

Chapter 4

The Conative Spectrum of Other Species

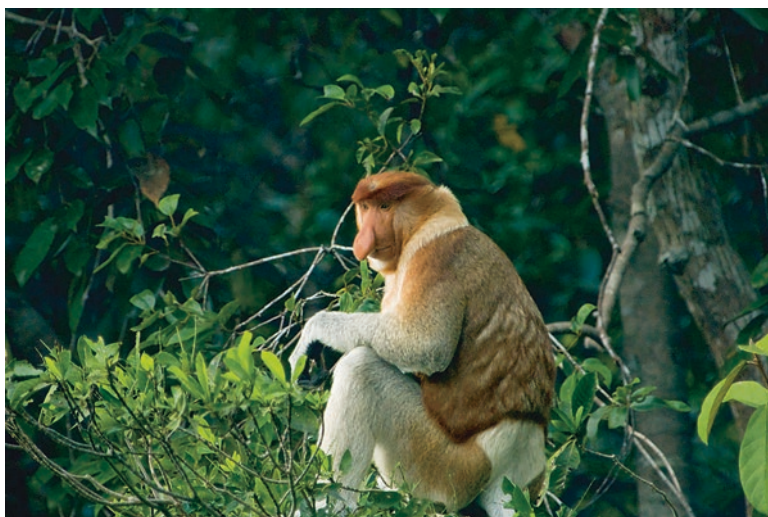
Fagan Bonds

In an essay in his *Psychology Today* column, Dr. Marc Bekoff provides a perfect overview of the fast changing nature of neurobiology as it continues to reveal fundamentals about other species that are critical to anthrozoology for the twenty-first century, minds that act upon thoughts and feelings.¹ The key is that all other species are now seen to possess the brain neurophysiology (those species that have brains) endowing them with the same preconditions for consciousness as we think of it among humans. This is, indeed, a game changer; our own doors of perception being blown wide open. Sea snails, which frequently live but one year, have demonstrated that in their old age some can become senile and their nerves have been studied which suggest precisely where senescence—perhaps with analogies to humans—is centered. They were actually “trained” by scientists (harassed with electric shocks and poking would be a better description of the training) to move their tails, and the reflex movements were measured according to the increasingly sluggish responses, deemed to translate into the onset of senility. Moreover, Giant California black sea hares, a cousin of sea snails weighing up to 30 lbs, have shown other evolved skills: ejection of ink-like clouds filled with amino acids that detract hare predators, like spiny lobsters, for a long enough duration to enable the hares to escape.²

¹ See <https://www.psychologytoday.com/blog/animal-emotions/201512/animal-minds-are-richer-science-once-thought>, Accessed March 15, 2016.

² “Senile sea snails are helping us understand memory loss,” by Robert Gebelhoff, *The Washington Post*, July 31, 2015, <https://www.washingtonpost.com/news/speaking-of-science/wp/2015/07/31/old-slimy-sea-snails-are-helping-us-understand-memory-loss/>, Accessed April 27, 2016.

Fig. 4.1 “Endangered Proboscis Monkey, *Nasalis larvatus*, Borneo,” Photo © M. C. Tobias



There is no quadrant of life, from a drop of Turfan Depression water and pinch of Boreal soil, to the deep ocean vents or even, bacterially, atop K2 that does not open up windows on the staggering intelligence and sensitivity of all life forms; not one of which ever discovered is so simplistic that we can create it ourselves. At the high altitude basecamps across the Himalayas, Karakoram and Hindu Kush, the life forms measure up in the millions of species, if not more, from Tahr (Asian wild goats), hemlock, poppy, snow leopard, and yak, to the millions of microbe species therein.

Cloning such creatures is an entirely different story of accounting and fixing the numbers: we’re basically just manipulating what is already there. But put all the Nobel Prize winners together throughout time, and they could not build anything that is alive which wasn’t already alive. Synthesis is no surrogate. Effects and consequences differ altogether from origins. Our thoughts and emotions respond to pre-existence. They cannot—in their wildest imaginative, emotional, and creative flights—invent it.

Brian Fagan’s book, **The Intimate Bond—How Animals Shaped Human History**³ opens with what may be the divining rod shaping the entire panoply of his (largely paleontological and archaeological) analysis of certain key species that went extinct and/or were domesticated instead by humans, shedding fascinating light on some of those otherwise obscured keyholes in the history of science. Fagan quotes from A. A. Milne’s **Winnie-the-Pooh**, “Some people talk to animals. Not many listen though. That’s the problem.”⁴ Chief Dan George (1899–1981) a leader

³ Bloomsbury Press, New York and London, 2015.

⁴ See <http://www.goodreads.com/quotes/29556-some-people-talk-to-animals-not-many-listen-though-that-s>, Accessed March 18, 2016.

of the Tsleil-Waututh Nation, of the Coast Salish band, said something similar: “If you talk to the animals they will talk with you and you will know each other. If you do not talk to them you will not know them, and what you do not know you will fear. What one fears one destroys.”⁵

In his “Chronological Table,” Fagan’s fascinating overview contains numerous highlights of the transformational relations between Ice Age cultures and wild horses, the first domestication of dogs, probably 15,000 years ago or so; 5000 years later, the domestication of animals like sheep and goats and pigs, bovines around 9000 BC, burros by 4500 BC, horses perhaps 500 years after that and within a 1000 years (3600 BC) the Botai peoples of southern Eurasia’s eastern Urals “almost certainly” were riding horses. By the time of Homer, data reveals that there were multiple “Assyrian donkey caravans” throughout the Levant; then camels were domesticated and eventually, in the Andes, Llamas, as well.⁶

With respect to dogs a recent finding by a large cohort of researchers investigating the origins of dogs determined they split off from wolves approximately 33,000 years ago in Southeast Asia.⁷ Others have argued, 8000 years ago. And yet another group of specialists, utilizing DNA markers, have ambiguously declared that dogs either originated in Europe or in China. If in China, then they probably migrated back to Europe with human companions “between 4000 and 11,000 years ago.” Given the estimated 1 billion dogs in the world, 750-million of whom are living without companion humans, so-called strays, the ones who “haunt the garbage dumps and neighborhoods of most of the world,” countless morphological and ethical issues arise when we speak of “man’s best friend.” A friend who, unlike wolves, does not regurgitate its food for its pups, and, according to studies by canine experts Ray and Lorna Coppinger, tend to choose which people, or person they will associate with, not the other way around.⁸

However one adjusts the approximate data sets, this all means that by 15,000 years ago the dogs, who evidently were in Europe within another 5000–10,000 years, could turn in to man’s loyal companion during extraordinarily low density relations with *H. sapiens*. The implications are important, though defy any easily established baseline that might predict mitochondrial versus genomic DNA and their relationships in terms of the evolution, not only of a species, but of its propensity for communion with another species; except to reiterate the basic difference: mtDNA, which manufactures its own tRNAs, passes down matrilineal ancestral information, which

⁵Cited by Carol Santora in her essay, “Speaking for the Animals Lost and Threatened,” <http://mahb.stanford.edu/blog/animals-lost-and-threatened/>, Accessed March 31, 2016.

⁶op.cit, Fagan, pp. 3–4.

⁷Cell Research, Cell Research advance online publication 15 December 2015; doi:[10.1038/cr.2015.147](https://doi.org/10.1038/cr.2015.147); “Out of southern East Asia: the natural history of domestic dogs across the world,” Guo-Dong Wang, Weiwei Zhai, He-Chuan Yang, Lu Wang, Li Zhong, Yan-Hu Liu, Ruo-Xi Fan, Ting-Ting Yin, Chun-Ling Zhu, Andrei D Poyarkov, David M Irwin, Marjo K Hytönen, Hannes Lohi, Chung-I Wu, Peter Savolainen, and Ya-Ping Zhang, Accessed December 24, 2015.

⁸See “Don’t Call Them Strays,” by James Gorman, ScienceTimes, The New York Times, April 19, 2016, pp. D1 and D6.

can be compared and contrasted with the greatly expanded nuclear DNA. In humans, for example, mtDNA has one chromosome, nuclear DNA has 46-23 from the male, 23 from the female.⁹

As with a proposed scenario relevant to the Canidae family lineage of 33,000 years ago, once again, today, we are seeing the split of canids throughout much of eastern North America, into such (awkwardly denominated) beings, as the coywolf.¹⁰ Once again, there is no predicting whether coywolves might succumb to any level of human domestication. If anything, experience is showing us that other predators venture near humans at their peril.

Fagan traces the evolution of interspecies relations, the many details, cruelties, mass hunting technologies (for example, the first established archaeological confirmation of rope “bits” and “bridles” used for conquering horses from between 3500 and 3000 BC; by 1200 BC bits of metal).¹¹ While Fagan systematically reveals how “the communication between hunters and animals goes back into deep time”¹² there is little to distinguish countless episodes that we might read into as shamanic trances (such as those rock paintings by the San peoples of the Drakensberg Mountains in South Africa) from sheer cruelty. Consider Fagan’s description of the following occurrences: “Until recently, San in the Kalahari Desert in Botswana still danced next to the carcass of a freshly killed eland. As they activated their potency, the medicine men (shamans) trembled, then sweated and bled from their noses. A dying eland trembles, sweating profusely, with melted fat gushing like blood from its wide-open mouth. Perhaps the San compared the human trance with the trauma of an eland in its death throes.”¹³ And while the British anthropologist E.E.Evans-Prichard was enthralled by the intimacy displayed by the Nuer peoples of the Nile in the southern Sudan towards their life-sustaining cattle¹⁴ whom they largely treated like royalty; or the fact that from primeval (what is today) Kentucky to ancient Egypt dogs and cattle were buried with ritual sobriety, or Alexander the Great’s horse, Bucephalus, treated (no surprise) like a King himself; that philosopher Michel de Montaigne (1533–1592) believed “that animals were more rational than people,”¹⁵ these rarely exhibited sentiments or waves of enthusiasm devolved,

⁹ See “Tracing Ancestry with MtDNA,” by Rick Groleau, NOVA, <http://www.pbs.org/wgbh/nova/neanderthals/mtdna.html>; see also, The Scientist, “Mitochondria Versus Nucleus Disruptions in the interaction between nuclear and mitochondrial DNA can lead to deficiencies in the mitochondrial energy-generating process, affecting fitness.” By Juliet Ash | February 15, 2013.

¹⁰ “Coywolves are Taking Over Eastern North America,” Marissa Fessenden, Smithsonian.com, November, 2, 2015; <http://www.smithsonianmag.com/smart-news/coywolves-are-taking-over-eastern-north-america-180957141/?no-ist>, Accessed November 28, 2015.

¹¹ op.cit, Fagan, p. 141.

¹² *ibid.*, Fagan, p. 11.

¹³ *ibid.*, Fagan, p. 10.

¹⁴ *ibid.*, Fagan, pp. 82–83.

¹⁵ *ibid.*, Fagan, p. 207.

ultimately, into such countering institutions as the slaughter houses in London. By 1750, according to Fagan, “at least 74,000 cattle and 570,000 sheep passed through the city’s Smithfield meat market alone that year.”¹⁶ A century later, “two hundred twenty thousand head of cattle and 1.5 million sheep now perished at Smithfield annually.”¹⁷

James Watt did not just invent a steam engine, but developed the measure of power according to “horsepower” and that entailed his experimenting with dray horses in a factory and pushing them so hard that he was eventually able to come up with his calculation, namely, that one horsepower was the equivalent of “4562 kg m (33,000 ft pounds) a minute.”¹⁸ But if all that sounds grim, consider Fagan’s description of London’s early nineteenth century so-called “Menageries,” like the one at London’s Bartholomew Fair, where “one collection of the large cats even allowed visitors free admission if they brought a dog or cat: they would watch it being fed to lions.”¹⁹ Such horrors have been inflicted in today’s world, to the alleged amusement for tourists sitting in buses in Harbin China as young calf are marched out to be devoured by tigers; to Copenhagen’s Zoo, where a healthy giraffe was shot so that four lions could eat it in front of visitors. And this is the madness in a city, Copenhagen, and a country, Denmark, revered by environmentalists for its largely green practices.

Now consider the scene in Icelandic Nobel Laureate Halldór Laxness’ **Independent People** (1934–1935)²⁰ wherein the young newlywed, Rosa slaughters the gimmer (a young sheep) at their home, Summerhouses. It is an indelibly gruesome scene; a heartless act of endless brutality that conjures millennia of some glaring truth beneath the scenery of rural life; the baleful pathology of human nature. When we turn towards that hope of true communion across species boundaries, we realize at once that the very formation of those walls and obstacles are surely more complex than all of our philosophies, psychoanalyses, and physics can demonstrate.

