focus on match-to-sample tasks and conditioned discrimination tasks, perfused with world labels, as Premack had done. They objected to the bonobos stone tool manufacture, music and art, and to their communications with visitors. All of these became prohibited.

They also objected to the development of area for forest travel similar to the 200 areas which was dedicated to this in Atlanta. Further objections were made to any attempts to continue any research which entailed travel in the forest. Forest travel was the paradigm around which language was constructed in order to provide a lifestyle similar to what the bonobos would experience in the wild. Also forest travel offered daily opportunities for comments on new things that were observed. The forest, although inside Atlanta, was connected for long distances to other forest by a riverine valley. Panthers, bears, raccoons, many species of birds, rabbits and other animals were regularly seen in the forest. These animals did not attack the bonobos. They also opposed the Smithsonian exhibit which described the language research with the bonobos, demanding equal representation in the exhibit. Their objections caused administrative curtailment of the bonobo's research trajectory D with the assurance and kinds of grants proposal requested. Additionally, graduate students and staff assigned to the orangutan team requested to cross-work in the bonobos facility. They complained that the protocols for the research effort did not follow standard AZA protocols — which were designed for zoo.

When a publication reported the bonobos had commented on the kinds of things that apes needed in captive environments, the orangutan team began to objected to the presence of the bonobos period and sought to have them transferred to Zoo Atlanta in exchange for gorillas. Some bonobo research was permitted to continue, but it had to be done by graduate

students were were part of the orangutan team, or by those who were opposed the original trajectory. No grant applications were allowed to go forward to federal agencies. The Atlanta Zoo demanded that the bonobos be removed and brought to the zoo and it claimed ownership of them. A court battle to determine ownership rights of the bonobos ensued.

Essentially the problem was one of jealously caused by competition for funds and control of the facility. The governing board, composed of local business persons and the Public Relations Director believed that the two projects should be treated equally at all times. The only bonobo research allowed was that which followed paradigms employed which did not involve any direct communication with the apes themselves. A central problem in the study ape language is that once apes become able to speak their input MUST necessarily be allotted validation and it begins to affect the research in a directional manner. The orangutan teach charged that this invalidated all animal protocols - none of were (or could be) put in place by animals. All had to be put in place by persons.

Technicians, who were AZA trained, refused to learn lexigrams or to employ them with the bonobos in conversations. They would “test” them for the recall of lexigrams and occasionally agreed to a request, but only if it fit the protocol standards. Thus language lost “value” because communication did not take place in a free and natural environment when shared information was valued and were negotiation was normal.

The technician sought to terminate the research trajectory in order to conform with AZA standards of animal care. These standards do not allow apes to make any decisions on their own, to produce stone tools, make fire, talk to visitors, or travel in the forest. . All of these activities are considered to be “non-natural” behaviors for apes. AZA protocol seek to avoid in apes any appearance of human activity. They seek to promote what they consider to be “natural displays” - which look life forest and “natural apes” who forage in the fake forest.

Surprisingly, during this period of time the bonobos comprehension of language expanded dramatically as did their keyboard use, However these became restricted to times when the technicians - who actively discouraged the use of the keyboard - were absent. Having left the relatively protected forest of Georgia State University, the bonobos saw quickly that there were new people in their world who did not approve of language being used by apes, in fact who actively disinterested its use by apes. There were also persons on the security force just outside that carried guns with order to shoot them should they appear to do anything dangerous. There were visitors who were allowed in the building in large numbers who had never heard of bonobos and who were offended by any sexual activity among them. There were persons who actively interfered with the functioning of their electronic keyboards -none of these things never took place in Atlanta.

The bonobos underwent a sobering realization that they were not the center of attention and that those who had raised them and brought them to Iowa were over-rules and had to determine what kinds of events could take place. They responded by caring about these persons and bu attempting to help them. They became able to understand more complex television programs and sought to watch programs that discussed various perspectives on the differences between humans and apes. They began to consciously try to project information about their abilities when the PR department brought news crews forward.

