Essential Wolves

Wolves were once the most widely distributed mammal on earth. They thrived for millions of years. Then human beings became a significant factor in the evolutionary formula, ultimately causing unspeakable suffering for wolves, taking the species to the brink of extinction. Human beings are the cause of countless extinctions, but of all the living forms on earth, only wolves were deliberately and specifically selected by humans to be destroyed. The last two hundred years of human history is marked by violent persecution of wolves, and in 1973 wolves were declared an endangered species. When wolves became protected under the Endangered Species Act, they had a chance to begin to recover. Now, wolves seem to be doing so well that many people believe it is time to remove wolves from the list of endangered species. This may seem cause for celebration, but in truth what this means is that it once again would be legal to kill wolves. The mind reels. And, hopefully there is a multitude of human minds pondering the question: What is our responsibility to this highly intelligent, social species that we once were determined to erase from the planet?

Understanding the true nature and needs of wolves requires an interdisciplinary approach. This paper highlights sociological characteristics of the society and dynamics of wolf packs that suggest pack life has cultural elements, and explores the psychological question: *what is well-being for a wolf*. Taking these topics into consideration, the wolf reintroduction programs are addressed, as well as natural recovery. This paper also re-examines the traditional model used to represent pack dynamics, and suggests that perhaps there is an alternative model that better represents and reflects the external workings of wolves' social organization, the nature of their relationships, and the essence of their inner emotional lives. The basic principles of complexity theory and the model of complex systems are presented, and how application of this alternative model is relevant to the question of wolf well-being, wolf culture, and the reintroduction programs.

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A psychologist friend of mine was here visiting *Raised By Wolves* (RBW*)*, the wolf/wolf-hybrid research center where I work and live. As usual, he was intrigued by the howling of the wolves. When the chorus of twenty wolf voices simultaneously faded into silence, my friend asked with earnest puzzlement, "How do they know when to stop singing?"
"They stop singing when the song is over," I answered.

So much of the intrinsic nature of wolves is reflected in their music, in their voices. Wolves really like ritual, and some howls, such as the vocalizations that communicate serious messages, warning of danger or potential threat, follow a strict standard protocol. Certain greeting rituals are accompanied with enthusiastic formalized singing. Other songs sound like free-flowing improvisation. Wolf songs, like wolf packs, have both order and flexibility, a harmonious balance of ritual and spontaneity.

One of the governing principles of pack life I find most endearing and admirable involves howling. The rule seems to be this: if one sings, we all sing. Rarely does a wolf sing alone, although some songs do include a soloist interlude. Sometimes they sing in rounds. *Listening* is as essential to my understanding of wolves as looking at them.

RBW does not have the technology required for a formalized study of wolf vocalizations, but I am quite certain that in the future, when a thorough, comparative, and imaginative study of wolf songs is conducted, what we will hear is the sound of structure. It stands to reason that wolf music must be as complex and packed with content as the songs of birds and whales. Long term research on whale songs and bird songs suggest there is evidence of culture in the music of these species. It is not so far fetched to propose that similar evidence will be discovered when wolf songs are studied in the same fashion, revealing that different wolf packs sing different songs, and that there is an element of wolf songs that is culturally transmitted.

Culture

The existence of wolves in the wild is still endangered, but what is generally overlooked is that the wolves that survive are in danger of losing the culture that has sustained their species for millions of years.

Culture is generally defined as a social group that transmits knowledge and customs to succeeding generations through learning; cognitive capabilities, skills, and protocol are developed through education. A culture is characterized by shared values, social forms, rituals, and patterns and practices of behavior. What is key to culture is tradition.

Animal Culture has become a hot topic. The culture of chimpanzees was the first to be formally acknowledged by the scientific world, and recently the culture of other animals, primarily primates, certain species of birds, and whales, are being recognized. If the current trend continues, it won't be long before humans realize that there are many species that meet the qualifications for having culture. Of all the potential candidates, perhaps the most deserving of this honor are wolves. It is indeed surprising that recognition of this has been so slow in coming.

A wolf pack is a well-ordered society, and each member is expected to learn, observe, and obey the laws. Proper conduct is essential, so instruction begins early. The elder pack members teach the young about pack etiquette. Much of this education is carried out through play. Wolves seem to understand that play promotes health, trust, intelligence, problem solving ability, and is the key to establishing emotional bonds, building good relationships, and developing and maintaining social success and unity, upon which their survival depends. Play provides an outlet for the expression of individual personalities, which is instrumental in determining the appropriate pack position for each pup. Although wolf play often involves competition, it is through play that the pups also learn cooperation.

There are behavioral aspects of play that are universal, common to all wolves and wolf packs. For example, as wolves are extremely curious, wolf play is exploratory. However, what is investigated is related to habitat and environment, so this type of play involves interactive behavior with specific features of the wolves' locality. Thus, creative, imaginative play evolves with characteristics unique to certain packs living in certain places, suggesting that evidence of culture may be found in the way wolves play.

Perhaps the most obvious evidence of wolf culture is in their hunting behavior. It is well documented that young wolves learn from their pack elders not only how to hunt, but *what* to hunt. Every intact wolf pack has hunters, but each pack tends to specialize in hunting one primary prey animal. (When the focus of this discussion turns to the wolf reintroduction programs we will return to this subject in another context.) There are a small number of packs that know how to fish. Fishing is not a universal characteristic of packs – it is a specialization of only a few select packs. Generations ago, a wolf discovered how to do it, and the knowledge and skills required for fishing were passed along from one generation to the next, becoming an integrated custom of the

pack. This is similar to the well-known example of Imo, the macaque monkey who started the tradition of washing sweet potatoes in the stream.

There are other features of the social organization of wolves that clearly indicate there is a well-developed culture at work in their world. In wolf society there is a division of labor, generally described as consisting of two categories - hunters and babysitters. Job assignments are not determined by gender – females can be hunters, males can be babysitters. After a decade of research and close observation of pack dynamics, I have learned that the organization and dynamics of pack position is much more complicated and sophisticated than the standard depiction. Our discussion of complex systems will elaborate on this theme.

Studies of the hunting behavior of wolves provide overwhelming evidence that young wolves are taught prey identification, and predatory skills and techniques by their elders. Without the older generations of wolves to pass along this knowledge, the natural predator-prey relations are disrupted and distorted. What has not been elucidated is that there are educational traditions involving parenting, pack values, and social order that are also vulnerable to disruption. Even wolves in captivity demonstrate that packs have shared traditions, and that knowledge is transmitted from one generation to the next.

Canine Biologist Marc Bekoff: *The plural of anecdote is data*

In July 1999 two four month old Timber wolves, brother and sister, came to live at the Raised By Wolves (RBW) research center. They had been rescued from horrendous circumstances by a wolf rescue ranch, and there they were nursed back to life. Needless to say, these babies had not been nursed by their mother – in fact they had been taken away from their mother at birth. Tragically, this is a common practice, carried out because some people erroneously believe the only way to socialize wolf pups to humans is to separate the pups from their mother and any other wolves, and for humans to bottle-feed and raise the babies. It is not uncommon for the mother to become so distressed that she will actually die. The pups generally grow up neurotic, sometimes overly aggressive.

It was obvious to me that the Timber Twins, whom we named Darwin (male) and Merlyn (female), were suffering from severe post-traumatic stress.

About a month later, two female British Colombian wolves, sisters, came to live at RBW. They were about a month older and quite a bit larger than the Timber Twins. These sisters, Pandora and Mystic, had not experienced the intense degree of trauma as the Timber Twins, but their short lives had been less than ideal. The four youngsters were put together in a large enclosure. We named this pack The Gubbios (in honor of the legend of Saint Francis and the Wolf of Gubbio).