¹⁶ *ibid.*, Fagan, p. 217.

¹⁷ *ibid.*, Fagan, p. 217.

¹⁸ *ibid.*, Fagan, p. 242.

¹⁹ Fagan, p. 253.

²⁰ First published in two volumes in 1934/35; Halldór Laxness, *Independent People*, trans. by J.A. Thompson (London: Harvill Press, 1999).

Fig. 4.2 “A Starving Dog in St. Petersburg, Russia,” Photo © M. C. Tobias



A single week across the USA as documented by PETA best illustrates in word and pictures the landscape of a bereft humanity, as illustrated in the “Excerpts Cruelty Investigations Department—Week of June 13–17, 2016,” sent out on the 17th, Father’s Day in America. The “National Emergency Response,” as PETA calls it—exactly “200” incidents, each one more gruesome and outrageous than the next, encompassing species as diverse as cows, dogs, crows, cats, rabbits, ducklings, and many more: emaciated, trapped, tortured, in the unending abyss of deliberate human infliction.²¹

And one must not forget that 70 National Park “units” allow hunting.²² Moreover, many National Parks allow hunting right up to its borders, as if the animals are reading the signs.²³

²¹ Personal email from Ingrid Newkirk, President and Co-Founder of PETA, “Please don’t miss any of these mind boggingly sad cases in just one week,” 12.40 p.m., June 17, 2016.

²² National Parks Conservation Association US, “Hunting in the National Park System?” Blog Post by Jennifer Errick, April 25, 2012, <https://www.npca.org/articles/57-hunting-in-the-national-park-system>, Accessed June 17, 2016.

²³ National Park Service: Frequently Asked Questions: Firearms in National Parks, <https://www.nps.gov/mora/learn/management/upload/FirearmsPublicFAQs.pdf>, Accessed June 17, 2016.

Quantum Anthrozoology

In their endlessly fascinating study of quantum biology, Johnjoe McFadden and Jim Al-Khalili initiate the reader with something Einstein believed to be impossible but turns out to be true, namely “that quantum particles really can have instantaneous long-range links.”²⁴ With so much subatomic particle physics constantly making news, this should not come, necessarily, as a surprise. What was surprising, say McFadden and Al-Khalili was that in 1976 it was proved that the European robin possessed a rare navigational skill known as “magnetoreception,” and based upon the recognition that somehow “the angle of dip of the Earth’s magnetic field could be detected within an animal’s body,” or at least that of the European robin’s.²⁵ “Spooky connections,” and “the weird quantum property of entanglement.”²⁶ or, for short, “that spooky entangled connection that Einstein couldn’t accept.”²⁷ That same entanglement (also known as “nonlocality”), was shown in 1997 to enable rainbow trout in New Zealand (where the fish are nonnatives) to also utilize magnetoreception, and it was discovered how (at least in that species) they can “smell the direction of the Earth’s magnetic field.”²⁸

The authors explore the fact Plato had recorded Socrates as identifying that which separated inanimate nature from animate, in other words, that spooky thing which separates an allegedly lifeless grain of sand from a whale. It was “a soul” according to Socrates.²⁹ And, in the words of McFadden and Al-Khalili, something else: “proton tunneling in enzyme reactions” at the heart of all bio-molecules and hence of all life; “the discovery that some, and possibly all, enzymes work by promoting the dematerialization of particles from one point in space and their instantaneous materialization in another ...”³⁰

One fascinating glimpse into the potential resonance of such a concept is referenced by way of a particularly compelling discovery about the Orkney Island voles. They would go nowhere near a trap that had been baited with the scent of a predator that had not, in fact, ever stepped foot on the Orkneys for five millennia, namely, stoats.³¹ That level of olfactory sensitivity is only the beginning of the complexities and sophistication of species sensory acuities that go well beyond anything a primate, for example, might ever grasp, even in the annals of fiction, or so we assume.

If whatever borders constraining life remain to be better ascertained, so much more so the interrelatedness of all those life forms whose numbers, as sampled

²⁴ **Life on the Edge—The Coming of age of Quantum Biology**, Crown Publishers, New York, 2014, p. 15.

²⁵ *ibid.*, McFadden and Al-Khalili, p. 6.

²⁶ *ibid.*, McFadden and Al Khalili, p. 15.

²⁷ *ibid.*, McFadden and Al Khalili, p. 17.

²⁸ *ibid.*, McFadden and Al Khalili, p. 174.

²⁹ *ibid.*, McFadden and Al Khalili, p. 28.

³⁰ *ibid.*, McFadden and Al Khalili, p. 94 and p. 97.

³¹ *ibid.*, McFadden and Al Khalili, p. 139.

earlier, may come close to 10 to the 40th power of individuals. If we are to thoroughly gauge some level of the relational sensory intersects between them, incalculable as that task will forever be, imagine the more complicated scenarios before us at the cellular or atomic levels. Then add the barriers of the Anthropocene by which we have so demonstrably intervened, and the hurdles to understanding—while there is still time to even gather a hint of all that data—becomes a true race against time. One region, one country, one example.

The Many Glitches of Fairyland Zoology

Millions of gallons of toxic water burst from their containment at an iron ore mine in Brazil in November, 2015, polluting 300 miles of the Rio Doce river, leading into the Atlantic, an area already within the heart of the Mata Atlantica terrestrial biological hotspot (some 95 % of the original forested habitat—gone), but in this case a river with a known 90 fresh water fish species, of which eleven had already been identified as verging on extinction. More than a dozen people have died and, as one reporter for the Los Angeles Times wrote, “With Brazil’s level of biodiversity, the die-off is likely to include an untold number of species that have yet to even be discovered,” some probably like the aggressive brain-eating amoebas, *Naegleria floweri*, that can cause the usually deadly Primary Amebic Meningoencephalitis in humans, and found in fresh-water lakes and rivers of South Carolina, among other places.³²

Our barriers to understanding the sphere of contact, of communications, are enshrined in the continuous catastrophes we unleash. But often, of course, there is no blame. Blame is a strange word, when coupled with nature. But that there has been no surcease in documented memory of such devastations, like that occurring throughout the 400 hundred years of human European occupation of the Mata Atlantica (the only South American region that was formally established as the capital of a European monarchy, ungainly Portuguese settlers who had no idea how to approach Amazonian indigenous wisdom with respect to *terra preta*, human-created black, sustainable soil) escalates the biospheric stakes in ways we cannot divine.

Even where the cascade effects, multiple levels of trophic collapse and interdependent vulnerabilities are fairly straightforward, as across Madagascar’s orphaned forest habitats, we are still left with vast gaps, in more ways than one. A recent study by Sarah Federman of Yale University’s Donoghue Lab and colleagues³³ showed

³²“As Brazil mine spill reaches ocean, its catastrophic extent becomes clear,” by Vincent Bevins, Monday, December 21, 2015, L.A. Times, <http://www.latimes.com/world/brazil/la-fg-brazil-spill-20151220-story.html>, Accessed December 21, 2015.

³³“Implications of lemuriform extinctions for the Malagasy flora,” Proceedings of the National Academy of Sciences of the USA. Federman S, Dornburg A, Daly DC, Downie A, Perry GH, Oder AD, Sargis EJ, Richard AF, Donoghue MJ, Baden AL. 2016, PubMed, See: “Lemur extinctions in Madagascar leave behind doomed orphan,” by Fred Pearce, New Scientist, 11 April 2016, <https://www.newscientist.com/article/2083800-lemur-extinctions-in-madagascar-leave-behind-doomed-orphan-trees/>, Accessed April 27, 2016.

very clearly that with the extinctions of “17 species of fruit-eating lemurs in the past few centuries ... many trees are now entirely dependent on the two largest surviving lemur species, the black-and-white ruffed lemur (*Varecia variegata*) and the red ruffed lemur (*Varecia rubra*).” And those two lemur species, upon whose robust fruit seed dispersal most of Madagascar’s 33 species of *Carnarium* hardwood depend, are themselves in rapid decline, extinction looming. When they’re gone the whole primeval system will collapse. We’re seeing this in region after region. And one cannot simply blame it on poverty, as much as we could easily blame everything or nothing concerning the lives of Others on poverty.

In places like South Carolina, poaching of endangered native plant species, particularly orchids, even in protected areas like the Francis Marion National Forest close to Charleston, has reached epidemic proportions, driving many plants—like the high mountain white fringeless orchid—to near extinction. It’s not just the plants that are illegally stolen, but giant areas of soil containing species-specific nutrients and dormant seed source that can be revived because most of the seized plants themselves will die.

The poachers—375 of whom were arrested in the first 9 months of 2015 in various parks just in the state of South Carolina—know all about the soil, the seeds, and the law.³⁴ These defiant criminals are not impoverished Malagasy trying desperately to feed their families with the proceeds of bush-meat. These are intangible, much vaunted *middle class* Americans.

Flawed Algorithms and Interpolations

Our interpolations are inevitably our own algorithms, our own sciences, whether we follow in the fashion of a Darwin or Lamarck, Buddha or Mahavira, Christ or Shakespeare, Raphael or Jan Van Eyck. It matters not. We are merely guessing like dowsers with forked sticks. We speak of clades and synapomorphies—the shared behavioral traits of a monophyletic common ancestor in the case of all the species of foxes, as well as all of the more than billion sheep, 1.2 billion captive pigs, 1.2 billion domesticated bovines, 600 million captive turkeys, 40 million+ captive burros, etc. But we are not capable of entering into their worlds, whether wild, captive, or domesticated. Even our companion animals who we love, often more than other humans, are mysteries to us. Day and night.

In 2005, one of scores of articles began to question the intelligence of cows and chickens and all the other “Animal Farm” characters.³⁵

³⁴ See “Poachers seizing rare ‘on the brink’ native plants,” by Bo Peterson, The Post and Courier, September 26, 2015. <http://www.postandcourier.com/article/20150926/PC16/150929512/1005/poachers-seizing-rare-x2018-on-the-brin-x2019-native-plants>. Special thanks to Dr. Melanie DeVore. Accessed April 27, 2016.

³⁵ “The secret life of moody cows,” Jonathan Leake, Science Editor, The Sunday Times, Published: 27 February 2005, http://www.thesundaytimes.co.uk/sto/news/uk_news/article100199.ece,

“Once they were a byword for mindless docility. But cows have a secret mental life in which they bear grudges, nurture friendships and become excited over intellectual challenges, scientists have found,” writes Jonathan Leake. And he reports on one scientist, Christine Nicol, a professor of animal welfare at Bristol University, who he says describes the fact that “even chickens may have to be treated as individuals with needs and problems. Remarkable cognitive abilities and cultural innovations have been revealed.”³⁶

Fig. 4.3 “Hen and Human Friend,” Photo © J. G. Morrison



Epiphanies at the Boundary Level

The epiphanies we feel in the company of wild, or companion animals—a joyous realm, to be sure—nonetheless makes the “planetary boundaries” all the more troubling. This is a concept, best realized by way of a recent compilation by Johan Rockström and Matthias Klum, which, with Peter Miller³⁷ defines both present and extrapolated end-of-the-century scenarios for nine such boundaries: “Climate change; Stratospheric ozone depletion; Rate of biodiversity loss; Chemical pollution; Ocean acidification; Freshwater consumption; Land-use change; Nitrogen and phosphorus pollution; and Air pollution or aerosol loading.”³⁸ Among the scenarios are a potential 4°C (7.2°F) increase in global temperatures by 2100, accompanying carbon dioxide concentrations of 560 ppm with the present loading of nine billion tons of carbon annually³⁹; the fact our species has already “undermined 60 % of key

Accessed April 2, 2016.

³⁶ *ibid.*

³⁷ **Big World Small Planet—Abundance Within Planetary Boundaries**, Yale University Press, New Haven and London, 2015.

³⁸ *Ibid.*, Rockström et al., p. 67.