They actively monitored the differences in opinion amongst those in the laboratory who could and did continue to actively employ English and the keyboard to communicate with them - and those who elected to treat them as unable to engage in other than simple one word requests, and as though they were eternally two years old.. These internal difference in the views of the basic intelligence and capabilities of apes had not existed at the University of Georgia.

Thus did the combining of an internationally known research team with a zoological team, whose goal was to provide entertainment visitors, cause friction. Thus did the zoo team seek to move the bonobos to Zoo Atlanta and to replace them with gorillas. They said that gorillas would be more attractive to visitors, because of their size and lack of sexual swelling. The fact the bonobos’ language capacity was expanding was of no interest to them, it was in fact a thorn in their side as they were not interested in the field of ape language. They were interested in gate and visitors. The bonobos genitalia was always a concern to visitors and they felt that gorillas would make a more appropriate exhibit.

The research trajectory came under additional stress when 5 feet of toxic water completely inundated the facility, within a few hours. For weeks afterward it remained, receding slowly. Shortly after the flood both Nathan Woman and Liz Pugh developed cancer. Panbanisha Wamba developed genital lesions. She later conceived an infant though the staff supervisor had her on a program of birth control. The infant was still born, which was very hard on her, as the had previously lost her other son, Nathan not long after the flood.

The flood led to the benefactor, Mr. Townsend, withdrawing financial support. The bonobos originally were relocated to Iowa because of promise of funding for life. However the Army Corp of Engineers indicated that flooding could take place again and that no further buildings could be constructed on the grounds. The floods and remaining toxic waters made it difficult to see how the original lifestyle of daily travel outdoors could continue in a reliable manner. Then Mr. Townsend withdrew all funding, as he saw no means of making money from the facility if additional ape buildings could not be constructed and additional apes species brought to Iowa, in order to build an ape zoo.

As Mr. Townsend withdrew funding, many of the security staff, graduate students, and research technicians who had worked mostly with the orangutans became upset at the loss of their positions. The graduate students had intended to take charge of the facility upon graduation. They intended that the authors of this paper leave before they graduated, and that they direct the facility. They began making up complaints about these parties and to threaten to take their complaints public because they understood how this wedge of fear could be used to have others removed by the board, who feared any negative publicity.

They succeeded in removing the director of the orangutan project by employing this method. Following his termination of board was very concerned about any additional complaints - because of the bad PR it would generate - regardless of whether it was true or not. And bad PR meant the board would difficulty raising funds. Those students and staff who desired to have the facility transferred to them therefore again raised false complaints, this time against those who had raised the bonobos and

brought them to Iowa. While the published complaints were directed at the first author, there were constant complaints also directed toward the second author and anyone who regularly employed the lexigrams, worked in direct contact with the bonobos and whom the bonobos loved and treated with great respect and dignity. The IPLS board (which took charge of the facility when Mr. Townsend stepped down) revised these charges twice and found them without merit. This board was then expended to include

scientists, conservationists and others who had worked with the bonobos. It took charge of the facility sought to continue and expand the language research trajectory following Mr. Townshend's termination of fund. This board was charged with looking after the future of the bonobos, including their health and well-being the operation of the facility and the overall nature of the research. The board began to slowly reinstate the research trajectory with the work of the first and second author, who received no funds.

This attempt so angered the former staff and students that they took their former complaints, which had previously been dismissed by the Iowa Primate Learning Sanctuary Board, to the press and demanded, for the third time, the removal of the first author. They indicated that they had saved their "work uniforms" and would return to the center as soon as all persons who had direct contact with the bonobos and and who had raised them from birth were removed. They wanted to operate the facility and use the bonobos for testing, but they did not want to continue the research trajectory.

They sought public support for their complaints previous director, under whom they worked at the time. They did not receive any administrative support for their claims from him. The new BHI board undertook a lengthy study of all complaints, and video-taped interviews with these persons, and compared their statements against lab records. They also understood extensive interviews of the current staff. They found no complaint that could verified. They fond that many of the bonobos 12 has not actually worked with bonobos and only echoed things they heard others say. They found most were were unable to answer any questions about the research which they opposed. They knew nothing of its history and were unaware of the publications that the research had produced. They simply opposed the research based on what others in the group has told them. The board issued a detailed report which found the complaints unverified and the current staff strongly in support of the first author and the continuation of the research.