The Gubbio enclosure shares an adjoining fence-line of about 300 feet with another enclosure that is home to our largest pack, the Posse. The Posse consists of eight members, three females (Embryo, Karma, and Echo) and five males (BudMan, Pooka, Gandalf, Galapagos, and Spud). This pack is a real family that has been together since 1996. BudMan, the alpha male, is the father of six of the Posse members. Embryo, the alpha female, has been a surrogate mother to BudMan's offspring, and she has been with them since they were born. For the first year of their lives, the pups were under the care of their biological mother, Miracle, who was the beta female of the pack. She was younger than Embryo, and welcomed Embryo's assistance in raising her offspring. It was actually Embryo who determined when it was time for Miracle to wean the pups. One could observe Miracle's intention to terminate nursing, and then see Embryo approach Miracle, causing Miracle to follow proper pack etiquette by going "belly-up" for the alpha. Then, Embryo would stand over Miracle, allowing the pups to come and nurse. Only when Embryo ceased this protocol could the babies be weaned.

When the pups reached their first birthday, Embryo became fiercely possessive of the pups, and assumed full responsibility for them. (It is beyond the scope of this paper to provide a

full account of the details and dynamics involved – a thorough treatment of the subject is related in *The Bluewater Wolves: the science, the stories*, publication pending).

Years of close observation of the Posse pack has taught me some unexpected lessons in pack dynamics, and when my observations included the Gubbio pack, what I learned was even more surprising.

The young Gubbios had been without any parental care or instruction (Pandora was the only one who had begun to bond with her previous human caretaker), and their emotional state was basically pure fear. The difference between these pups and the Posse pups, who had been raised by their biological parents and family, was remarkable. The Posse pups had been playful, curious, social, affectionate, and showered with attention by the older members of their pack. The Gubbio pups, at first, did not even play - did not even seem to know how to play. They were terrified of humans, and most of time just paced incessantly.

In utter amazement, I witnessed intriguing dynamics unfold. From the other side of the fence, the Posse took the Gubbios under their wing. Even though they were not in the same enclosure, the Gubbios clearly began to recognize Embryo as "mother". A pattern began to emerge: Embryo would walk over to the adjoining fence, and the Gubbios would line up, as though taking their seats at school. Embryo demonstrated how to cache a bone. There would be exercises in play signals, and an abundance of play, as well as touch, took place through the fence. The Gubbios received musical instruction, what and when to sing, and before long the youngsters were gleefully joining in the group howls. I watched Pooka, the beta male of the Posse, catch a mouse, chew it up, and regurgitate it through the fence to the young Gubbios. The Posse members initiated the Gubbios into pack rituals and instructed them in pack etiquette. Certain members of the Posse even took turns assuming a position and posture of protection next to the fence, clearly "babysitting" the Gubbios.

With keen interest, the Gubbios watched the Posse interacting with me, playing with me, and they observed the relationships between the other animals living at RBW and the RBW volunteers. Slowly, gradually, the Gubbios became less fearful of us. Their neurotic pacing ceased, and in its place was a riot of play. They even began playing with the RBW humans. This play rarely included touch, but a relationship of trust was being forged.

Pandora, who had clearly emerged as the alpha female, was particularly intent on receiving attention from and interacting with Embryo. Young Darwin, the only male of the Gubbio pack, concentrated on the activities of BudMan, as though he somehow understood he would one day be the alpha male of his pack, and was intentionally attempting to figure out how to do it. Darwin tried to solicit special attention from the male members of the Posse, and Gandalf was the one who responded with the most dedication. A pattern of behavior developed between Darwin and Gandalf that resembled a surrogate father–adopted son relationship.

The individual members of the Posse, and the Posse as a pack, actively engaged in teaching the Gubbios what being a wolf and a wolf pack was all about. And the Gubbios couldn't get enough of it. I am convinced that if the Gubbios had not had the Posse as a surrogate family and role model, they would not be the happy, well-adjusted wolves they are today. Under these conditions, the Gubbios were successfully rehabilitated. In order to grow up emotionally and physically healthy, they had to be part of a fully functioning pack, with the feeling of belonging and protection; they needed to be loved, to feel safe, to play, to be disciplined by their elders, and they needed to be <u>taught.</u>

Wolves have long childhoods; being extremely social creatures, they require a lengthy childhood because they have much to learn. Traditionally, wolves do not breed until they are three or four years old, when they begin to reach maturity.

It is not widely known that the average life span of wolves in the wild is now only four years. Nature designed wolves to live between ten and fifteen years. The reason that wolves are

not surviving into adulthood is due to human interference - the leading cause of death for wolves is humans.

According to a report on the status of the reintroduced wolves in Yellowstone, there were no wolves over four years old, and most were 2 and 3 year olds. This accurately represents the current status of wolves in the wild in general. What this means, of course, is that wolves are not surviving long enough to reach full maturity. Without the older generations of wolves to teach the young, the new generations of wolves are receiving no instruction on what it is to be a wolf or a pack. This is resulting in a population of wild wolves who, if they somehow manage to live long enough to grow up, are growing up without any role models or education. There is no one to lead them, no way for them to learn or master the social structure of the pack that has sustained their species for millions of years. There is the very real possibility that in the not too distant future the wolves that are left in the wild will be neurotic and dysfunctional, and human interference will be the reason.

Without a generation of elders there can be no culture, for without mature adults schooled in the customs of the culture, the traditions cannot be passed along to new generations.

Wolf Reintroduction

Wolf biology in Yellowstone has now become wolf politics (Link & Crowley 1994: 93).

Wolf reintroduction programs were designed to put wolves back where they belonged – a noble intention, but unfortunately it isn't quite that simple – or easy. The sad fact is that the reintroduction programs have been a new source of misery and misfortune for wolves. When one studies the problem carefully, one finds cause to wonder if this well-intentioned program is really doing the wolves any favor. I have been forced to conclude that it is not.

The current predicament of wolves is, of course, larger than the issue of reintroduction, but the reintroduction programs can serve to highlight some of the basic dynamics that will determine the fate of wolves. The problem is quite complicated, encompassing variables that approach infinity, for we not only have to take into consideration all that we know about wolves, but also all that we do not know.

The aspects of reintroduction addressed here will focus on *the humans* - "general operations", motivation, philosophy, politics, and, *the wolves* - the reality of reintroduction for them.

There are a number of wolf reintroduction programs. In general, wolves who have been or are slated for reintroduction in the American Rocky Mountain regions come from the wilds of Canada. As the Mexican wolf is basically extinct in the wild, Mexican wolves bred in captivity are the ones who will be "reintroduced." Both of these approaches are seriously flawed.

There are two main problems with the Mexican wolf re-entry program. Both are fairly obvious. First, the captive bred wolves have no indigenous older generations of wolves to provide guidance, care, and instruction – without this essential ingredient the plan is doomed to fail. Second, the designated reentry area is heavily populated with people who do not want the wolves to be there. At public forums, these people have blatantly and vigorously expressed their hostile and violent intentions, which they have, in the past, carried out. Regardless of these repeated warnings and the tragic results of the past, reintroduction efforts persist. The chances of survival for the wolves who are released into these regions are slim to none.

The Rocky Mountain reintroduction programs involve wild wolves, usually taken from Canada. The intention seems to be to capture a pack and then release it in the designated re-entry area. However, as previously mentioned, none of these packs seem to have any members older than four years. There is an abundance of information on the whereabouts of these

"reintroduced" wolves, and also the death rate (which is stunningly high), but I have been unable to find answers to many of my questions regarding the details of their capture. Much information appears to be unavailable. For example:

- "success" rate: how many reintroductions have been attempted? (where, when, how many wolves, etc.) and the results -how many and who survived and under what conditions, how many lost and how, and what are the effects of these losses on the surviving pack members?
- the detailed specifics of how relocation sites are selected
- selection process – what wolves are taken from the wild; how is this "decided"; who decides; where exactly are they taken from, how, how many (taken from same pack, are whole packs taken and relocated – how do they know they have the entire pack?
- are individuals from different packs mixed?
- male/female ratio, age, are they "disease protected", are they all radio collared, tagged, etc.
- if "pack position" is taken into consideration, who determines/identifies this? Based on what methodology?