³⁹ *ibid.*, Rockström et al., p. 39 and 54.

ecosystem services in support of human wellbeing;”⁴⁰ “local-to-regional scale thresholds” which, in other words, fall under the radar of global data and in innumerable ways go far towards further undermining the resiliency of the biosphere. Write the authors, “there’s ample evidence that gradual changes in key variables such as biodiversity, harvesting of biomass, soil quality, fire, water flows, or nutrient cycles can trigger abrupt changes when critical thresholds are crossed in ecosystems such as lakes, forests, or coral reefs.”⁴¹ Such bottom-up, as opposed to top-down planetary boundary impacts have inordinate sway over the entire life force of Earth, and come down to two “core boundaries,” namely “climate and biodiversity.”⁴² Underscoring the climate crisis in a perspective hard to turn away from, the authors point to the following: During all of 2 weeks in July 2012, Greenland’s ice went from bright and reflective, to darker and absorbing; from net cooling to net heating, such that it released “300 exajoules (EJ), (10 followed by 18 zeros) of energy into the atmosphere” which is half of the world’s entire annual energy use.⁴³

The prospects for assuring temperance within the boundaries is all but shot. If, as Rockström, Klum, and Miller indicate, we must maintain at the very least 85 % of all tropical and boreal forests, and at least 50 % of temperate forests⁴⁴ then the chances of preventing total biological collapse have already passed us by, with some one third of all tropical forests gone, and nearly 50 % of all trees on Earth, gone. Extinctions cannot be remedied once their preconditions have been concretized. Hence, the ethological sciences are in so fragmented a state as to leave only traces of what is possible, at the planetary level. By 2009, the authors suggest humanity had already broken through a third of the nine planetary boundaries, including “climate change, rate of biodiversity loss, and the global nitrogen cycle.”⁴⁵ These barrier breaks have been economically analyzed by a number of assessment strategies including the UN Millennium Ecosystem Assessment, and the Economics of Ecosystems and Biodiversity (TEEB) studies. Three barrier breaks are equivalent to about 23 % of the planetary (human) GDP, but applying economics to this crisis is not our goal, nor is it remotely realistic. We simply cannot possibly grasp true biological value and those village microcosms and city sectors that have been applauded for their noteworthy wildlife and carbon-free resiliency experiments cannot remotely mirror a world of nearly 7.4 billion people, 95 % of whom are meat eaters and energy consumers. Some 50 % of those slaughtered animals end up as waste—they are not even eaten—150 kg (330 lb) per person in Europe.⁴⁶ Measuring such nonlinear correspondences between human demographics, consumption, extraction and biodiver-

⁴⁰ *ibid.*, Rockström et al., p. 43.

⁴¹ *ibid.*, Rockström et al., p. 69.

⁴² *ibid.*, Rockström et al., p. 71.

⁴³ *ibid.*, Rockström et al., p. 81; See also, “The NOAA Annual Greenhouse Gas Index (AGGI),” by James H. Bulter, and Stephen A. Montzka, Earth System Research Laboratory, Updated Spring 2016, <http://esrl.noaa.gov/gmd/aggi/aggi.html>, Accessed May 27, 2016.

⁴⁴ *ibid.*, Rockström et al., p. 76.

⁴⁵ *ibid.*, Rockström et al., p. 88.

⁴⁶ *ibid.*, Rockström et al., p. 184.

sity loss will surely be improved by the Global Observation System of Systems (GEOSS)⁴⁷ but the data does not begin to penetrate the communication shields. We can't see or hear or read what's actually happening. Communion data between species is so biased on so many human-induced levels as to be little more than a tease.

What we can see and hear involves morphology and field work. Back in the lab, we come upon the classic dilemmas of biodiversity research: ontogeny (the individual organism's development) versus phylogeny, the species' evolution, involving phylogenetic inferences that encompass traits that can be passed down. Phenetics looks for similarities between species. The systematics of the phylogenetic trees involve both cladistics and what is known as evolutionary taxonomy, wherein the differences between the evolution of an individual and of the species are merged to the extent methodically possible. Definitions are stifling and biologists continue to grapple in their search for more enlivening and tactical strategies for the meaningful naming of living organisms. By doing so, our various approaches to taxonomy enable us to come closer to recognizing the extent of these planetary and core boundary regions and their inhabitants, and, hopefully, finding socially accepted means of reconciling our species with as many others as possible. The great scientific tease made exponentially more frustrating. It is a daunting task, as underscored most recently in the treatise, "Avoiding collapse: Grand challenges for science and society to solve by 2050," with its extensive bibliographical record that firmly establishes highlights of humanity's awareness of the aforementioned challenges.⁴⁸

Imagination That Translates into Biological Success

Across the dizzying array of anthrozoological challenges, the key, we believe, to unlocking all of the daunting challenges that have backfired on human arrogance and arrogation, fundamentally addressed by our very inchoate natures, is that realm of human predilections that are, quite simply stated, *interested* in Others. An imaginative need that is akin to the chief precondition for true engagement, authentic collaborative virtue, biophilia. That means continuing to strive to understand the Others: Those whom naturalist George Ord first named the "terrifying bear" (*Ursus horribilis*) in 1815, referring to all of America's *U. arctos* spp.; but it also means the ravens in Bhutan (that nation's national bird) and Beatrix Potter's Flopsy Bunnies. The primary task of our human generation—other than to survive—is to imagine the infinite imaginations of our fellow species. We may never achieve fluency in any other animal or plant language, but we are coded in our own ineffable mysteries and this unreachable design quality of our own dreams, reveries and cognition is mirrored in the same qualia that is that of all Others. Hence, a common language of the

⁴⁷ *ibid*, Rockström et al., pp. 155–156.

⁴⁸ By Anthony D. Barnosky, Paul R. Ehrlich, and Elizabeth A. Hadly, *Elementa: Science of the Anthropocene*, doi:10.12952/journal.elementa.000094, <https://elementascience.org/articles/94>, Accessed March 24, 2016.

unknowable. That is, in and of itself, sufficiently relatable, the pensive prowess of all species. This inwardness sweeps the biochemical world and we are free to peruse it, not under any duress but for the bountiful poetry that is rewarded those who attempt the transactions and metaphysical transports between species.

In examining, for example, “large-brained social animals such as corvids,” scientists have realized extraordinary truths regarding “convergent evolution” as more and more species, in orienting to the massive planetary boundaries outlined above, find themselves developing a common currency of response strategies to ecological stress imposed by humans. Some species will be successful in doing so; many will not. Imagine, for example, if climate change were to utterly obviate the biological preconditions for all mammalian hibernation. What then? Would squirrels fare better than bears?

The more than 120 species of the Corvidae family have mental repositories encompassing “causal reasoning, flexibility, imagination, and prospection”—the clear ability to think into the future.⁴⁹ That Black-Billed magpies (*Pica hudsonia*) recognize themselves in a mirror, and one would surmise California Yellow-Billed Magpies (*Pica nuttalli*), as well⁵⁰; that Caledonian crows (*Corvus moneduloides*) use at least two kinds of tools (curved sticks for probing).⁵¹ These are merely minute components of a vast revolution in our understanding of Others pressing hard for new, revitalized views regarding the future of taxonomy that levels the playing field according to violence, nonviolence, success and failure—not reproductive success, but durability as an organism against the onslaught of ourselves.

How we *choose* the criteria; methodologies of inquiry; yardsticks of measurement; self-effacement for purposes of negating bias, will be critical in formulating detours in our itineraries and ethical boundaries between *in vivo* and *in vitro*. Outright *discussion* with Black Bears—as we think of the term—in the circumstances described earlier, will be all but impossible. Nor can we build scientific understanding on simulated encounters, or the accumulation of anecdotes derived from individuals who have survived some form of attack of a predator and are in the process of being rushed to ER. This is tricky business. There are guidelines—breached by the very prisons themselves—within biomedical labs. Out in the wild, common sense etiquette and humility must dictate the terms of engagement. Many people will have little guidance in navigating such critical waters, and this is a big problem for biosemiotics.

Ultimately, achieving some kind of revelatory basis for claiming knowledge gains suggests that true biological success involves a working imagination. Is there

⁴⁹ See “The Mentality of Crows: Convergent Evolution of Intelligence in Corvids and Apes,” by Nathan J. Emery and Nicola S. Clayton, *Science* 10 Dec 2004, Vol. 306, Issue 5703, pp.1903–1907, doi:[10.1126/science.1098410](https://doi.org/10.1126/science.1098410), Accessed January 9, 2016.

⁵⁰ Excerpt, “The Thing With Feathers; The Surprising Lives of Birds and What They Reveal About Being Human,” by Noah Snyder, March 26, 2014, Audubon, <http://www.audubon.org/news/excerpt-thing-feathers-surprising-lives-birds-and-what-they-reveal-about-being>, Accessed May 21, 2016.

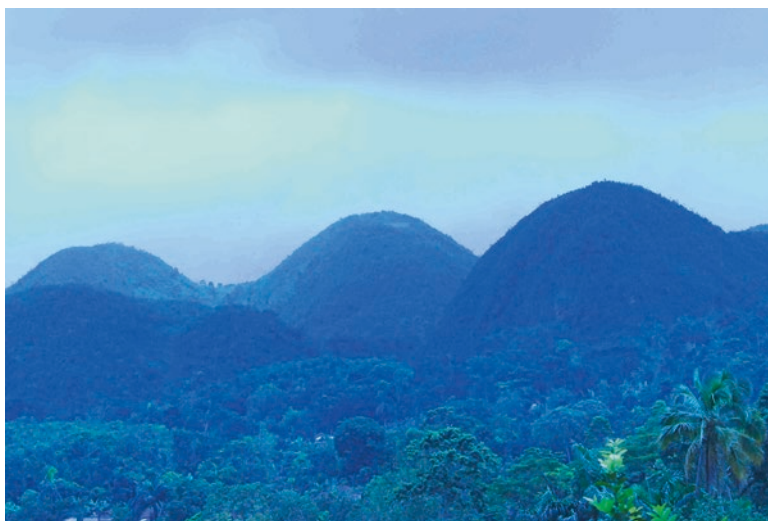
⁵¹ See <http://www.sciencemag.org/content/297/5583/981.short>, Accessed January 10, 2016.

a jumping spider, an octopus, a Borneo leopard who has what Mozart had? We think, absolutely “yes.” But by what tests, or rules of the game, or philosophical outlines do we establish reliable baselines for such *eurekas*? And, more importantly, who is counting? We wouldn’t be obsessed with measurements à la an Eratosthenes’ sieve, Ptolemy’s **Almagest**, an Archimedes’ “Sand Reckoner,” Newton’s Unit (Second Law of Motion), Planck or Einstein (1) if we weren’t a curious organism and (2) if we weren’t concerned about the causes and consequences of our ecological behavior as a species as it affects all others. That so many people do care conveys the hope of a human conscience and its prospects in a wounded world. And so we try to save frogs and trees, and keep the water clean, against odds—the number of human consumers on the planet—that are daunting.

Take, as but one cautionary example, the whistling, burrowing Mozart (*Eleutherodactylus Amadeus*) and Hispaniolan Ventriloquil frogs (*Eleutherodactylus dolomedes*). Both species were long thought to be extinct within Haiti’s Massif de la Hotte and Massif de la Selle, mountain regions rising above the southern coastlines near Les Cayes, the French community within Saint-Dominique, now known as Haiti, where John James Audubon was born in 1785 and spent his first 6 years.⁵² These two frog species were rediscovered as a result of a determined expedition by Conservation International’s Amphibian Group, led by specialist Dr. Robin Moore in partnership with Dr. Blair Hedges of Pennsylvania State University. They actually rediscovered a total of six allegedly lost amphibian species. Was this kind of expedition noninvasive, ethical by the best anthrozoological practices, such as we have been intimating/proposing? Particularly in a country with much more on its mind than lost frogs, following the devastating 2010 earthquake? Probably, yes. Forty-eight native Haitian amphibians were assessed by the expeditions and, ultimately, would help substantiate high rates of Hispaniolan endemism (a hotspot within the Caribbean hotspot); and thus the critical importance for galvanizing support of the nation’s first national park, Pic Macaya, a 150-km² heaven that, in re-stabilizing the watersheds and extending intergenerational ecotourism jobs and revenues for a deeply economically marginalized population of several hundreds of thousands of Haitians, could only be viewed as a winning combination of solutions.

⁵² Conservation international, “Mozart and Ventriloquial Frogs Sound A Note Of Hope And Warning For Haiti’s Recovery,” 1/11/2011, http://www.conservation.org/NewsRoom/press-releases/Pages/Mozart_Ventriloquial_Frogs_Hope_For_Haiti.aspx. Accessed May 21, 2016.

Fig. 4.4 “Pic Macaya National Park, Southwestern Haiti,” Photo © M. C. Tobias



The park comports with habitat, wildlife and human needs—needs of good family planning, medical care in general, education, jobs, safe drinking water—while also recognizing and satisfying ancestral spiritual traditions of communal commons and sacred trees within the circumspection of local Haitian Vodou. Those are some of the key cornerstones of any conservation balancing act. Haitian national park protocols are a good template for the rest of the world (as are those of Easter Island’s Parque Nacional Rapa Nui). In both cases, scientists, community leaders and policy experts are starting from enormous ecological deficits and trying to rebalance the biological budgets. So here are two telling case studies in defining ethical boundaries within responsible contexts. Most other countries in the world are commencing higher up on the scorecard of sustainable ground-rules.