Then the BHI sought to expand the work by inquiring of Dr. Hopkins and Dr. Taglialatela as to whether they would like to assist in they endeavor. They indicated that they wished to do so. The board, believing that they had expressed their true intent extended them an invitation to so do. However, the wording of the resolution rmakng this offer - as written by them - contained legal terminology that they claimed allowed them to transfer the bonobos and the facility to entirely to them and to completely terminate all BHI input, oversight and ownership of the bonobos. In addition they claimed this terminology gave them the right to completely demolish BHI as a nonprofit entity with any relationship whets ever to the bonobos and that they were full owners of the bonobos.

Board members had questioned the nature of the wording, and the intent Dr. Taglialatela and Hopkins prior to the vote, but were provided provided with misleading answers by trusted the legal counsel. At the time of the vote, the first author had already been removed from the facility and forbidden to speak to the board. She was no allowed on the grounds and placed under threat of arrest if she spoke to BHI members or attempted to see the bonobos. She was ordered to vote for the resolution and told it was her means of seeing of the bonobos in the future. As soon as the resolution was passed, all board members were banned from the facility with the permission of Dr Taglialatela and Hopkins.. Many many requests for permission were sent forward and were turned down. Only a handful a, accompanied by BHI's legal counsel, have been allowed and none have been allowed during the past year.

Steadily every person who had any close relationship to the bonobos was fired or removed by other means. No one who participated in the research from Kanzi's birth in 1980 forward was allowed any further access to the bicultural bonobo family they had created with the help and assistance of Matata. The shock of this proved too much for Matata who soon died from undetermined causes. Nyota refused to eat and became very ill. Teco suffered epileptic seizures and periods of inability to walk and partial paralysis. Dr. Taglialatela and Hopkins also refused the first author to retrieve data, books and personal property from the lab. They destroyed video and computer data and claimed that the first author had collected no data. They met with staff and told them that the first author have left the facility and moved away. When it became clear that this was not true, they asked the staff to vote for or against the return of the first author. The staff unanimously voted for her return on two occasions. They were then systematically removed one at time and replace with persons who had no bonobo experience and no understanding of the research. .

Dr. s Taglialatela and Hopkin's then resurrected the false claims of the earlier employees who had lost their jobs when Mr. Townsend terminated the funding. They presented this to the new persons they hired to encourage them join in these complaints against the research. They attempted to declare that the BHI board had disbanded itself, that the first author had left the facility and abandoned it, and that Duane Rumbaugh, who had begun the project, sought them out and encouraged them to steal the bonobos and the facility. None of these accusation were true. The Bonobo Hope board was advised to take Dr Taglilatela and Hopkins to federal court. The court ruled that it lack jurisdiction over the case and sent the case to state court. The case is currently moving toward action in state court. Dr. Taglialatela and Hopkins claimed that the research trajectory had been abandoned in Iowa and that no research had been done. To support their claims they confiscated all video and all computer based data and programs and all records and personal property of the first author. They used the confiscated data to assert that no research had taken place.

It is hoped that the bonobo's are healthy and that they have not received psychotropic drugs. Dr. Taglialatela and Hopkins are rarely in Iowa, visiting the bonobos no more than 1.5 days per month,. During that time they are with staff. The bonobos no longer vocalize or talk through out the day as they did previously. A total silence hangs over the facility and large 15 foot hole reside along the back fence. There is no one in the facility between 5 pm and 9 am to care for the bonobos. Dr. Taglialatela announced to BHI members that they were not welcome in the facility if the worked with the first author. They have demanded that the BHI board remove any members are related to Dr. Rumbaugh and those whose relationships included contact with the

bonobos, and whom the bonobos trusted as family members.