All these factors have an influence on the social and psychological state of the animals concerned. Complete answers to these key questions remain elusive.

Wolf reintroduction in Yellowstone became politically entangled in a major legal mess, and this ordeal highlighted a problematic pitfall of the program: once these wolves became part of the reintroduction program, they were considered an "experimental-nonessential" population (*nonessential* !) – this means they are no longer protected under the endangered species act, which means it is legal to kill them. It seems to me those wolves were much better off where they were before. Where they were before was in the Canadian wilderness. Ironically, media headlines proclaim that wolves have been returned to the wild, when really what has happened is displacement. The public announcements heralding the return of the wolves informs people of the designated area - then, of course, people know that now there are wolves where there were no wolves before. Some people rejoice, but others take it as an opportunity for covert operations to seek out the wolves to kill them. For wolves, media attention dangerously blows their cover.

Referring to certain wolves as "nonessential" reveals a stunning lack of understanding of wolves as well as a rather shocking lack of compassion, empathy and humanity.

There are still an astonishing number of people who want to kill wolves. This is generally due to prejudice, ignorance and/or greed. Wolf-hating is part of the cultural tradition of some people. At the other extreme are people who want wolves reintroduced because they want the wolves to be there; the main motivation for reintroducing wolves is that an overwhelming number of people want them there. Unfortunately, what well-intentioned people want for wolves isn't necessarily what is good for wolves. Some people become so caught up in the enchantment of wolves, that what is actually in the wolves' best interest gets lost.

This point can made extremely clear by considering the following excerpts from Peter Steinhart's book The Company of Wolves (Alfred A. Knopf, 1995).

Steinhart relates an interview with Renee Askins, who was influential in bringing the "Wolves and Humans" exhibit to Yellowstone. She enthusiastically tried to convince the then new director of the National Park Service, William Penn Mott, "…not only that wolf reintroduction was ecologically desirable, but that it was an act with far-reaching implications for the human spirit. Mott was especially interested in the way parks might meet spiritual needs" (Steinhart 1995: 252).

Steinhart continues:

> Askins perceived that the debate about wolves is not just about historic faunas or ecosystem functions or loss of livestock. She realized that the

> debate is so laden with hidden meanings that it is almost wholly symbolic. 'You can never predict the way people are going to connect to the animal,' she says. 'They're so wholly a metaphorical animal… I think they offer a vehicle for us to talk metaphorically about the things in our lives that are not here or we wish were here… Wolves represent something far greater than the consummate predator in the ecosystem,' she says. 'When I talk about the wolf issue, I talk about the importance of wildness in our lives…Wolves offer that sense of wildness – the way wolves move, the way they play, their unpredictability, their living on the edge of their endurance, savage and surviving out there.' To see such things, she says, helps us find ourselves" (Steinhart 1995: 252-253).

Many wolf-lovin' people reading this passage might applaud the message, but there is a problem here. The problem is that the focus is clearly on what humans want, not on what is good for the wolves. Real wolves are not metaphors. Real wolves are not symbols. And wolves are not here for our benefit, or to fulfill our spiritual needs. That wolves are our chosen animal symbolizing wildness, that our passion for wolves can stir the human spirit is not a bad thing – but it is rather irrelevant to real wolves. When the focus becomes what wolves can do for humans, what humans can get from wolves, the reality of the wolves' experiences is diluted and people get distracted from the issues that are essential for the wolves' survival. Thus, our well-meaning programs to help wolves are backfiring.

There is no question that the presence of wolves has restored the ecosystem of Yellowstone – part of the reason for the evolutionary success of wolves is that they are good for the environment; they play a significant role in keeping their ecosystem healthy and in balance. But the efforts to put wolves back into ecosystems that we once exterminated them from involved countless more deaths and suffering for wolves.

Steinhart's book provides many of the tragic details of the early experimental release programs. Attempts to restore wolves to their former habitats took place in the 1960's through the early 1970's. He reports that, "there had been only four publicly acknowledged attempts, and all had failed" (Steinhart 1995: 249).

In his book The Wolf Almanac, Robert Busch points out that, "It is not unusual for wildlife managers to accept high losses in their reintroduced populations. Many projects of the past have failed altogether. Of 146 international reintroductions tracked by the U.S. National Zoo in Washington D.C., only eleven percent have been deemed successful" (Busch 1995: 157).

No doubt there are plenty of lessons we can learn from our mistakes. One lesson is rather Humpty-Dumtpyesque: once you fragment and shatter the ecosystem it isn't all that easy to put it back together again.

Natural Recovery

What is frequently overlooked is that wolves are reintroducing themselves. They have migrated from Canada into Washington State, re-colonized parts of Idaho, the upper peninsula of Michigan, Minnesota, and other areas.

Curiously, many people involved in the human operation to reintroduce wolves are not happy about the phenomena of wolves repopulating themselves without any human help. Steinhart reports that "…there are people… who look upon the wolves arriving by dispersal as passive and uncertain. They see that as something less than management, whereas they see reintroduction as something clear, predictable, and tangible. Ream (biologist Bob Ream) explains, 'The U.S. Fish and Wildlife Service is more manage-oriented and more control-oriented.' And they want to spend money on management, not on research" (Steinhart 1995: 222). Part of the program is comprised of what is called the Wolf Working Group, who are

"more interested in reintroduction than in natural recovery, partly because its members were managers who felt that reintroduction was a way to control where the wolves go and where they don't…" (Steinhart 1995: 222). (When I recently re-read this passage in Steinhart's book, it occurred to me that the Wolf Working Group needs to take another look at Jurassic Park).

Wolves have ways of making the boundaries of their territory known – with scent-markings, scat, and probably with other signs we know nothing about. They do not understand the human way of marking boundaries - with invisible, unsmellable property lines. They are not designed to understand the concept of staying inside the National Park where we want them and staying out of the places where we do not want them.

The general public is given the impression that once wolves are released into the designated reentry area the wolves are living free, wild and free in the wilderness where they belong. But trying to control these reintroduced wolves is a big part of the program.

Relocating wolves where they are already repopulating themselves results in further misfortune for wolves, and no where is the attempt to control wolves more evident than in the "Wolf Management" program in Minnesota where, it has been determined by biologists, there are now too many wolves. Wolf management largely consists of the common practice of systematically killing wolves, including whole litters of pups. (Note the absurd irony of this - too many of an endangered species.)

The insensitivity and anthropocentrism of some people involved in "wolf management" is well represented by Bob Hayes, who is quoted in the book Following the Pack, as saying, "I got involved in designing the wolf-control work. We wanted to experiment with it. We wanted to do things like remove all the wolves but the alpha males in packs and see what happens. That occurred. We manipulated it ourselves…" (Link & Crowley 1994: 68).

When humans decide where to reintroduce wolves, this decision is based largely on the presence of a healthy prey population. But are humans really qualified to determine what is a fit territory for wolves? We know next to nothing about what criteria wolves use, and they are surely better judges of a suitable habitat than we are.

Natural recovery is a far safer, saner way for wolves to repopulate the places that can sustain normal, healthy pack life. Wolves need only two fundamental things from humans in order to successfully make a comeback:

1. They need for us to stop killing them (to remain under the protection of the Endangered Species Act).
2. They need wilderness – a more or less intact ecosystem complete with ecological corridor zones.

These are the key points: you cannot have a healthy population of wild animals without wilderness, and you cannot have a healthy population of animals if they are constantly being traumatized and persecuted.