In terms of the specific language-processing, interspecies communication data streaming from the re-discovery of these Haitian species, the very decision to attribute Mozart’s name, enlivens the science, the interest, the imaginative quest to restore ecological balance to whatever extent in the southwestern wilds of a country that has lost the vast majority of her primary canopy.⁵³

⁵³ See <http://www.haitian-truth.org/how-a-single-national-park-might-help-transform-a-nation-haitis-pic-macaya/>, Accessed May 21, 2016.

Fig. 4.5 “Pigeons and Humans in a Mexican Plaza,” Photo © M. C. Tobias



The Pigeon Test

Another way to assess the extent to which humanity is making strides in formulating protocols that are ethical is to consider our relationship with an easily observed group of birds who seem to have forgiven *H. sapiens* our past transgressions, namely, the family known as Columbidae, with its approximately 310 species of pigeons and doves. While their history has been celebrated, humans eat them, destroy them by any number of means, and have fashioned entire industries to “control” them. Yet it is estimated that there are probably no more than 400 million pigeons left in the world today.⁵⁴ That is a shockingly low number, considering that in mid-nineteenth century America, there were billions of just one of those many hundreds of species, the Passenger Pigeon (*Ectopistes migratorius*) and we assiduously made sure she went extinct by 1914, just in time for us to kill 17 million and injure and maim another 20 million of ourselves in World War I.

Pigeons, like hens, chickens and roosters, display astonishing diversities, behavior, social bonds, language and song, as well as beauty in most human’s eyes, certainly all those who delight at St. Mark’s Square in Venice and, before the laws

⁵⁴ See <http://ovocontrol.com/pigeons/pigeons/>, Accessed May 22, 2016.

turned squeamishly anti-pigeon, Trafalgar Square in London.⁵⁵ That same zoophobia can be seen in laws against feeding birds from Paris to Pasadena.⁵⁶ Ironically, it is in England's National Gallery, abutting Trafalgar, that the British Empire keeps one of its most touching and important works of art—along with a vast litany of paintings depicting horses, cows, sheep, and any number of other animals, both dead and alive—but, in this stated instance, we are referring to Titian's "Boy With A Bird,"⁵⁷ circa 1520s.

Pigeons have been awarded medals of heroism in war. One pigeon, Cher Ami, saved the 77th Division in the Battle of the Argonne in the autumn of 1918. One would hope such commendations might gain traction in a "general election" favoring pigeons; that a pigeon test might be employed to determine the humanism of any town, with its plaza; of any city and her denizens; of any country and the citizenry who either love, or, at worst, ignore pigeons. We have seen similar celebratory status granted monkey and rat temples in Nepal and India, Australia's Norfolk Island given over to cows, a cat island (Tashiromima), rabbit island (Ōkunoshima) and dragonfly parks in Japan, protected dogs and cows across the roadsides of Bhutan, revered Marsh Rabbits in the Florida Keys, Pig Island in the Big Major Cay (Bahamas), Ilha de Queimada Grande, the Snake Island off the coast of Brazil (teeming with Golden Lancehead Vipers), the U.S. Fish and Wildlife Refuge, the Farallon Islands, 28 miles west of the Golden Gate Bridge, Wrangel Island in Russia, between the Arctic Ocean's Chuckchi and East Siberian Seas, the rhesus monkeys on Cayo Santiago in Puerto Rico, the wild horse island (Assateague, in Maryland), live butterfly pavilions in London and Los Angeles, and gardens—everywhere, Beatrix Potter's house, and the outer green corridors of Kyoto being the historic global epicenters of this ancient human–nature affiliation.⁵⁸

⁵⁵ See *Pigeons: The Fascinating Saga of the World's The Naturalist's Library: Ornithology*, Vol. V. Gallinaceous Birds, Part III. Pigeons, William Jardine and Prideaux John Selby, *Most Revered and Reviled Bird*, by Andrew D. Blechman, Grove Press, New York, NY, October 10, 2007. See also: Published by W.H. Lizars, Edinburgh (1835); and *es Pigeons*. KNIP, Antoinette Paulette Jacqueline (1781–1851)—TEMMINCK Conrad Jacob (1778–1858). Published by Paris: Mame for Mme Knip and Garneray, [1808–] 1811.

⁵⁶ See <https://www.cabq.gov/environmentalhealth/urban-biology/pest-management/pigeons>; <http://www.dailymail.co.uk/news/article-394624/Pensioner-fined-50-feeding-pigeons.html>; <http://blog.sfgate.com/stew/2013/07/25/feeding-sf-seagulls-illegal/>; <http://www.woking.gov.uk/planning/envhealthservice/pest/pigeon>, Accessed May 23, 2016.

⁵⁷ NG933.

⁵⁸ See Atlas Obscura, "Animal Islands: Seven Islands Ruled by Creatures Great and Small," by Allison Meier, November 18, 2013, <http://www.atlasobscura.com/articles/guide-to-animal-islands>, Accessed June 4, 2016).

Fig. 4.6 “Visitors Meditating on the World’s First Signed Sand Garden, Ryoan-ji, Kyoto,” Photo © M. C. Tobias



UNESCO’s Creative Cities Network, founded in 2004, has 116 city members from dozens of countries, the idea being to nurture creative and sustainable urban environments.⁵⁹ The European Wilderness Society has developed its own Pan-European Green Corridor Network⁶⁰ There are humane networks throughout the world⁶¹ and greening trends everywhere—from cities with the most animal-friendly hotels, vegetarian-only condo complexes in Mumbai, to animal-friendly airlines. All of this should make a pigeon test a rather basic requirement for any Metropolitan Statistical Area (any urban conurbation with a minimum of 50,000 human residents).

When a village or city celebrates an animal, or identifies with a species, people take note. Explorer Ruth Harkness brought the first Giant Panda to the USA in 1936 and a contagion of celebrities and the public far and wide came to visit the bottle-fed Su Lin at the Brookfield Zoo outside Chicago.⁶² A Cephalopod, Inky the Octopus, plotted and successfully executed his own “Great Escape,” (the movie was in 1963) playing the roles of Steve McQueen, James Garner and Richard Attenborough, along with Director John Sturges all in one, the night he slipped through a labyrinth of constraints at the National Aquarium in Napier, New Zealand, successfully disappearing back into his home, the Pacific Ocean, having gotten through drain pipes and racing crossing many floors. Another Octopus named Paul picked all the winning teams in advance of Germany’s 2010 World Cup in South Africa, making quite a

⁵⁹ See <http://en.unesco.org/creative-cities/home>, Accessed May 22, 2016.

⁶⁰ See <http://wilderness-society.org/pan-european-green-corridor-network/>, Accessed May 22, 2016; See also, **Global Green Infrastructure: Lessons for Important Policy-Making, Investment and Management**, by Ian Mell, Taylor and Francis Group, 2016.

⁶¹ For one example, see <http://humanenetwork.org/>, Accessed May 22, 2016.

⁶² Harkness, Ruth. **The Baby Giant Panda**, 1938. New York: Carrick & Evans. p. 36.

name for himself; while many other Octopoda have lent glory to their urban captors by simply escaping human confinement.⁶³ These are all very sick kinds of enthusiasm, which should, in a logical world, put a mirror to just what is actually going on.

How can we feel confident of the Mozart frog analogy? Why must we be certain? “Certainty” would prove nothing; facts can be feckless in their influence; nor would some ecological “Day the Earth Stood Still”⁶⁴ or “The Voice of the Dolphins”⁶⁵ necessarily change the politics of our relations with other species. This is **Animal Farm**⁶⁶ writ on a planetary level where the ramifications of our acquired wisdom and religion have never consistently granted relations between people, let alone those causes and effects engulfing people in their orientations to personages of other species, any peace of mind.

Regardless of the measures likely to be enacted or not by our ever involving research into the minds of our fellow creatures on this planet, there is a fast-looming reality: we are most certainly newcomers to a biosphere buzzing with intelligence, wit, playfulness, imaginative solutions to problems, and creative juices, so to speak. This is the reality, a remarkable discovery in our backyards that changes everything—or it should; a backyard, in the most sublime sense, that will be examined later on this work.

Fig. 4.7 “Burro and Young Lady,” Late 19th century Anonymous Photograph, Private Collection, Photo © J. G. Morrison



⁶³ See “Octopus Escapes From an Aquarium in New Zealand,” by Dan Bilefsky, *The New York Times International*, April 14, 2016, p. A8.

⁶⁴ Twentieth Century Fox Corporation, 1951 based upon the novel, *Farewell to the Master*, [from *Astounding Stories* by Harry Bates, October 1940], Screenplay by Edmund H. North, Directed by Robert Wise.

⁶⁵ **The Voice of the Dolphins and Other Stories*, by Leo Szilard, Stanford University Press, Palo Alto, CA 1961.

⁶⁶ *Animal Farm: A Fairy Story*, by George Orwell, Secker and Warburg, London, UK, 7 August 1945.

Animal Intelligence That Challenges Our Own

Rex Harrison, as the character of Dr. Dolittle, declares that Polynesia, his companion Blue and Gold Macaw, must start teaching his languages to Dolittle at 7 a.m. the following morning. Sings Harrison, “If I could talk to the animals! Just imagine it”⁶⁷ Dr. Onur Güntürkün, a Professor of Biological Psychology in the Department of Neuroscience at the Ruhr-Universität Bochum⁶⁸ has been in the forefront of shaping that volition, confirming that the absence of laminated brains in birds, unlike the evolution of the brain in mammals, has not disadvantaged them. Rather, they have achieved a similar range of what is generally thought of as human “cognitive competence.”⁶⁹ This would not have surprised Hugh Lofting, author of the 22 Dr. Dolittle books, between 1920 and (posthumously) 2000, nearly 2500 pages of deliriously ethological meditation.⁷⁰

Says Güntürkün, “corvids use just 8.5 g of brain, whereas chimps need 400 g or more.”⁷¹ In accord with a wave of recent data suggesting that “birds may have miniaturized their brains to the extent that they have much smaller and much more densely packed neurons,” says Güntürkün, pigeons, to take yet another species example, have “ended up with a brain that has the same molecular mechanisms, the same kind of internal connectivity and organization, and the same kind of thought as a mammal’s brain, with high cognitive abilities, including self-recognition.”⁷² Such revelations go well beyond the state-of-the-art presumption of a decade ago regarding the allegedly superior evolution of the mammalian brain.⁷³ In those epiphanies was put forth the hypothesis that “a new layer of granule cells, giving rise to the laminated isocortex”—as projected to being necessary “to support fine topography in their [mammalian] sensory maps”—was analyzed.

More recently much weight has been added in favor of a new and necessarily transformative taxonomical perspective, coming out a whole wave of “sentience” studies. The emergence of the journal, “Animal Sentience: An Interdisciplinary Journal on Animal Feeling,”⁷⁴ a publication of the Humane Society Institute for Science and Policy, premiered its first issue, of 2016, in which the first published

⁶⁷ Lyrics/Music: Leslie Bricusse / Album: “Dr. Dolittle,” Publisher: 20th Century Fox/Hastings (1967) ASIN: B001THI2RQ, <https://www.youtube.com/watch?v=tOvIKgoeP4s>, Accessed May 23, 2016.

⁶⁸ See <http://www.rd.ruhr-uni-bochum.de/neuro/index.html>, Accessed January 27, 2016.

⁶⁹ See <http://www.sciencemag.org/content/306/5703/1903>, Accessed January 28, 2016.

⁷⁰ See *The Metaphysics of Protection*, by M. C. Tobias and J. G. Morrison, A Dancing Star Foundation Book, Waterside Press, 2014, pp. 62–84.

⁷¹ See “‘Animals do think’—surprising insights into the evolution of cognition and communication,” by Marilyn Larkin, 19 December 2013, pp.4–5, Neuroscience, <https://www.elsevier.com/connect/story/scientific-discovery/neuroscience>, Accessed December 25, 2015.

⁷² *ibid.*, Larkin, p. 5.

⁷³ See, for example, “The evolution of mammalian cortex, from lamination to arealization.” Montagnini A., Treves A., *Brain Res Bull.* 2003 May 30;60(4): 387–93, PubMed.gov; <http://www.ncbi.nlm.nih.gov/pubmed/12781326>, Accessed February, 3, 2016.