The case will be taken to state court. Dr. Taglialatela and Dr. Hopkins were professionally dishonest in their manner of obtaining authority over the facility and the bonobos. They have changed the lives of the bonobos in a serious manner, and one that is intended to block any extension of the research trajectory. While this is portrayed as an individual difference of opinion between staff and researchers; that is false. The real battle is between different political views on how language questions can and cannot legitimately be raised about them. Questions that entail two-way linguistic communication inevitably require allowing the "subject" input and thus the subject comes to determine, in part, the direction of the research and to define the nature of the two-way inquiry. This became highly controversial because the inevitable outcome is that of personhood for the bonobos. And personhood cannot abide continued biomedical research on apes. The Yerkes Center offered Dr's Taglialatela and Hopkins financial support for 40 years if they were able to take full charge of the bonobos and the facility and remove all oversight by BHI. This almost happened. BHI continued to fight the legal battle for the future of this linguistic family of bonobos.

I wish to extend my eternal gratitude and greatest admiration to those person who have been brave enough to stand on the side of the apes through trial, tribulations, intentional disinformation and abuse through many decades - in order to create a real two-way linguistic program. The first is my sister Liz Pugh and her daughter and her husband. They have endured suffering that should not come to any person and have maintained without fail the true competencies of apes. They have given their entire lives to assist the recognition of the bonobos true intelligence by the "outside world, " in way too noble to begin to describe without impugning those who have tried to stop them. I also wish to extend my gratitude to the second author who has done the same and in so doing joined the bonobo family. I am grateful to my former husband who tried throughout his life to walk the line between ape as subject and as person and two-way linguistic being. He started all of the serious work with apes, which began with the transfer index and its emphasis on one trial learning, which requires the understanding of inferred rules. Had he not undertaken the amazing effort with Lana, which has not yet receive proper recognition, no other research with apes would have ever taken place and the entire field would have been dismissed by Herb Terrace who sought to raise Nim for one reason only - to claim that the field was hoax. He never attempted serious two-away investigation as is obvious from his now tapes.

To those who have attempted this and whose work has been deliberately and repeatedly blocked by nonscientific means, I offer by my eternal admiration and gratitude. The truth about apes has been discovered but only the tip of the iceberg has been revealed. It will require a re-organization of scientific method to press further and a realization that if and when a being that is conscious of being conscious begins to speak —all the past methods of treating "animals" as insentient must be abandoned. If not the methods will again be employed to place a chokehold around the neck of any such being.

In 2004, the bonobos were relocated to Iowa when an entrepreneur offered to build a new facility to fund the research for the rest of their lives and to provide $450,000 to GSU, for their transfer to Iowa. It appeared to be an ideal long-term solution for this unique groups of cross-species co-reared bonobos. However soon, the addition of persons from the National Zoological Society caused the original goal to become that of providing a zoo which would allow visitors to gain an educational experience with all 4 species of apes. In line with the "language-like" work that had already become popular at the National Zoo, a variety of match-to-sample and discrimination tasks were substituted for language. The stimuli employed in these tasks were given "names." The "experimenters" held up objects and asked the apes to "name" them. But this was the only use of the so called "name, " making it essentially a pair-associate learning task. The "name" was not employed in sentences, in conversation, or any form of language use. The only thing the apes needed to do was to memorize the key to be pressed to each different item. Yet is was sold to the public as "language."

True Language is constantly employed to provide new information in conversation. No one wants to hear the same thing repeatedly, much less pair a sound, gesture or geometric form with a hat, a ball, a bowl, etc. over and over. The brain is always seeking new information, especially when it listens to language. These paired- associate and match-to-sample tasks have no linguistic function, bore both the ape and the experimenter, and require extensive training with food reward for correct answers. However they can be employed to lull lay audiences into thinking that the "ape is talking" because the ape is said to be "naming."

These "for show" researchers eschewed all language dialogue, forest travel, the emergence of stone tool manufacture, fire-making, music, representational art and other abilities that were emerging from the bonobos linguistic brains, as "inappropriate behavior for apes" and insisted on their termination. Then in 2006, they encouraged Zoo Atlanta to claim ownership of the bonobos. Zoo Atlanta ordered the bonobos transferred to Atlanta and the language research terminated. While the case was pending in court, the facility flooded leaving 5 feet of contaminated flood water in the bonobos' enclosures for weeks, and mud once the water resided. The entrepreneur removed the promised funding and left the organization in 2012, citing the stock market crash and the flood of 2008. A group of internetional scientists stepped forward in 2012 to help keep the bonobo project operating, and the bonobos were put under the auspices of this nonprofit corporation, *Bonobo Hope*. The zoological staff and orangutans - which had come from zoos and the entertainment industry - were returned to zoos.