The Problem of Livestock Predation

Psychologist James Hillman: *To grasp the disorders in any subject we must study carefully the environment of the disorder...* (Roszak, Gomes, & Kanner 1995: xxi)

In both the Southwest and the Rockies, predation of livestock is considered the most serious problem. What is generally overlooked is that humans are largely responsible for creating the very problem they are trying to eliminate.

How are humans responsible?

The following excerpts are from a letter written by Ed Bangs, Wolf Recovery Coordinator, to Fund For Animals (regarding Ted Turner's wolves who were going to be part of an experimental program using shock collars to train these wolves not to hunt and kill livestock):

> "I believe that attacking cattle is behavior that these wolves learned… Most wolves, even though they live near livestock, do not recognize them as prey… Wolves rarely attack livestock because most were never taught to hunt and kill livestock by their packs. Most wolves were raised by parents that hunted and ate wild native prey and therefore never learned that livestock can be hunted, killed, and eaten… Wolves grow up in very tightly controlled family groups and are taught by their older pack mates where, when, and what to hunt. Research has indicated that if a pack hunts deer, for instance, they know how to locate and kill vulnerable deer. The pack 'tradition' for hunting deer is passed from adults to pups for generations."

If young wolves are not learning that livestock is not prey, it is because they had no parents or elder wolves to teach them. If they have no pack with a generation of mature wolves, it is because humans have killed them. Rarely does nature eliminate an entire pack, but humans have deliberately tried (and succeeded), and sometimes a youngster or two might not be present at the slaughter, and are left to raise themselves. Yet, wolves continue to be killed with no regard for who the individual might be. Humans must take responsibility for the fact that continuing to persecute and kill wolves not only contributes to the problem of livestock predation, it created the problem.

The slaughter of wolves, both systematic and random, has caused the social fabric of wolf society to come apart. Apparently, it has not been clearly brought to public attention that the consequences of our antagonistic interference is that we have caused wolves to behave abnormally because we have so profoundly disturbed their way of life. Continuing to kill wolves will not solve the problem – it will only exacerbate the abnormal behavior. Loren Eiseley warned us decades ago that "obstacles cannot be overcome with ignorance".

Field research – are we really a benign presence?

Canine biologist Dr. Marc Bekoff has written extensively on animal cognition. His paper "Field Studies and Animal Models: The Possibility of Misleading Inferences" presents important data about the impact field researchers can have on the wild animals they study. There is overwhelming evidence that the behavior patterns of these animals (both as individuals and collectively) are significantly affected by human interference, manipulation, and certain research methodology. Bekoff points out that keeping track of target wild populations usually involves the presence of humans. For the purpose of tracking, identification, and collecting other data, it is common practice for research teams to attach some form of foreign object to the animals, such as radio collars or tags. This often requires the trapping or darting of the animals. Behavior changes attributed to such "devices" are called "the instrumentation effect".

Although the effect of human intrusion on the animals being studied can appear to be neutral, Bekoff assures us that this is misleading. Field research can have a negative influence on "...nesting, reproductive patterns, dominance relationships, mate choice, use of space, vulnerability to predators, feeding and care-giving behaviors…"

Bekoff's focus is on the biological and behavioral consequences of human interference and he has amassed an abundance of data. I will relate a brief summation of but a small sampling from his report.

- For about a month after being fitted with radio collars, Kit foxes experienced a "post-collaring acclimation period". During these 30 days the foxes suffered loss of body mass and a decrease in their survival rate.
- In large gray mongooses, their use of space was altered when they were captured and recaptured to collect data.
- The normal feeding behavior of Magpies was disrupted due to the presence of humans because the Magpies spent so much time and energy trying to avoid their observers.
- The nests of White-chested chats that were visited daily by humans suffered an increase of nest predation.

  Tourism and visitation to nest sites also result in hormonal and behavioral changes.
- Exposure to humans and aircraft significantly altered the behavior of Adlie penguins. An increase in nest abandonment resulted in a marked increase in nest mortality. A large increase of the penguins' heart rates also occurred.
- In Trumpeter swans, human presence and noise caused behavior changes regarding incubation.
- A small device designed to measure the speed and depth of dives of Little penguins disrupted foraging behavior.
- Tagging the wing of ruddy ducks caused a decrease in their rate of courtship and an increase of preening and sleeping.
- The color of leg bands used to mark zebra finches influenced mate choice. A marked increase in reproductive success was found for black-ringed females and red-ringed males. Reproduction suffered for those with green or blue rings.
- In female meadow voles, radio collars influenced dominance relationships
- Ear tags on white-footed mice interfered with grooming, resulting in higher infestations of larval ticks.

  Susceptibility to infection can also be the result of devices used for research.

Procedures for a variety of experiments that do not employ the use of handling, marking, or trapping, also can alter and influence the biology and behavior of the animals. Bekoff's examples of these include: visiting home ranges, territories, or dens of animals, manipulating food supply, changing the size and composition of groups by removing or adding individuals, playing back vocalizations, depositing scents (odors), distorting body features, using dummies, manipulating the gene pool.

> "All these manipulations can change the behavior of individuals, including movement patterns, how space is used, the amount of time that is devoted to various activities including hunting, antipredatory behavior, and to various types of social interactions including care-giving, social play, and dominance interactions. These changes can also influence the behavior of groups as a whole, including group hunting or foraging, care-giving behavior, and dominance relationships and also influence non-target individuals (Bekoff, 4).

Bekoff also emphasizes that "…when behavior and activity patterns are used as the litmus test for what we call 'normal species-typical behavior,' we need to be sure that the behavior patterns being used truly are an indication of who the individual is in terms of such variables as age, gender, and social status. If the information used to make assessments of well-being is unreliable, then it is likely that the conclusions that are reached and the animal models that are generated are also unreliable and can mislead current and future research programs. And, of course, our errors can have horrific effects on the lives of the animals being studied…"(Bekoff, 2)

The use of radio collars to track wolves is basically a given, but the ill effects this has on wolves is not well known. The following quote from The Wolf Almanac provides facts and perspective about this that has not been widely publicized:

> "…for the past three decades, collar-crazed biologists have swarmed over most of the wolf's North American habitat. Unfortunately, many of the wolves

> caught for radio-collaring are injured during the trapping process. In one study of 109 wolves live-captured in Minnesota and Alaska from 1969 to 1976, forty-one percent had skin lacerations, dislocations, or broken bones due to trap injuries. Almost half (forty-six percent) had tooth, lip, or gum injuries caused by the wolves' attempts to chew off the trap. Paul Joslin, Director of Research at Wolf Haven International, believes 'that current technologies for catching them are so traumatic that wolves should not be caught unless there is a reasonable expectation that the results will have some potential positive benefit for the animals involved.' He adds that there are 'some preliminary data to suggest that wolves not only remember what happens to them, but are capable of suffering from post-traumatic stress.' In the rush to gather data, the humane aspects of biology are sometimes left behind" (Busch 1995: 179).

What is Well-being for a Wolf?

In addition to the aforementioned catalogue of biological disruptions for which humans are responsible, there are also serious sociological and psychological consequences of our actions.

Part of the reason wolves were such a great evolutionary success was their adaptability. Yet, one thing the RBW research teaches me over and over in countless ways, with overwhelming clarity, is how extremely sensitive and vulnerable these animals are. Their degree of emotional attachment to each other, their pack, and their territory is immense. Hunting and mating isn't what makes a wolf a wolf – for a wolf, the pack is everything. Wolves need each other; they need to belong. The importance of the pack, being part of the pack is *essential.* As far as pack-mates are concerned, no one is nonessential.