⁷⁴ See <http://animalstudiesrepository.org/animisent>, Accessed March 2, 2016.

essay by Steven Harnad concerns “Animal sentience: The other-minds problem,”⁷⁵ its Abstract commencing with something of a credo: “The only feelings we can feel are our own. When it comes to the feelings of others, we can only *infer* them, based on their behavior—unless they tell us. This is the ‘other-minds problem.’” In Donald M. Broom’s essay, “Considering animals’ feelings—Précis of Sentience and animal welfare,”⁷⁶ the scope of his concerns encompasses much of the periphery-free expanse of this new taxonomic topography. Broom includes such pivotal challenges to researchers as the declaration that “major change in attitudes regarding awareness and feelings in human and other animals has occurred as studies of behavior have become more detailed.” The fact that “Sentience implies having a range of abilities, not just feelings” and that one of those abilities could be construed as “moral behavior [as] a successful strategy used by both human and nonhuman individuals”; that “estimates of brain sophistication should take account of function rather than anatomy alone because animals vary in the parts of the brain that have complex analytical functions” all, in turn, segues into the (not surprising) embrace of the fact that “spiders have substantial cognitive ability and perhaps executive awareness”; that “there is clear evidence for aspects of a pain system in gastropod molluscs, such as snails, slugs, and swimming sea slugs”. In fact, says Broom, “All vertebrates, including fish, as well as some molluscs and decapod crustaceans, have pain systems.” And he is ultimately compelled to speculate, “Are there any solely human qualities?”⁷⁷

Fig. 4.8 “Nephilia Orbweaver in southern Suriname,” Photo © M. C. Tobias



⁷⁵ Animal Sentience 2016.001, <https://isc.uqam.ca/en/component/savrepertoireprofesseurs/ficheProfesseur.html?mId=ZOAHV0jyfrM>, Accessed March 6, 2016.

⁷⁶ Broom 2014, Centre for Anthrozoology and Animal Welfare, University of Cambridge, Animal Sentience, Issue Number 5, Accessed March 6, 2016.

⁷⁷ *ibid.*, Broom.

When one comes upon a bird like the Brown Thrasher (*Toxostoma rufum*), Georgia's State Bird, in the Mimidae Family, along with Mockingbirds, and the two New World catbirds, the Gray and Black, a serious problem arises as an example of how little we know, in answering that question. While the Brown Thrasher was first recognized by Mark Catesby in his monumental **Natural History of Carolina, Florida and the Bahama Islands** (the first such biological account in North America, published between 1729 and 1747), and subsequently identified (though named differently) by Audubon, the primary difficulty in grasping the eloquence and complexity of the Brown Thrasher is in its communication/musical skills. This largely monogamous species (surrounded by a complex of 171 protected species in Georgia [read: species that are vulnerable to extinction])⁷⁸ is, in essence, one of the Mozarts of North American birds, from what has thus far been heard: between 1100 and approximately 3000 *different* songs. The red-eyed Vireo sings as many as 20,000 songs per day, and much of that music has been thought of by people as if this elegant little songbird is perpetually asking questions and finding the answers, musically. The great North American tenor, Plácido Domingo is known for a repertoire of at least 150 works, in six languages. Comparisons are difficult. Friedrich Schiller, who wrote the poem "Ode an die Freude" ("Ode to Joy") in 1785⁷⁹ and from which Beethoven borrowed the text for his final movement of the Ninth Symphony, is said to have lamented the fact that this poem was somehow not in touch with reality. So something else was going on in the author's mind. And as for Beethoven, deaf to the music of birds by the time of his monumental composition, slowly dying, in part, from lead poisoning, relying on pre-acoustical memory, we will never be able to decipher that mystical genius that was able to adopt a depressed poet's words into so sublime a context. But if an indecipherable Viennese composer could do it, imagine what Brown Thrashers and red-eyed Vireo's are doing.

This is why anthrozoology is particularly an esoteric science: we simply know very little about our fellow life forms. Indeed, we know little about the "Beethovens" in ourselves. This craving across the blurred abyss of species is certainly elicited in such musical passions as Bach's wonderful Cantata, "Hertz und Mund und Tat und Leben" ("Heart and mouth and deed and life"), BMV 147, ten parts, first performed July 2nd, 1723. By those four parts, we have a gorgeous Oratorio, suited to every Christmas and must surrender to enjoyment, as opposed to analysis. Fortunately, with Bach, as with Domingo, and the Brown Thrasher, it is easy to do so, as has been the perennial case with the argument in countless guises for biophilia, and for such Big Categories as Faith, Hope, and Love.

Recently, Helen MacDonald, author of "**H is for Hawk**" penned an essay, "Why Do We Feed Wild Animals?"⁸⁰ in which she referenced a brief history of the wild animal feeding passion, including mention of the nineteenth century children's

⁷⁸ See <http://www.georgiawildlife.com/node/1366>, Accessed March 30, 2016.

⁷⁹ See <http://lucare.com/immortal/ode.html>, Accessed June 17, 2016.

⁸⁰ Helen MacDonald, The New York Times Magazine, January 6, 2016.

Dicky Bird Society whose pledge involved a love of other creatures, and the leaving of food for any number of vertebrate species, not just birds. In his landmark essay, “On the semiosphere,”⁸¹ the late Estonian, Juri Lotman (1922–1993) who taught at the University of Tartu, wrote, “Meaning without communication is not possible. In this way, we might say, that dialogue precedes language and gives birth to it.”⁸² By this wonderfully ecstatic prelude he edges into the notion (or “phenomenon” as he likens it) of “texts within texts”⁸³ and concludes, “After all is said and done, we can reduce these two axes to one: the development of right-left; that which, from the genetic-molecular level to the most complex information processes, forms the basis of dialogue—the basis of all meaning-making processes.”⁸⁴

Fig. 4.9 “Cecina River Valley, Tuscany, Italy,” Photo © M. C. Tobias



And

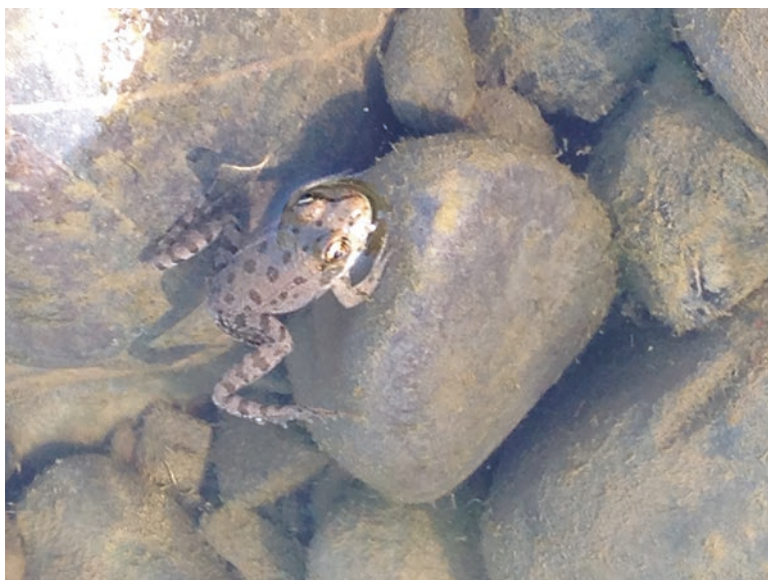
⁸¹ First published in Russian in 1984—О семиосфере—, translated by Wilma Clark and published in 2005 in *Sign Systems Studies*, 33(1): 205–229 in 2005.

⁸² *ibid.*, Lotman, p. 218.

⁸³ *ibid.*, Lotman p. 225.

⁸⁴ *ibid.*, Lotman p. 225.

Fig. 4.10 “Pool Frog in the Cecina River Valley, Tuscany, Italy,” Photo © M. C. Tobias



The Semiosphere

These linguistic implications for ethology of a planet-wide semiosphere are stunning. They enshrine the presupposition that our connection to all those Others is comprehensive: a full-body, mind, spirit, emotional, and psychological confluence that defines the biosphere. By that we are suggesting that there are illimitable interdependencies, prior to, during, and presumably well beyond the words and music we employ to grapple with this endlessly engaging choreography of living beings, ancestors, and future generations. The semiosphere is that world of passing signals emitted and received at every conceivable and inconceivable level, from subatomic motion and formation to electrical and magnetic conductivities; from psychic nuances to sensory confirmations. The cognitive mirrors that we perpetually gaze into, whether subliminally, or in the acutely present; whether as a subconscious reflection of our entire phylogenetic ancestry or in those premonitions which both haunt and look forward to communion with other species, are fundamental to our survival and self-appraisals.

Since the time of Don Griffin’s book, **The Question of Animal Awareness** (1976) “consciousness” in other species as been largely accepted by the zoological

community as a given.⁸⁵ Bees have most assuredly been perceived as having minds of their own. But this is not only obvious but beyond all species barriers, from invertebrates to viral, bacterial and prion species. As we have written elsewhere, between our (Jane and Michael) 206–270 bones and some 100 billion neurons in each of our brains, we weigh between us approximately 4480 ounces, whereas the average fly weighs in at 0.00035th of one ounce. Now, consider this premise: If we giants are not willing to spare a fly, what is the prognosis for a blue whale? The question is germane to the noösphere, that conceptual/spiritual realm in which the sum of our thousands of genetic generations are challenged to adopt a *new nature* that rises above self-importance, embracing instead both the fly and the blue whale. This is anthrozoology in its purest doctrine.

Albrecht Altdorfer's painting "The Battle of Alexander at Issus" of 1529 reveals what most military historians believe to have been between 25,000 and 108,000 soldiers. Between 1580 and 1590 the Flemish engraver Jan Sadeler, in his epic seven works, "Creation of the World," specifically Day Five, also populates his little piece of paper (7.7×8.8 in.) with hundreds of creatures, intimating tens-of-thousands of others. They have been squeezed by human conscience into artistic harmony that fully abides by some underlying unanimity such as Max Planck envisioned: a golden age, or Renaissance *aetas aurea* of consciousness even at the subatomic particle level, which Planck called a "constant" and for which, under different characterizations he won the Nobel Prize in 1918. As indicated earlier, all these numbers have biological significance that should not be underestimated. The brilliant spasm of Phanerozoic adoptions of hardened shells and vertebrate life forms (the last 542 million years of biological evolution encompassing the Paleo, Meso, and Cenozoic eras—*Era* from the Greek meaning "make life appear")—represents a protective legacy that is driving all forms of safe harbor today, from the deep-sea octopus (*Graneledone boreopacifica*) who nurtures some 160 eggs for up to 4 1/2 years, to the 590 day maximal limit of gestation for a Humpback Whale (*Megaptera novaeangliae*). Protection, *Aegis* in ancient Greek, is the key to such anatomical predilections and communication, by every conceivable means, that transpire between mother, father and offspring. It is emblematic of a semiospheric potential which we take to be—not a barrier between species, but the point of contact, or biological edge, where anything is possible, every gaze a valuable precursor to co-imagination and co-amelioration. Because remember, our hopes to assuage the pain in other species, the goals of ahimsa, or nonviolence, is a reciprocal promise.

⁸⁵ New York: Rockefeller. University Press, 1976.

Fig. 4.11 “Bhutanese Schoolchildren,” Photo © M. C. Tobias



This is a crucial departure from the Darwinian blockades erected ideologically between species for purposes of delineating reproductive capacities. Even among whales, there have been at least a dozen recorded hybridizations between fin and blue whales. Christian de Duve has written, “there is no such thing as the living cell. There are only living cells . . .”⁸⁶ Think of this as: in biology the idea of a barrier is a very tenuous one, and certainly no ideal. There may be reflexive *default buttons* in the behavioral delineations, but that is not destiny.

Similarly, and with deeply added behavioral nuance, the biologist Theodosius Dobzhansky, in reflecting upon natural selection said that “a really solitary animal is a rare phenomenon” and that “the fittest may also be the gentlest.”⁸⁷

Whatever states of being and information processing evolution is actually revealing to our lenses of perception, the blur between individuals connotes a commensalism of thought without limit. We know this to be true instinctively. It is instinctive in humans to make connections, not breaches; to form bridges rather than chasms. It is easier for us to add than to subtract; to construct rather than deconstruct. Such potential favors species collaborations, not disassociation. Conversely, when Picasso completed his perfect sketch of a bull, the result of 11 lithographs in 1945 and 1946, each rendering with fewer strokes, he is famously quoted, “A picture used to be a sum of additions. In my case a picture is a sum of destructions.” His de-construct-

⁸⁶ **A Guided Tour Of The Living Cell**, Volume One, Illustrated by Neil O. Hardy, Scientific American Library, New York, N.Y. 1984, p. 1.