The high-level language comprehension the bonobos developed in Iowa far surpassed their abilities in Georgia and, as a result, language was rapidly propagated through the group of younger bonobos and those who had been in the control group. Their increased understanding of their particular situation began to result in repeated requests to go where they could be free. They also expressed increased concern about the killing of all apes in Africa by humans. Opportunities to document their increased linguistic competency were limited because the organization's goal had become that of operating the facility as zoo, and language research was being steadfastly given a back-seat. However video data and daily records were kept.

In 2013, the group of scientists who had come together to form Bonobo Hope, and to ensure the future of the bonobos, invited to former students of the first author to interview. After considerable discussion they were invited to assist with the ongoing research effort. They brought expertise with bonobos vocalizations and lateralization. The intent was to add these topics

to the ongoing program of cross-species co-rearing, stone tool manufacturing, art, music and the emergence of hominid capacities. After agreeing to work hand-in-hand with the *Bonobo Hope* board and to help continue the ongoing program, the former students decided to employ dubious legal tactics to transfer the bonobos and the facility to themselves, without so informing the *Bonobo Hope* board. Next they locked board members out and terminated all employees who had previously engaged in the cross-species co-rearing through-out the lives of the bonobos. They sought Yerkes funding, adopted biomedical standard operating procedures and terminated the original program of cross-species co-rearing. In the meantime they took credit for all of the previous research in interviews with Time Magazine, Iowa Public Radio, Channel 13, and on PBS. They touted previously repudiated false claims against board and first author in order to justify their action.

In their public videos they can be observed paying Kanzi with food to perform perfunctory, repetitive tasks. The tasks entail no dialogue or opportunity for Kanzi to express his own thoughts. He is presented as the "rock star" and the "Elvis Presley" of ape language - while they demand paired associate responses from him - and refuse to allow him to communicative his own desired, thoughts and knowledge. They refused to allow him to speak his own mind or visit with those who co-reared with his mother Matata from 1980 until 2013. When he requests to see the people in has known his entire life, this requests are called 'errors' and attributed to 'fat fingers.' In other words he is not touching the keys intends to touch because his fingers are to fat. (Figure 1 illustrates the clarity with which Kanzi was able to touch the symbols when he wanted communicate his thoughts.)

Nonetheless, Kanzi surely continues to comprehend language, but in all the recent videos he is silent. He does not employe his vocal cords or his symbols for communicative purposes. Perhaps they have taken away his interest in self-expression, by simply ignoring anything that is a not the "response" they have requested through the use of pointing cues or computer based paired-associate tasks. Both such cues are clearly utilized during the videos with local media or on PBS.

Kanzi's original language acquisition and use never involved these cues nor any form of repetitive practice. It arose from a natural desire to communicate with those around him whom he trusted and with whom he spent most of his time in the forest.

They claim that Kanzi is no longer able to do the kinds of things he was reported to do through out his life. They also assert that none of the other bonobos possess language. They note that they intend to try to determine "if the others can learn language?" Yet they adamantly refuse to put into place the conditions that led to Kanzi's linguistic competence, and/or that maintained it.

Prior to their hostile take-over of the facility in 2013, all bonobos utilized language. It is unclear whether the bonobos have:

a) now lost this capacity because of the highly restrictive housing and treatment protocols

b) whether they simply refuse to employ language due to the current conditions

c) whether these former students lack the capacity to discern language use when it takes, so dependent are they upon prompts and cues to elicit language.

e) during the period of time between when they worked the bonobos students and 2013 they seem to have forgotten what language is and how it is employed.

As the article goes to press, Bonobo Hope is filing a petition for the return of the rights of the bonobos to languaged way of life, one is which they dialogue and share their thoughts. BH also seek the return of the its rights to oversee the care and future of the bonobos, right that were removed from the board without its knowledge.

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