Play is also essential. A significant amount of learning takes place through play. Play is also instrumental in forming and securing social relationships. Wolves of all ages are extremely playful, and all members of a pack play together creating a network of connections that helps to keep the pack bonded together. The physical and mental health of a wolf and a pack rely on play. Feeling safe is the ideal atmosphere for play. Although play can involve risk-taking, there can be no play when there is a constant threat of danger or prolonged fear and/or grief. Being in the grips of trauma eliminates the possibility of play – this means no learning, no maintaining or strengthening social and emotional bonds, and ultimately the loss of physical and mental health.

There is so much more to the well-being of wolves than simply being alive, so much more to their survival, their recovery than how many there are. It seems to me there is a serious lack (perhaps a complete absence) of concern or interest in the animals' emotional state and psychological and sociological condition. What are we using as criteria for assessment of their well-being?

When we remove wolves from their native territory, fragment them from their families, deposit them in an alien environment, it stands to reason that they will be disoriented and distressed. Wolves who have been bred in captivity with no older generation of wolves to guide them are released into the wild where hundreds of human enemies await them. These wolves will also be confused, fearful, and thoroughly unprepared and unequipped to live life as normal well-adjusted wild wolves.

If we truly are concerned about the survival and well being of wolves, their interdependence must be respected. Their strength depends on the consistency of their relationships and environment. It is essential that our understanding of these qualities influence our actions towards them. We can no longer act the way we did when we were ignorant of their high intelligence, social nature, and deep emotions. Our relationship with wolves must reflect a respect for both their evolutionary success and strength, and their sensitivity.

Physically, wolves display remarkable powers of resilience, and their intelligence is also remarkably flexible - because they are such outstanding learners, their cognitive powers include great problem-solving capabilities, and they remember. However, their psychological and emotional health is really quite delicate.

There is no shortage of examples illustrating this. There was an incident that occurred at RBW in March of 1999 involving the Posse pack, RBW general manager Renée Seelbach, and myself that cogently portrays the point. The drama also included some gunmen. The following field note excerpt tells the story.

March 14, 1999

Just at sunset, after a beautiful day, lots of visitors (everyone had left), I was starting to climb into my jammies when shaken by the sound of shotgun fire. The guns were going off right across the road. It sounded as though it was coming from the vacant property just west of the Posse enclosure. The shotgun fire persisted, so I quickly threw on some clothes and dashed out to the wolves. BudMan was totally flipped out, in a complete panic, running around. I soon realized what he was doing – he was trying to herd his whole pack to the far east side of the enclosure, trying to move everyone as far away from the sound as they could get. Embryo was frozen in fear, just standing there in utter shock. All the other Posse pack members, responding to BudMan's franticness, were in a frenzy.

BudMan's eyes were like saucers. He kept dashing around, trying to keep the pack together, and then he saw that Pooka was to the west side of their main den. He madly dashed over to herd Pooka to safety. BudMan was SO scared. I could see that he did not want to go over to the west side of the enclosure, but he had to rescue Pooka. He was, at once, unbelievably frightened and incredibly brave. His devotion and concern for Pooka made his courage take precedence over his fear.

I called up Renée to tell her what was going on, that I was going to try and stop the gunfire, and that if I turned up missing I just wanted her to know what was happening.

Renée shouts, "Wait for me! I'm on my way!"

But I put on my very tough looking black leather jacket, relate my plan of action to the wolves and speak some words of reassurance to them, and start walking over to where the guns are going off. Just as I reach the group of gunmen, Renée comes roaring down the road and soon joins me.

I address the group of gunmen. "I was wondering if I might have a word with you." As briefly as possible I tell the men the situation: A few years ago, BudMan's mate had been shot and killed – he knows what the sound of gunfire means. He is beyond terror-stricken, and as he is the alpha of his pack, all his pack-mates follow his lead, and so the whole pack (actually all the wolves at RBW) are in a hurricane of fear and anguish. As a youngster, Embryo, now the alpha female, was herself shot through the neck – she also knows what the sound of gunfire means.

"I'm not trying to tell you what you can or can't do on your land," I said, "I just wanted to explain to you what it's doing to the wolves – and why."

After briefly grumbling, "I bought this land so I could come out here and shoot…" the main gunman pauses. It appears as though he is having a thought that is almost too big for him. He looks in the direction of the wolves, then at me, and says, "I raise bulls… and ya' know, I sure wouldn't like it if a bunch of guys were upsetting them."

After that, the gunmen are actually very kind and understanding, and they agree to stop shooting.

Renée and I return to the wolves.

BudMan was still freaked out – panting hard, agitated, and the other pack members were still responding to his panic. Gandalf was shaking. Renée and I stayed with them, spoke to them in a reassuring way, and touched them gently. The whole pack was circled around us. At last, BudMan and Embryo, standing side by side, began responding to our efforts to soothe them and calm them down. After a while they both laid down on the den, in exactly the same position, and then everyone else started to settle down, too. I watched as the horror and dread and nightmarish memories began to fade from BudMan and Embryo's eyes.

As I continued to softly stroke Embryo and BudMan, the impact of what had just happened started to hit me. BudMan was so afraid that harm would come again to his beloved family, that he would lose another cherished companion. Embryo's fear had paralyzed her. The

whole drama was heartbreaking and intense… and one can only wonder with anguish what agony humans have inflicted on the wolves in the wild…

Culture Shock

The failure to recognize and respect the culture of wolves has resulted in tragic, perhaps approaching irreversible, fatal, consequences for wolves and their culture. Wolves in the wild are not only experiencing personal trauma, but collective culture shock; where there is culture there can be culture shock.

Culture shock is the extreme anxiety and confusion experienced by a group (culture) when exposed to an alien culture without adequate preparation. What could possibly have prepared wolves for what humans did and are doing to them?

Wolves cannot be expected to easily accept and embrace a foreign land; wolves are not immune to culture shock. They are also not immune to literally being shocked, as the shock collar experiment conducted on Ted Turner's wolves illustrate. Using the shock collar protocol, these wolves would be conditioned to stop bothering livestock or they would be put to death (a frightening resurgence of the operant conditioning experiments that plagued the days of behaviorism).

After carefully studying the aforementioned letter by Ed Bangs in which he explains and defends this plan, one finds it plausible that perhaps no intentional malice was directed at these unfortunate wolves, but certainly presenting this procedure as the only alternative to killing these wolves displays a disturbing lack of compassion, not to mention creativity. The methodology employed to teach these wolves is a far cry from how wolves are meant to learn. Shock collars are inadequate substitutes for parents.

Anthropocentrism is partially responsible for a lack of vision where the reintroduction of wolves is concerned. It is deeply disturbing that there appears to be an inability or unwillingness to recognize that relocation is dislocation; for wolves, the experience of reintroduction is the trauma of displacement, utter disorientation, and a disruption of normal life that can lead to individual and collective despair, depression, dysfunction, and the disintegration of the health of the wolf, the pack, and future generations.

Culture & Environment

There are almost endless definitions of culture, and the criteria used to determine what constitutes a culture also varies widely. For example, one set of standards for culture states that the customs in question cannot be genetically acquired or "compelled by the environment" (Newsweek, March 26, 2001).

However, there is no question that the culture of a group is significantly shaped by habitat. The relationship between culture and environment is a well-researched area of study, and it is too reductionistic to imagine that the environment has no influence on the nature of a culture. The culture of the tropics could not occur in the Arctic Circle, the Eskimo culture would not work in Spain.

A brief remembrance of what happened to Native Americans when they were displaced from their homeland brings the point home: people and the life-ways of a people are inseparable from the environment in which they live; the consciousness and culture of a group is directly related to the characteristics of their geography; habitat is a creative force in coloring the cultural landscape.

Wolves are intimately connected with their home territory. It is common for relocated wolves to immediately try to find their way back home. The time and energy devoted to getting

back where they belong takes precedence over and disturbs normal life activities, but wolves are willing to risk it in order to return home.