⁸⁷ **Mankind Evolving—The Evolution of the Human Species**, Yale University Press, New Haven Connecticut, 1962, pp. 132–136.

tionist point alludes to a profound ambiguity in all translations: we can describe them as simple or as complex. Add meaning, or suggest meaning through minimalism. John Ruskin worried that the emergence of the new world of photography would kill the art of landscape painting. But we have learned over time that details are infinite and so are the opportunities for greater and greater understanding, compassion, and the celebration of that which we *don't* know or understand. At some point we must surrender to joy.

When answers to questions are not forthcoming; when responses from other species confuse us, cannot be sorted out, reject our version of story-telling and logic, as they almost entirely do, we fill the dystopian abyss with our singular hubris. We feel our profound isolation. As the only entirely arrogant species we can be certain that this attitude of Self, this quality of mind that rejects distribution of individuality throughout our families and communities has resulted in a massive restriction. We have restricted the boundaries of our concessions to the Others, but there can be no doubting the contributory elements inherent to the biospheric processes that give rise to species deeply choreographing their relationships in real-time, for purposes that obviously must perpetuate diverse life forms, attachments between and betwixt species—we've known this for at least 200,000 years—born of shared habitat and desire and curiosity. In other words, the intransitive in all linguistics, that which has no object, cannot come to closure, remains a biological hope. It is overflowing with such hopes. Investigators like Thales, Lao-Tzu, Mahavira, Buddha, Aristotle, the Essenes, the Van Eycks, Dürer and Savery, Jan Van Breughel and Francis Bacon, Linnaeus, Buffon, Darwin, and Wallace et al. merely catalogued diminutive emblems of these hopes; named small and imaginative examples, postulated elegant if basic formulations, only to witness every generalization dashed by astonishing anomalies and more inventive approaches by life, with each passing generation.

Fig. 4.12 “A Moai on Rapa Nui (Easter Island), Chile,” Photo © M. C. Tobias



Sentience is not in that category of hope: it zooms in without debate or delay onto the hot mantle of our feelings. But questions and answers are definitely lodged in our cognitive inwardness, blocked, though by no means forever, not necessarily so. Every question we may ever pose is pinioned on the very real potential for breakthrough.

Hence, when we speak of the genetic distinctions, for example, between sea slugs, land snails, bananas, pocket mice and primates, including ourselves, we see that the pantheistic embrace of their relative equality comes down to what it is they occupy in order to survive; the eco-niche and the behavioral downstream effects of that environmental constraint and/or liberation. The evolution of plants—gymnosperms, angiosperms—devolves to naked, or sheathed seeds, and what this says about other boundaries, or lack of boundaries in the communication process.⁸⁸ While botanists would view this as a largely reproductive and distribution of genes issue, within that causal universe it is an information-based reality. Heredity, the broadcasting of seed, the perpetuation of a species against all odds, is as much about evolution as it is communication. This is a challenging notion because it begs the issue: who is speaking to whom, and by what means, in what languages, and how can we humans be sure of anything, let alone take part in the conversations?

With respect to the earlier referenced American Black Bear (*Ursus americanus*) the 16 subspecies can all converse, mate, consume similar diets and, most importantly, they communicate verbally, nonverbally, but also via a written record, leaving marks on trees (senior males leaving their marks the highest on both hard and soft mast-bearing trees). These elevated hieroglyphics also convey scents, something the Egyptian litterateurs and chroniclers never considered. Also thoroughly communicative about those 16 subspecies, each has evolved slightly different coloring, from all black in places like Michigan, to brown or cinnamon in the Rockies, to pure white, the *Ursus americanus kermodei* of British Columbia. A continental-wide series of manifested communiques in living color.

The Disambiguation of Ethics

As recently as 25,000 years ago, different *Homo* species were mating. The blur is ongoing between species, calling into question the taxonomic verities that have been continuously re-evaluated. So what we call a species is, in fact, a unit of information that is open to re-definition. Our keynotes and stanchions all hinge upon our ideas of nature. Pillars of physiological investiture that are vulnerable to a multitude of variations. As Einstein so famously indicated, we cannot possibly solve problems by relying upon the same modes of thought and expression in which those very problems are couched to begin with. We have to think beyond. Moreover, at the level Einstein was contemplating, we know today that six elements have disappeared from nature (numbers 95–100 on the periodic table) and can only be resurrected

⁸⁸“The Gymnosperm Database,” <http://www.conifers.org/zz/gymnosperms.php>, Accessed June 17, 2016.

(300,000 atoms being the microscopic threshold for observation) in a laboratory.⁸⁹ For the comparative ethologist, this, in turn, obliges us to prepare for anything, in terms of what might be possible between all species (known and unknown). In fact, it re-assembles all the traditional conventions of species definitions, as well as almost daily exobiological discoveries of other inhabitable planets; and seeks to promulgate new assessments for what “life form” ultimately means; and why it is so important we humans take an interest.

Most importantly, the numbers, ideas, preconceptions and what we think of as fundamental scientific truths fall sway to ethical deliberations in our time that must recognize differentiation throughout the biological Kingdoms, but even more so, similarities that are the precursor for meaning, as cognized by the aforementioned Juri Lotman when he wrote of “dialogue,” “meaning,” “communication,” and the making of meaning. Every anatomy ushers in behavior. The interdependency of ecosystems encompassing species and individuals guarantees that evolution is simply another word for communication: dialogue at every level of ontology, phylogeny, and the vast loom of genomes craving their moment in the sunlight or the darkness. To grasp this precocious chat-room of species is to acknowledge from the outset that there are psychological, emotional, psychic, and trans-species energetics which necessarily incite both silent and loquacious appeals to relational points-of-view and direct contact between individuals.

These myriad of personages are, from the human vantage point, ambassadors of tens-of-millions of language groups, if we can understand language as a semiotic outpouring commensurate with survival of individuals whose species are driven to encourage them and their loquacity for purposes of perpetuation, but also, for the multiple contacts—not unlike any social media network—that irresistibly craves the companionship instantly discernible in every biome. Interestingly, in John 1:14, “the Word Becomes Flesh.”⁹⁰ That flesh has undergone speciation, the term evidently first applied by an American botanist, Orator Fuller Cook (1867–1949) to distinguish cladogenesis from phyletic evolution within lineages.⁹¹ When 135 distinct Mexican bird species were analyzed recently, new overlays for phylogenetic and evolutionary species definitions were applied, resulting in a very different number of taxons. Indeed, 122 of the species were suddenly viewed in a revived, vigorous light, suggesting that they were not what they have previously been thought of and, indeed, were new species altogether, under new prevailing definitions.⁹²

⁸⁹ See Emsley, J. (2011). *Nature's Building Blocks: An A-Z Guide to the Elements* (New ed.). New York, NY: Oxford University Press; See also, Silva, Robert J. (2006). “Fermium, Mendelevium, Nobelium and Lawrencium”. In Morss, L.R.; Edelstein, N.M.; Fuger, J. *The Chemistry of the Actinide and Transactinide Elements* (3rd ed.). Dordrecht, The Netherlands: Springer Science + Business Media.

⁹⁰ See <https://www.kingjamesbibleonline.org/John-1-14/>, Accessed March 20, 2016.

⁹¹ Cook, O. F. (1906). “Factors of species-formation”. *Science* 23 (587): 506–507, doi:[10.1126/science.23.287.506](https://doi.org/10.1126/science.23.287.506). PMID 17789700. Accessed March 3, 2016.

⁹² “An Alternative Species Taxonomy of the Birds of Mexico,” by Adolfo G. Navarro-Sigüenza and A. Townsend Peterson, *Biota Neotropica* vol.4 (no.2) <http://www.biotaneotropica.org/br/v4n2/pt/abstract?taxonomic-review+BN03504022004>, Accessed December 20, 2015.

Consider that a pig in 1266 at Fontenay-aux-Roses, was tried and sentenced to death while in 1750 a female donkey (a jenny) was acquitted in a court of law, witnesses attesting to the donkey's virtue. Not the same outcome for an endangered Western Lowland Gorilla at the Cincinnati Zoo over Memorial Day, 2016, shot dead by zealous zoo emergency response who killed the 17-year-old Harambe, a demonstratively affectionate individual who was, by most eye witness accounts, protecting the little boy who had crawled through the enclosure, then fell 15 ft into a shallow moat and there met the gorilla. Rather than tranquilize the magnificent and magnanimous ape, he was murdered. 140,000+ protestors signed a petition that the zoo and parents should be charged with Harambe's death.⁹³ All survivors were rightly (in our view) acquitted. The tragedy cannot be undone. The lesson harkens back to the ambiguity referred to above, with respect to Picasso's "Bull" and how it is that humans over evolutionary time come to view other life forms.

History casts different spotlights on animal rights and human wrongs. The point to be followed is that historically we have provided proxy legal settings for other species which inherently signals in the human spirit a latent if not entirely activist lure towards the company and collaboration of non-humans. It is a biological absolute: we cannot live without them. We seem inherently to recognize that we are all one, and that the taxonomic differences devolve to a langue scientifically self-important but which may, in fact, have little to say to those of us who identify entirely with other species. Eye to eye. In other words, there is a clear and continuous blurring, throughout human history, of natural selective borders between species.

Equally blurred is human perception of the remarkable proliferation of species. Sharks, for example. Humans kill well over 100-million of them per year, and most of their great diversity is heading towards Threatened and Endangered categories; while they harm a miniscule number of humans annually. Now, Port Jackson sharks in Australia—the most common in the waters of that continent—have been re-examined with a keen eye towards their penchant for socializing and friendliness, so contrary to the conventional notion of perfectly evolved robotic-like killing machines. "If you grab them, they tend to be passive. Kind of like a pet." According to a lead scientist for an ongoing study, Dr. Culum Brown at the Behavior, Ecology and Evolution of Fishes Laboratory at Macquarie University suggests that "the sharks liked to dine together."⁹⁴

We arrive upon the great unraveling of the crucial global (our multiple hominid) evolutionary gap and consequent outrage—and expressly, our great human foible—which has singularly precluded us from grasping a spectacular fact: Every other species has achieved both it's voice and it's ear, as it were, accommodating the biotic transitions from the Antarctic to Inhaca; from Yasuní to the Galápagos; from the Las

⁹³ *"Gorilla shot dead at Ohio zoo after dragging four-year-old boy who fell into enclosure," John Minchillo, The Associated Press, National Post, May 29, 2016, <http://news.nationalpost.com/news/world/gorilla-shot-dead-at-ohio-zoo-after-dragging-four-year-old-boy-who-fell-into-enclosure>, Accessed May 30, 2016.

⁹⁴ p. D6, "The Friendly Side of Sharks," by Laura Parker, The New York Times, January 12, 2016. Accessed January 12, 2016.

Tres Marias in Mexico's waters (later to be discussed in detail) to New Zealand's Ulva Island within the Rakiura archipelago. Like the invisible newly hypothesized ninth planet, this ninth Symphony is invisible only to our species. Though we do have the astonishing capacity to console ourselves with Beethoven's Ninth, he like several other hugely sensitive and evolved humans absolutely confirms the theory: we talk to the animals but refuse to listen to them. The seeming complexity it is not: no algorithm is necessary to compute the great gap waiting to be closed. Human violence in all its forms ("progress, civilization, superego") also obfuscates the transmission of languages between every species and that of humans, if not the outright folding of the proteins to predispose our genetic phylogeny and 22 amino acids to turn away from that which we dimly conceive to be all too real: an holistic living biosphere whose purpose we do grasp by way of our enthrallment at her beauty.

Fig. 4.13 "Two Friends" Photo © J. G. Morrison



Despite there being over 6090 spoken human languages,⁹⁵ countless more dialects (165 indigenous languages just in North America) and many more in our collective global past⁹⁶ Arik Kershenbaum⁹⁷ of the National Institute for Mathematical and Biological Synthesis has suggested that "The problem for scientists is that no one

⁹⁵ **Ethnologue**, 19th edition, by Gary Simons, February 22, 2016, <http://www.ethnologue.com/ethnoblog/gary-simons/welcome-19th-edition#.V00tgiMrLX8>, Accessed May 30, 2016.

⁹⁶ "How many languages are there in the world?" by Stephen R. Anderson, With Contributions from David Harrison, Laurence Horn, Rafaella Zanuttini and David Lightfoot, Linguistic Society of America, 2010.

⁹⁷ See http://www.nimbios.org/personnel/pd_Kershenbaum, Accessed May 30, 2016.

knows how language evolved.” Of course, there have been thousands of theorists weighing in on this topic. “Oddly enough,” Kershenbaum continues, “there don’t seem to be any transitional proto-languages between whale and bird songs—said to be the most sophisticated animal calls—and our own speech.”⁹⁸ Employing a mathematical repetition Markov model (predictable events in array predicated upon immediately preceding short-sounds, calls, alarms, etc), with the presumption that “there is a defined window of [read: linear] history that can be used to predict what happens next,” Kershenbaum writes, “What makes human language special is that there’s no finite limit as to what comes next.”⁹⁹ With that presupposition fixed and arguably core to the global semiotic database, Kershenbaum’s research utilized the recordings of “wild rock hyrax, a small and furry rabbit-like critter that grunts, wails, whistles, and barks, along with calls of free-tailed bats, Carolina chickadees, Bengalese finches, orangutans, pilot whales, and killer whales. [And] For comparison, he also threw in the text of Shakespeare’s “Hamlet” as a sample of human language.” Kershenbaum and team found for each species studied under this straight forward (and simplistic, mechanical) guise, that nothing made sense (any wonder?); those animals studied each went far beyond simple Markovian predictions.¹⁰⁰ None of this should come as a surprise. Comparing Hamlet to hyrax or, for that matter, Wittgenstein to a whale, must necessarily make for the scratching of heads. Most notably, with regard to the former, the poignant declaration at the conclusion of his *Tractatus Logico-Philosophicus* (1922), “He must surmount these propositions; then he sees the world rightly./Whereof one cannot speak, thereof one must be silent.”¹⁰¹

But without fully engaging the language of that colossal quantum of aesthetics and the ethically sublime, nor its nullity in silence, we are like, perhaps, the burning remedy that intercedes between our stunned silence (inwardness) and hope to reconnect with the Others—and there is little time left to activate it. And just possibly all this is not so much a question of biomechanics, as of some generalized linguistic philosophy that can rewrite the code of human etiquette. Like the young scientist, Mingming Yang, who was deeply involved in the search for the Higgs boson subatomic particle, and on a journey to southeastern Alaska, to focus on “compassion,” and “humanity as a whole,” said, “I am often asked, ‘What is the use of the Higgs boson?’” To which she replied, “I want to say, ‘It is not to make use of.’”¹⁰² This level of humanity and humility, in turn, might start (and rapidly) to influence our behavior towards Others. We need to dispense with obsolete linear presumptions, taking our cue from the wind through, say, an Aspen grove; glean the infinite, yet clonal reactive sounds; that indescribable bliss of a million leaves chiming in the

⁹⁸ See http://www.nimbios.org/personnel/pd_Kershenbaum, Accessed May 30, 2016.

⁹⁹ *ibid.*, Kershenbaum.

¹⁰⁰ “Chirps, whistles, clicks: Do any animals have a true ‘language’? by Meeri Kim, August 22, 2014, <https://www.washingtonpost.com/news/speaking-of-science/wp/2014/08/22/chirps-whistles-clicks-do-any-animals-have-a-true-language/>,” Accessed May 30, 2016.

¹⁰¹ *Tractatus Logico-Philosophicus*, by Ludwig Wittgenstein, With an Introduction by Bertrand Russell, Harcourt, Brace & Company, Inc., New York, 1922, p. 189.

¹⁰² “Scientific pursuit: A detour,” by Sonia Luokkala, Los Angeles Times, June 1, 2016, p. A2.

brightness of daylight; an eternal, if ephemeral ballet that admits to know analysis for which we should ever dare claim responsibility. Rather, let us be assured that language transcription is simultaneously engaging and jettisoning life particles into the wind; accessing individual trees from both the inside and outside. We, who hear it, marvel at it, already possess the same “Airs on a G-string” (from J. S. Bach’s 3rd Orchestral Suites or Overture No. 3 in D major) in ourselves.¹⁰³

We have it in ourselves as much as it exists in the living world. Yet, despite it being on our *inside*, most of us, we imagine, fail to actually *listen* to it, the way we would listen to Vivaldi’s “Le Quattro Stagioni” (“The Four Seasons”), or to a waiter reeling off the delicious specials of the day.¹⁰⁴

Yet, stubbornly, our inchoate music of the spheres and languages of nature on our *inside* are fully predisposed to engaging every dissonance and harmony, yet resist hearing it—thus precluding it—the infinite Vivaldi’s and Handel’s of the natural world—from being made accessible to those human disciplines that so impact all that lives. The true origin of species is the creation of beautiful meaning. That restless music is ongoing. We know this to be true from an infinity of glimpses out every window of the human soul. But we fail to embrace the code that would enable us to achieve universal harmony; that codex, the many psalters, bestiaries, missals, enchiridions and Books of Common Prayer that have been calling to us since our morphological inception. We have cracked the code: it’s all in how we phrase the question and what we expect the answer to achieve. Humility—unsettling and breathtaking humility—can biologically emerge under great stress. Such has always been the case from the first Archaea, including the prokaryotic thermophiles, halophiles, acidophiles, and methanogens, creatures of extreme environments (by human measure) who must be saying and singing of life eternal; of fiery spectacles and interstellar-like nuance.¹⁰⁵

Their bacterial endospores, surviving for millions of years, even upon meteorites, have long been studied and are testimony to a life force that has little reason to be interested in primates like us. But we should be interested in them. Imagine the rudiments of a translation algorithm between humans and even a single species of bacterium?

They teach us that friction, stress, working through hardship, and ultimately, collaboration, is at the root of every evolutionary force we think of as successful.

In sum, we believe we’ve reached the tipping point enabling the code to which we’re referring to become manifest. We hope to thoroughly examine and elucidate this cipher so that other humans can appreciate, if not engage in it outright. Our fellow creatures deserve nothing less and there’s no more time to waste.

¹⁰³ See <https://www.youtube.com/watch?v=GMkmQlfOJDk>, Accessed June 17, 2016.

¹⁰⁴ See *A Vision Of Nature—Traces of the Original World*, by M. C. Tobias, Kent State University Press, Kent, Oh, London, UK, 1995, Chapter 5, pp. 121–130; See also, Everett, Paul (1996). *Vivaldi: The Four Seasons and Other Concertos, Op. 8*, Cambridge: Cambridge University Press.

¹⁰⁵ See <http://webprojects.oit.ncsu.edu/project/bio181de/Black/single-cells/single-cells.html>, Accessed May 15, 2016.

Ecological Communion

An example from one hour ago. I (Michael) was out walking along the slightly flooded 220-mile long Oconee River (named after the now extinct Hitchiti, a language group of the Muskogean family which includes Choctaw and Creek-Seminole, among others) as it flows past the “Greenway” of Milledgeville, Georgia. The river has high levels of point and non-point pollution, but there are large wild regions of swamp and heavy concentrations of birds, as many as 422 known to exist in the whole state of Georgia. I was alone on a dirt trail a few feet above the fast moving high green water, which stretches several hundred feet across, merging eventually with the Ocmulgee into the Altamaha, eventually spilling into the Atlantic some 51 miles south of Savannah. Among the dozens of rare, threatened, and endangered species is a vascular plant named *Franklinia alataamaha* discovered in 1765 by William Bartram, but virtually never seen since. As described by the Georgia Conservancy, “... a multitude of creeks, sloughs and oxbow lakes, are refuges for alligators, wood ducks and wild turkey. At least 125 species of rare or endangered plants and animals exist along the Altamaha River. Birds such as the bald eagle and swallow-tailed kite, soar above its banks. The shortnose sturgeon and the manatee swim through the Altamaha’s lazy meanders. The gopher tortoise and the eastern indigo snake coexist among its sand ridges, and the sandbars and sloughs are home to seven species of pearly mussels that live nowhere else in the world.”¹⁰⁶

But on this Thursday afternoon, at 1:12 p.m. I found myself face to face for over 15 minutes with the closest living visual relative of the virtually extinct Ivory Billed Woodpecker—a large male *Dryocopus pileatus*, the Pileated Woodpecker. Considered to be “Uncommon” but of “Least Concern ver 3.1” by the IUCN, given its relative abundance throughout North America.¹⁰⁷ It was not the first time I had seen this largest of all known living woodpeckers of North America in the wild, but it was the longest encounter I’d ever had with a member of this species in so undisturbed and solitary a location. In observing each other—and it was a mutual observation fest—I came away wanting to know everything about this gorgeous being. One goes immediately to resources provided by the Cornell Ornithology Laboratory.¹⁰⁸

Essentially, the mates are loyal, they will not leave their territory, their cavity nesting provides subsequent homes for other vertebrates, and their vocalizations are deemed to be frequent but limited in range. Their coloring, reproductive rates, and requirements for large sized mature forest species are part of their increasing rarity, as old forests get destroyed.

There he was searching for beetle larvae, possibly other insects, but mostly resting and keeping an eye on me. Our communion was more than just the two of us. Rather, I found myself encountering one of the last wild rivers and surrounding

¹⁰⁶ See <http://www.georgiaconservancy.org/diy/paddle-the-altamaha.html>, Accessed February 24, 2016.

¹⁰⁷ See <http://www.iucnredlist.org/details/22681363/0>, Accessed June 17, 2016.

¹⁰⁸ Bull, Evelyn L. and Jerome A. Jackson. 2011. Pileated Woodpecker (*Dryocopus pileatus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/148>; <http://bna.birds.cornell.edu/bna/species/148/articles/introduction>, February 25, 2016.

forests in all of the southeastern USA and this resident avian was my momentary guide to that far-reaching habitat. Riparian biomes that included “bottomland forests, cypress and mixed cypress-hardwood swamps, hardwood hammocks, pine flatwoods, pine forests bordering riparian areas, freshwater and brackish marshes, wet prairies, sloughs, and pastures.” Ideal habitat for not only the woodpecker, but also Mississippi and the quite beleaguered Swallow-tailed kites.¹⁰⁹

The question hinges on the Other: his mind, his spirit, his intentions, his life-cycle, and the great dream that might encompass something beyond my own thoughts; allowing for a reciprocity that would enrich my life, and his. This is at the heart of any anthrozoological significance, let alone purpose.

I could not help but relate the Georgian pileated—whose language this day in Milledgeville confounds me in stymied bliss—to that of the California acorn woodpecker’s prodigious elocutions; *Melanerpes formicivorus*, with whom, when in California, I hear and see daily: 65–90 g, 13–15 cm wing length. There are no acorn woodpeckers east of California that we know of, but that’s a whole other story. Much like the geographical isolation of the “Tennessee Walkers” of South America, Maned Wolves.¹¹⁰ Yuan Yao describes how “waka calls” “were *individual-specific* in the acorn woodpecker.” In Yao’s research, the differences between waka calls from different individuals were sufficient to allow individual identification of at least 11 birds at a fairly high accuracy (94.1 %) ... The waka call, says Yao, is “the most common vocalization in the acorn woodpecker”¹¹¹ and he also recognizes that “The social system of the acorn woodpecker is among the most complex of any bird.”¹¹² Yao’s impressive analysis “implied that both [of the birds] may contain individual cues that could be perceived and responded [to] by other distant individuals” and that the “syllables, *wa* and *ka*, contributed to the individuality of waka calls.”¹¹³

Early on, Yao distinguishes between calls and songs, suggesting that “vocal communication may be the main form of social communication in the acorn woodpecker, and particularly important for understanding its social complexity.”¹¹⁴ All of this analysis suggests a highly sophisticated polymathic capacity which, in fact, is pervasive throughout the biosphere. Now, consider, by comparison, the size of the pileated woodpecker: average adult weight, 300 g, 11 ounces, and wingspans of 40–49 cm.¹¹⁵ For the

¹⁰⁹ See http://www.georgiawildlife.org/sites/default/files/uploads/wildlife/nongame/pdf/accounts/birds/elanoides_forficatus.pdf, Accessed February 25, 2016.

¹¹⁰ “Studies of Vocal Communications in Cooperatively Breeding Acorn Woodpeckers (*Melanerpes formicivorus*,” Dissertation by Yuan Yao, UCLA, 2008, UMI Number: 3356519; Copyright 2009 by ProQuest LLC, Ann Arbor, MI, p. 105, 5.1.1 “Vocal individuality in acorn woodpeckers,” Accessed February 26, 2016.

¹¹¹ *ibid.*, p. 6.

¹¹² *ibid.*, p. 3.

¹¹³ *ibid.*, p. 105.

¹¹⁴ *ibid.*, p. 120.

¹¹⁵ Woodpeckers: An Identification Guide to the Woodpeckers of the World by Hans Winkler, David A. Christie & David Nurney. Houghton Mifflin (1995); See also: “The Ecology of the Pileated Woodpecker,” Sally F. Hoyt, Ecology Vol. 38, No. 2 (Apr., 1957), pp. 246–256, Published by: Ecological Society of America, doi:10.2307/1931683, Stable URL: <http://www.jstor.org/stable/1931683>, Accessed February 26, 2016; See also Cornell’s All About Bird recordings https://www.allaboutbirds.org/guide/Pileated_Woodpecker/sounds, Accessed February 26, 2016.