For a wolf, being "reintroduced" means being traumatically removed from their native territory, probably with a fractured pack, and deposited in an unfamiliar area. The territory of a wolf pack is part of the pack. Imposing an arbitrary separation between a pack and their place is as thoughtless as keeping pack-mates apart. Subjecting them to this hardly seems to be a kind and loving gesture on their behalf.

The tendency to disregard the importance of the integrity of the whole may be attributed to the significant portion of the scientific community that is still under the influence of the old Cartesian Split school of thought, pledging allegiance to the anthem of dualism: reduce and dissect, divide and conquer.

In a way, reintroduction programs can be perceived as an enlightened effort to restore the balance of nature. In another way, unfortunately, the actual reality of it is causing additional fragmentation.

Ecologists are scientists concerned with interrelationships and patterns of relations between organisms and their environments. The field of ecology can be defined as the study of connectedness (Roszak, Gomes & Kanner 1995: 8), and it has demonstrated and delivered a powerful truth: *There can be no working whole without all the parts.*

There is another field of science, relatively new, called complexity, which is the scientific study of natural systems. Complexity and ecology are highly compatible and complementary.

The science of complexity offers a model of systems that can serve as a viable and important alternative model for describing and comprehending the intricacies and operations of pack dynamics.

Complexity

Biologist S.J. Singer*: I link, therefore I am* (Wilson 1998: 110).

The bonding between pack-mates weaves the individuals into a seamless whole. The importance of this has been terribly neglected – and the traditional model of a dominance hierarchy may be part of the reason.

In the 1930's – 1940's, Rudolf Schenkel studied the behavior of captive zoo wolves. This is where the standard dominance order based hierarchy model originated, and it is the very same model that is used today. It has remained unchanged and unquestioned since 1947, and it is important to keep in mind that this unanimously accepted explanation of the social system of wolves was based on the study of captive zoo wolves.

According to this model, dominance orders are strictly lineal; the traditional model of pack hierarchy places the alphas at the top of a ladder, with the beta male directly under the alpha male. Note there are essentially two ladders, one for the males, one for the females. Usually there is no mention of a beta female, but the rare acknowledgement does position the beta female just beneath the alpha female. The pack members who decorate the descending lower rungs of the ladder have received no particular attention and seem regarded as rather inconsequential (nonessential?). No operational definitions or names for these positions are included in this model. At the very bottom of the ladder, however, there is a role referred to as the omega. This bottom dweller is frequently described as the scapegoat, often clownish, and sometimes the victim of vicious attack.

Looking through the lens of complexity, the view is quite different. One sees not a linear structure, but a web. Or even better, an atomic or a solar system! *Alphas are not at the top, they*

are at the center. The male and female leaders are the core, not the pinnacle. Then, radiating out, orbiting around, as both particles and waves, is the rest of the pack. The betas orbit closest to the center, but there are fields and ellipses around and between and connecting every individual and every other individual. Comprehending the alphas not at the top but at the center demands one to conceptualize and comprehend pack dynamics in a totally different way.

The ladder model, with the alphas at the top, puts limits on points of connection. The ladder hierarchy is linear, vertical, where the top level, the alphas, would associate only with the rung just below them, with the betas, vertically. The betas would then associate with the individuals directly below them, etc. The dynamics observed in the RBW packs did not fit this model. On a regular basis, the alphas associate with every member of the pack at all levels. In the complexity model there would not even be a "level", rather, dimensions. The various participating points or parts (individuals) of the system (the whole) interact with all the other parts. The alphas are at the core of all this activity, acting as a central force organizing these interactions.

Complexity emerges spontaneously from biological systems. Both internal and external forces are involved. Complex systems are nonlinear, adaptive and self-assembling, and can well describe and be applied to wolf pack dynamics. *

The main features of an adaptive complex system include the following: universal properties, emergent properties, unpredictability & sensitive dependence on initial conditions, flow: smooth & turbulent, phase transitions, degrees of freedom & rules, fractals, and chaotic behaviors and attractors. All these primary characteristics of the complex systems model can be translated into the system of the pack.**

Fundamental to complex systems is this: *the whole is greater than the sum of its parts*. This is also pivotal to understanding the true nature of wolf packs.

The idea that a wolf pack is a "collective" is not a new or original idea (Fox 1980: 58, 99). However, the concept of the pack as a complex system is not synonymous with these past descriptions in two important ways. First, the traditional application of the pack as a unit is tied to the linear ladder hierarchy structure, while the unity and cohesiveness of the complexity system is a non-linear organization following different laws, with properties that differ from those of the "ladder" model. In the ladder model, hierarchy is based on ranking, in the complexity model, the hierarchy is one of *linking*. (For a more detailed explanation of this, see appendix).

Second, the linking hierarchy of the complexity model, with its emphasis on interactive relationships within the whole, infers both awareness and consciousness; the wolves live as one, obeying the special biological evolutionary rules of the wolf pack while simultaneously assessing, adapting, asserting individuality, engaging in numerous, changing complex relationships, educating and being educated, exercising choice and even creativity.

In a wolf pack, it is the personal relations of the individuals that create the organization of their society. Gregory Bateson believed that relationships should be used as a basis for all definitions of living organisms (Capra 1983: 81). This would certainly apply to wolves.

Jung speculated that there is a basic need to feel a part of a larger whole, and also to feel that the universe is ordered (Temerline 1975: 160). He was referring to people, but it applies

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* My 1999 paper *Analyzing Wolf/Wolf-hybrid Pack Dynamics as a Complex System* is the first documentation of the theory proposing a scientific merger of wolf ethology and complexity. This paper is an abstract of the material covered in the book, *The Bluewater Wolves: the science, the stories* (publication pending), which addresses the subject in great depth and detail.

** For readers interested in additional information on complexity theory and how the complex systems model can be used as a model for pack dynamics, please refer to the appendix at the end of this paper.

equally well to wolves. In some ways, wolves carry this out more effectively than humans. The linking-hierarchy of the complex system of the pack provides each individual member with a strong sense of belonging, order, identity, freedom, unity, and even purpose. Though, admittedly, much of what wolves do remains bewildering, using the model of complex systems can greatly enhance one's understanding of the dynamics observed.

Comprehending the complexity of pack life, and how dependent the pack is on its environment and on all of the pack members can also surely help us in our endeavor to protect this highly social, intelligent, endangered member of the animal world.

Conclusion

Ecopsychologist Terrence O'Connor: *To heal is to make whole* (Roszak, Gomes & Kanner 1995: 152)

The first scientific study of wolves was done by Adolph Murie, and in 1944 his book, The Wolves of Mount McKinley was published. To the astonishment of almost everyone, Murie reported that the intrinsic nature of wolves appeared to be that they are both shy and friendly. Other early researchers concurred with Murie's assessment.

It is possible that our persistent interference and violence against wolves might actually undermine their true nature. Human interference, both hostile and well intentioned, also poses a very real threat to the integrity and continuation of the natural organization and evolution of the lives of wolves.

> "It is important to stress that what appear to be relatively small changes at the individual level can have wide-ranging effects in both the short- and long-term… when we are unsure about how our activities will influence them we should err on the side of the animals and not engage in these practices until we know (or have a very informed notion about) the consequences of our acts" (Bekoff, 5).

Increasing and improving our knowledge of wolf pack dynamics is crucial to the preservation of the species; without an understanding of wolf culture, the true culture of wolves is in danger of disappearing from the wild forever.

There are many fields of science that have valuable contributions to make on issues concerning wolves. Being interdisciplinary is essential. We must embrace relevant insights and information wherever they come from, and translate this knowledge into whatever action or non-action is required.

Using complexity as a model of pack dynamics and recognizing wolf packs as a culture could revolutionize our current understanding of wolves, profoundly influencing human efforts to preserve the true nature of wolves and their culture, and significantly improve the chances of wolves - as individuals, a species, and a culture, of surviving in the wild.

Failing to take cultural and psychological variables into serious consideration is a major flaw in the reintroduction programs. The inevitable trauma of separation and displacement experienced by the wolves is a significant obstacle to success. Once one realizes that, for wolves, re-location is *dislocation,* one also has to come to the realization that this inevitably dooms the intent of the program.

If our real intention is to be helpful to wolves, a better solution is to keep wolves (ALL wolves) under the protection of the Endangered Species Act, and allow them the freedom to re-enter and re-populate naturally. Wolves are smart. We should not underestimate their ability to assess the potential and move into areas that they decide will suit their life-ways, into territories they determine are good for them. They are much better judges of their needs than we are.

It is well known that wolf packs have rules and customs that regulate their population. A healthy functioning pack will normally produce only one litter (an average size litter is five or six pups) once a year (in the spring, of course) and only if environmental and pack conditions are favorable. The general rule is that only the alpha pair will have mating privileges, though under certain circumstances there may be exceptions to this rule. This method of population control is another reason for the evolutionary success of wolves – they do not overpopulate. Human manipulation of wolf packs and wolf populations could significantly disrupt this feature of wolf culture.

Life as a wild animal in the wilds of nature is no walk in the park, but wolves did just fine for millions of years without any help from humans. Humans are now very much in the evolutionary mix. We would be wise to acknowledge that wolves (as well as all other species) do not exist for our benefit, and wonder what our responsibility is to them.

If wolves are removed from the list of endangered species it will be because biologists determine there are once again enough wolves – whether or not an animal is considered endangered is strictly based on numbers. I believe in the case of wolves, it would be appropriate to make an exception. Regardless of how many wolves there are, though they may not qualify as endangered, they will still be <u>in danger</u>. If wolves are not legally protected, there is no doubt that they will again be the targeted victims of cruel, reckless, relentless slaughter. Ultimately, this will put them right back on the list of endangered species.

To some extent, the fate of wolves will be dictated by scientists and politicians, but to a greater extent it will be decided by our own human culture; our value perceptions, attitudes, philosophy, ethics, morals and motives – who we are, collectively, as a people, is what will determine the destiny of wolves.

Those of us who truly love them can see that the best thing we can do for them is to let them be. Let them have their place in the wild and let them live – that is all they really need from us.

Let us hope that when wolves stop singing it's because it is the end of the song - that the silence is not the sound of the extinction of a species.

APPENDIX

The following brief overview defines some of the fundamental characteristics of complex systems and how these features apply to pack dynamics, providing a very general idea of how the model of complexity theory can be used to represent and describe the society and social structure of wolves.

Universality

Universality – every wolf pack shares the same basic structure, and operates following a set of fundamental guidelines, principles, and laws.

Complex systems must have universality, which means predictable properties. Anything invented three or four times is considered a universal. For example, a universal evolutionary strategy is intelligence. Culture is a universal. There is a definable sequence, an order and certain common features in all civilizations.

Hierarchy is something that all wolf packs have in common that is also common in other similar complex systems. Although hierarchy is the word traditionally employed to model wolf pack ethology, it is used to represent, in an oversimplified way, a very linear thing - the rungs of the ladder, instead of what it is - punctuated, dynamic equilibrium that is much better understood using a complex system's model.

In his book Ghost in the Machine (1967), Arthur Koestler points out that, "The word 'hierarchy' is of ecclesiastical origin and is often wrongly used to refer merely to order of rank - the rungs on a ladder, so to speak."

A fundamental feature of hierarchic systems is that it is both parts and a whole. Koestler coined the term "holon" to better capture the essence of the system. Holon is from the Greek 'holos' meaning whole, and the suffix 'on' as in neutron or electron, implies a particle or parts. Due to the characteristic "sub-assemblies" of a hierarchy, the terms 'part' and 'whole' are relative and ambiguous.

However, hierarchies have rules. The word hierarchy actually means 'sacred rule' ("hieros" from the Greek meaning sacred, and "arkhia" which means rule). There are rules, which govern the activities of the whole; the group, and also rules, which guide the behavior of the individual. There are also certain laws or principles, which apply to all the levels of the hierarchy. A holon-hierarchy has both fixed rules and flexible strategies/degrees of freedom. Rules generate order, operate automatically (unconsciously), and do not exhaust possibilities; and there are a number of strategic (conscious) choices that can be made.

Koestler writes, "In a well balanced hierarchy, the individual retains his character as a social holon, a part-whole... an ideal society of this kind could be said to possess 'hierarchic awareness', where every holon on every level is conscious both of its rights as a whole and its duties as a part" (Koestler 1967: 246-247).

The concept of hierarchic awareness, "the holon of the whole" is homologous with what complexity calls emergent. Each particle is pivotal to the whole; what Kant described as maximum individuality within maximum community (Eve, Horsfall, Lee 1997: 18).

Emergence

Emergence – within this universality, unique traits emerge from each wolf pack - they are all the same, but they are all different.

Complex systems have emergent properties. Emergence is a pivotal feature of complexity. Emergent phenomenon is a term that comes from philosophy used to describe the behavior of a system which appears to "transcend anything that can be found in its components - where the whole seems greater than the sum of its parts... the behavior of the system seems to transcend that of its parts..." (Stewart & Cohen 1997: 23, 64).

From the nature of the parts, their patterns of connecting, and the rules for adjustment, emergent properties arise from natural systems. The whole is not just the sum of all the individual parts. Behavior that is emergent can be known by the dynamics and nature of the parts and understanding the interaction between the parts. Emergent behavior is not a property of the separate parts. A food-web is a good example of an emergent property of a complex system.

Wilson defines emergence as "...the appearance of complex phenomena not predictable from the basic elements and process alone" (Wilson 1998: 86).

The emergent properties of a pack seem obvious - clearly the pack is an organism that is more than the sum of its individual members. Each pack member is an individual, but the combination, the gestalt, of their coming together creates a whole other entity, a system, both unique and unpredictable. Thus, the nature and evolution of the pack organism is itself emergent.

Unpredictability & Sensitive Dependence on Initial Conditions

Unpredictability & Sensitive Dependence on Initial Conditions – small, subtle changes can have unpredictable and disproportionate influences on the pack.

Unpredictability is an intrinsic quality of complex systems. In 1963, Edward Lorenz proved mathematically that weather is impossible to predict (Gleick 1988: 21-31). The laws he discovered also governed cloud formations, the behavior of rivers, airplanes in flight, chemical reactions, hormonal ebbs & flows, wildlife population fluctuations, economic cycles, heart beats, EEGs, the brain's billions of interconnected nerve cells, and even the Big Bang.

There are laws in the world of chaos. A major law involves sensitive dependence on initial conditions, which is the basis of unpredictability. The future state of the system depends on the current state; however, in a chaotic system, small changes in the initial values of the system's variables can have disproportionate outcomes - disproportionate and surprising. Minute inputs, tiny influences, slight differences dramatically determine, lead to, produce large differences and very different outcomes. Basically, sensitivity to initial conditions means that small change generates disproportionate change. The classic example is: A butterfly flaps its wings in Brazil and sets in motion an atmospheric disturbance that ends up as a storm in Detroit. Thus, the popular, less technical name for this phenomenon is the butterfly effect.

For a wolf pack, then, in order to qualify as a complex system, there must be evidence of unpredictability in its dynamics (both to the human observer and the wolves). The emergent property of unpredictability and sensitive dependence on initial conditions is easily identified in pack dynamics. One slight shift here (a sudden change in the weather pattern, a thorn in a paw, a stranger, a flap of butterfly wings) can affect the future state of the pack in unforeseeable ways.

Flow: Smooth and Turbulent

Flow: smooth and turbulent – this can be translated to describe the aggression & aggression events within a pack -conceptualizing the pack as a complex system activates a reexamination of aggression by exploring how chaos theory might be used to explain the seemingly random patterns of aggressive behavior, and how aggression may actually be an essential dynamic of organization.

One aspect of chaos and complexity that seems particularly relevant to pack dynamics is the liquid flow model. The flow model is another way to look at chaos. Chaos asks the question: How does flow change from smooth to turbulent, and, how can flow create something random?

Consider liquid flowing through a pipe. At the center, the liquid moves most quickly. Due to the frictional drag that increases as the wall is approached the liquid moves more slowly. Nevertheless, all the liquid is flowing smoothly in a laminar flow. Molecules interfere with each other in a smooth way except very near the pipe walls. There is turbulence only near the wall; however, the region of turbulence grows as the velocity of the liquid increases until all the liquid is involved in turbulent flow.

The conditions when an orderly system turns chaotic marks the onset of turbulence. In a wolf pack, when a peaceful scene begins to rumble into an exchange of snarls and growls, which erupt into an aggression event, that is the onset of turbulence. In terms of complex systems theory, the placid, stable general state of the wolves could be perceived as smooth or laminar flow. When the smooth flow of pack life turns into aggressive outbursts (or in some cases play romps), this agitation translates into turbulence.

One sees that fluid disturbances are complicated structures in which the complexity has come about by some interfering process. What causes the flow (the steady state) to become turbulent (an aggression event)? And then one must ask: Is there an identifiable attractor or dynamic factor which maintains the smooth flow up to a point or also maintains some kind of order amidst chaos?

Phase Transitions

Phase Transitions – the oscillations and shifts in the system that result in a new arrangement of the system; packs *change.*

More or less, the development of the RBW Posse pups followed the standard format of canine development as depicted in the definitive work of Scott and Fuller (1965). However, there was a

simultaneous parallel evolution occurring, which was utterly unpredictable. This parallel evolution did not fit into the standard stages of canine maturation, but does match the concept of phase transitions.

The term phase transition is borrowed from physics (used, for example, when referring to a liquid changing to a solid) to describe a set of different stages that the pack moved through. The Posse pack did indeed go through a series of major transformations or phases, each phase having its own arrangement drifts, organization, themes and highlights.

Phase transitions occur in all kinds of biological and physical systems. These systems may undergo phase transitions at certain temperatures and/or pressures. One arrangement of atoms or molecules gives way to another arrangement as another system becomes more stable. When that happens the old system converts into a new system.

With wolf pack phase transitions, the variables are not just temperature or pressure, but time and other variables. One arrangement of the pack gives way to another arrangement that is more stable, and the pack moves into a new equilibrium. In analyzing phase transitions, looking for a formula that can predict the existence or development of attractors becomes important in determining when and what form the phase change will take.

Degrees of Freedom and Rules

Degrees of freedom & rules – this applies to pack operations, positions, and personalities.

Every piece of a dynamical system that can move independently is another variable, another degree of freedom (Gleick 1988: 135).

According to chaos theory, there is not a simple dichotomy between order and chaos, between patterns and randomness. Instead, certain types of apparent randomness are phoney: They have hidden order. The order lies not in what is observed, but the rules that generate it. “Simple, deterministic rules can generate order... but equally simple deterministic rules can generate disorder, apparent randomness” (Stewart and Cohen, 1997: 61).

Survival and biological complexity means being able to gather and process information about the environment, and making the appropriate response. In a wolf pack, this involves both rules and degrees of freedom. Degrees of freedom refers to the assortment of options allowed by the rules.

There is a whole catalogue of pack ethology that constitute an extensive array of wolf protocol and etiquette - rules. These include the following: singing, greeting, eating, territory, scent-marking, mating, division of labor/job assignments, even play. (For example, there appears to be a rule that the pack does not play in front of strangers. At RBW, it is Embryo, the alpha female of the Posse pack, who determines and decides if it is okay to play. She makes the call not only for the Posse pack, but for the other packs as well.)

One can observe the operations of fixed rules in a wolf pack, and one can also see an abundance of flexible strategies and degrees of freedom. The more social the animal, the more intelligent the animal; the more intelligence, the more personality. The more personality, the more degrees of freedom.

The varied personalities within any given pack has been well documented. Personality seems to influence, perhaps even determine the position in the pack for each individual. A pack full of personalities means perpetual interactions and adjustments. Of complex systems, Lewin writes, “Such systems may... bring themselves to the edge of chaos, a constant process of coevolution, a constant adaptation” (Lewin 1992: 149).

Any careful, on-going observation of pack life is convincing evidence that there is no way that everything the wolves are doing is hard-wired. Certain rules may be inherited, instinctive, others taught, but overall, the moment-to-moment dynamics are overwhelmingly unpredictable. Yet, the pack sustains remarkable stability and organization while constantly adapting and adjusting. The laws of the pack inherently contain options. Even in captivity, they live in an ever-changing environment, and the environment provides clues and challenges that must be dealt with according to the situation. Wolves rely on the environment to activate certain triggers, but also to stimulate, challenge and exercise their problem solving ability and degrees of freedom. Intelligence depends on there being something to be intelligent about.

The life of a wolf is packed with rules, and also full of choices. Decisions must be made. The decisions are complex, and must be made by assessing information, needs, status, and the alphas must agree. This requires efficient, effective communication, between the alphas, and with the pack. Assignments and plans have to be communicated clearly to the others, must be acknowledged by the others, and then there must be cooperation, and trust.

Perceiving the structure of the pack as an atomic or solar system is a fitting model. Yet, there is another dimension of action and organization best described as a cell, a cell dividing but remaining one.

The pack is one, but the pack is also two. Within a pack there is a sub-system; sub-packs. One sub-pack is *the hunting party* – obviously, they are the ones who go off and hunt - the pack needs food, and this means they must leave their home base. In their absence *the home team* has the important job of holding down the fort. The home team consists of the pack members who stay home to defend their territory against intruders, and it also may mean protecting babies. However, the division of labor extends beyond the jobs of hunter and babysitter, alpha or beta. "Another change, rarely considered in the literature, is temporary or short term change. In this case, the division of labor changes one way and then back again within a stipulated time period…" (Eve, Horsfall, Lee 1997: 184). Using the Posse pack as an example, Pooka's role as beta male is not ambiguous - he is the King's man, and he is a hunter. However, Gandalf has emerged as a pack member who wears a variety of hats, displaying great flexibility and intelligence.

The Hunting Party in the Posse pack consists of BudMan, Embryo, Karma, and Pooka. On occasion, Gandalf and/or Echo join them. The Home Team pack members are Galapagos, and Spud, and sometimes Gandalf and Echo. The roles of Gandalf and Echo are determined by where they are needed most. For example, if there were clearly some potential external threat, they would stay with the Home Team and help protect and defend. Other circumstances would require their presence elsewhere, if an extra or "understudy" hunter were needed. In this case Gandalf and /or Echo would be hunters.

The majority of the time, Echo and Gandalf are with the Home Team. Hunting Parties can be gone for days, so the Home Team has to know how to function smoothly, safely, and effectively on its own. *It has its own organization; its own hierarchy*. When Gandalf is with the Home Team, he is basically the Home Team alpha. The Home Team or understudy alpha is a pack position not previously identified. This position seems to have equal power to that of the beta, but it is a different role.

Gandalf also acts as sentry. When all the others are snoozing away, Gandalf is awake and alert, the first to dash over to any threat of intrusion or disturbance in the land beyond their territory, and if necessary he will sound an alarm call to rally the rest of the pack.

Self-regulation is an essential principle of the hierarchic concept. On one hand, its operations must be guided by its own fixed canon of rules, and on the other hand by indicators from a changeable environment. The environment has a definite influence on the rigidity or flexibility of behavior. Flexible strategies/degrees of freedom imply an awareness of alternatives and the ability to make choices.

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