Pileated Woodpecker their complex music (and/or language) is characterized in a series of recordings dating to the early 1950s which include: slow and fast “Wuk” series calls, “Waa” and “Wok” (sic) calls, “various calls by juvenile,” “Begging calls of nestlings” and “Drum,” “Drum with double-tap,” and “Tapping.” Listening to tapping in a cooperative breeding species, is inherently a magnificent preoccupation. Focusing upon a bird’s song, not for a second or two, but in earnest, is the ecstasy of learning and speaking a new language. The bird’s genius summons all of our physiological acumen. It is preconditioned because it co-evolved for tens-of-millions of years hearing other avifauna, presumably at one point, the acorn woodpecker. Hence, my inevitable comparisons.

There is a woodpecker envy inevitability within our co-creative aptitudes. This would explain why at least 60 million Americans listen to bird calls; are stupefied by avian language as it alliterates, transliterates and helps us to slip into that deep trance-like state accompanying the human enlistment of pleasure and contemplation. It is the acoustical gaze that is our joy and inspiration and assuredly arises in tune with our listening to a fine symphonic composition, performed flawlessly, as if a chord, a harmony had continued unabated, abetted by manifold echoes in a great Medieval cathedral; a primordial cave, the Chartres of all cochlea and auditory nerves. The woodpecker, this day, is both a visual sensation, brilliant, directed eye-flow, peering right at me with a gunner’s precision, but also arousing in me a medley of ossicle motion, those three bones in my middle ear which ultimately connect with the nerves responsible for my brain picking up every possible sound wave this enormous bird is conveying.

Fig. 4.14 “Victoria Crowned Pigeon, *Goura victoria*, New Guinea,” Photo © M. C. Tobias



But in both the Acorn and Pileated Woodpecker analysis and recordings, what is entirely absent, in our opinion, is corresponding research into the all-important subjective realm, the attitudinal realm of human response. This is key to bypassing the

science and focusing upon unconscious delectation that equates with identification of one on one; human and woodpecker. This is the missing link that goes to the core of all our scientific objectification of language in other species. It misses, in other words, the real opportunity to become part of the semiosphere and thereby gain altogether different understandings. Subjective anecdotes have more cumulative weight of science than science herself. Emily Dickinson's 14 acres of botany, her gardening, was possibly more important to her understanding and expression of poetry, than the poems themselves.¹¹⁶

Devolving from fact to feeling is key to breaking the barrier codes of interspecies communication. Writes Ferris Jabr, "She [Dickinson] meticulously dried and flattened a wide range of species—chestnut, dogwood, poppies, lilac, nasturtiums, even a couple of algae—and artfully fixed them to paper, christening many with the appropriate Latin names In her 1789 poems, Dickinson refers to plants nearly 600 times and names more than 80 varieties, sometimes by genus or species." More than 350 of those plants were flowers. She was, according to Jabr, disinterested in going to Church after the age of 38 "because she had found her personal Eden in her gardens."¹¹⁷ Dickinson's family's property, called Homestead, had a greenhouse completed in 1855 and from her devoted explorations and nurturance emerged a pressed book, now at Harvard containing "more than 400 plants."¹¹⁸

The late Alexander Skutch estimates he studied over a period of 60 years, mostly in Costa Rica, the life histories of some 200-bird species but never banded or collected them. He simply knew them, including one of his personal favorites, the Golden-naped Woodpeckers, because the male and female always slept together.¹¹⁹ Skutch also loved hummingbirds, of which he was probably the world's leading expert. But he also delighted in Laughing Falcons, particularly the communication specifics between the male and female when a male would bring his mate an acquired snake for a meal and the ten minutes of discussion typically attended upon their dinner preparations. Gruesome from our animal rights perspective, but real.

Skutch, not unlike Thoreau and Dickinson, defies the scientific method, which is precisely where we believe zoosemiotics must focus if it is to be, ultimately, relevant to the crisis of the Anthropocene. One example of language usage among humans may suffice to intimate the breadth of this proposition and it comes from a remarkable book, **Beethoven And His World**¹²⁰ In one essay, by Tilman Skowronek, "Keyboard

¹¹⁶ See <https://www.emilydickinsonmuseum.org/landscape>, Accessed May 15, 2016.

¹¹⁷ *ibid.* See also, "The Lost Gardens of Emily Dickinson," by Ferris Jabr, *Science*, The New York Times, May 13, 2016, http://www.nytimes.com/2016/05/17/science/emily-dickinson-lost-gardens.html?&moduleDetail=section-news-1&action=click&contentCollection=Science®ion=Footer&module=MoreInSection&version=WhatsNext&contentID=WhatsNext&pctype=article&_r=0, Accessed May 20, 2016.

¹¹⁸ *ibid.*, Jabr. See also, MS Am 1118.11. Houghton Library, Harvard University. Herbarium, ca. 1839–1846.

¹¹⁹ See "An Interview with Dr. Alexander F. Skutch," by Richard Garrigues, <http://www.angelfire.com/bc/gonebirding/skutch.html>, Accessed March 3, 2016.

¹²⁰ Edited by Scott Burnham and Michael P. Steinberg, Princeton University Press, Princeton NJ, 2000.

Instruments of the Young Beethoven,” the author concludes, “Consequently his sometimes extreme musical notation from this period may be seen as a faithful reproduction of what was possible for Beethoven the pianist on the instruments of the day, rather than as idealistic, visionary, or transcendent transcriptions of musical ideas (impossible to be performed literally by *any* pianist).”¹²¹ Later, Skowronek adds, “Only the most exuberant (poetic would be the term in the early nineteenth century) text, by [Ignaz von] Seyfried, comes to the point of stating that the ‘stoutest structure (of the instrument) scarcely could withstand’ Beethoven’s ‘forceful utterances.’”¹²²

In context, both Beethoven and the woodpeckers have everything in common. Next time you find yourself wandering in central Georgia, keep that in mind.

Comparative Sentience and Sapience

In 2009, a provocative study was published in *Bioacoustics*, *The International Journal of Animal Sound and its Recording*.¹²³ The concept collectively defined was deceptively commonsense. Write the authors, “Individual recognition of animals from their vocalizations would enable researchers to better understand ecological and behavioral interactions. If animals have the ability to recognize individuals of their own species from their sounds, then there ought to be ways of classifying such sounds as belonging to certain individuals.”¹²⁴ In establishing a base-line of research, the authors reference assessments of language-making (in addition to what must be characterized as sophisticated calls, or telling songs) that go with the “Yellow-bellied Marmot *Marmota flaviventris*,” “Eagle Owl *Bubo bubo*,” “Piping Plover *Charadrius melodus*,” “Gunnisons Prairie Dog *Cynomys gunnisoni*,” “Zebra Finch *Taeniopygia guttata*,” and “Indigo Bunting *Passerina cyanea*.” In each instance, different methodologies, including “fuzzy logic” had been employed by the many researchers cited, leaving an impression of essentially an endless series of tactics that could be strategically applied towards an empirical outcome or outcomes.¹²⁵

The *Bioacoustics* international journal has been in publication since 1988. In the most recent 2015/2016 issues, species-specific research has included such features as “Syntax of complex bird song in the large-billed reed warbler (*Acrocephalus orinus*),” “Differences between male, female and juvenile haddock (*Melanogrammus aeglefinus* L.) sounds,” “Handling dolphin detections from C-PODs, with the development

¹²¹ *ibid.*, Skowronek, p. 177.

¹²² *ibid.*, p. 192.

¹²³ See [https://www.researchgate.net/profile/Alexander_Kirschel/publication/235457987_Using_songs_to_identify_individual_Mexican_Antthrush_\(Formicarius_moniliger\)_A_comparison_of_four_classification_methods/links/004635284d0e6b2d3a000000.pdf](https://www.researchgate.net/profile/Alexander_Kirschel/publication/235457987_Using_songs_to_identify_individual_Mexican_Antthrush_(Formicarius_moniliger)_A_comparison_of_four_classification_methods/links/004635284d0e6b2d3a000000.pdf), 2009, Vol. 19, pp. 1–20; See also, “Using Songs To Identify Individual Mexican Antthrush *Formicarius Moniliger*: Comparison of Four Classification Methods,” by Alexander N. B. Kirschel, Kent A. Earl, Yuan Yao, Ivan A. Escobar, Erika Vilches, Edgar E. Vallejo and Charles E. Taylor, © 2009 AB Academic Publishers.

¹²⁴ *ibid.*, Kirschel et al.

¹²⁵ *ibid.*, Kirschel et al., pp. 1–2.

of acoustic parameters for verification and the exploration of species identification possibilities,” “Variabilities in the performance of the spectrogram correlation detector for North-east Pacific blue whale calls,” and “Distribution of sound pressure around a singing cricket: radiation pattern and asymmetry in the sound field.”¹²⁶

In one recent study vocalizations of seven widely distinct taxa were examined.¹²⁷ Write the authors in the opening of their Introduction, “Some species have vocal repertoires of tens or even hundreds of discrete elements; others have only a handful but use them to generate a wide variety of combinations ... An individual mocking-bird *Mimus polyglottos* can mimic over 100 distinct song types of different species, and combine them into diverse sequences. Even the rock hyrax *Procapra capensis*, using no more than five discrete vocal elements, creates long vocal sequences that are rarely the same on repetition.”¹²⁸

And continuing: “Thus, even species with few vocal elements can sometimes generate an apparently unbounded range of possible combinations. Such varied vocal behaviour raises the question of the role and origin of complexity in animal vocal communication, and the comparison of vocal complexity across taxa, including human speech.”¹²⁹

The precursor to such revelations hinges, in this research piece on a few key suppositions: (1) that “human language uses ‘context-free grammars’ (CFGs) that are capable of generating recursive sequences and unbounded correlations”; and (2) that a “Markov chain” is “the most common model used to examine animal vocal sequences” (referring to the fact that any syllable B used in a language utterance must be determined by a previously used syllable A).¹³⁰

Andrey Andreyevich Markov, mentioned earlier in this book, was a Russian mathematician (1856–1922) whose work on stochastic processes has been adopted in numerous disciplines, including linguistics. In the study of animal languages, it is disingenuously didactic and reductionist in that its sole basis for probability interpolations hinges upon what happened in a linear, previous occurrence, and can thereby predict what will happen next. There is no margin of error, no coda at the conclusion of a sonata form¹³¹; no latitude for creativity, whimsy, or the unpredictable. It is, in other words, a cold calculus akin to machine memory and prediction, like Morse Code.

¹²⁶ Taylor & Francis Online, http://www.tandfonline.com/loi/tbio20?open=1&repitition=0#vol_1; See <http://www.tandfonline.com/action/showAxaArticles?journalCode=tbio20>, Accessed March 3, 2016.

¹²⁷ “Animal vocal sequences: not the Markov chains we thought they were,” by Arik Kershenbaum, Ann E. Bowles, Todd M. Freeberg, Dezhe Z. Jin, Adriano R. Lameira, and Kirsten Bohn, The Proceedings of the Royal Society of London B: Biological Sciences, 20 August 2014, doi:[10.1098/rspb.2014.1370](https://doi.org/10.1098/rspb.2014.1370), Accessed March 3, 2016.

¹²⁸ *ibid*, Kershenbaum, et al.

¹²⁹ “Animal vocal sequences: not the Markov chains we thought they were,” Arik Kershenbaum, Ann E. Bowles, Todd M. Freeberg, Dezhe Z. Jin, Adriano R. Lameira, and Kirsten Bohn, *Proc Biol Sci.* 2014, Oct 7; 281(1792): 20141370, doi:[10.1098/rspb.2014.1370](https://doi.org/10.1098/rspb.2014.1370), PMID: PMC4150325, p. 1, <http://rspb.royalsocietypublishing.org/content/281/1792/20141370.full>

¹³⁰ *ibid.*, paragraph 3, of Introduction, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4150325/>

¹³¹ See **Sonata Forms**, by Charles Rosen, W. W. Norton & Company, 1988.

Despite these simplistic problems, it has been manifest in much research concerning other minds and other languages. In the case of the mockingbird, and those species studied by Kershenbaum and colleagues¹³² the authors concluded that despite the application of non-Markovian approaches to understanding other animal communications, “To the best of our knowledge, no extant species other than humans have a true language, with an unlimited ability to communicate abstract concepts.” And they go on to declare, “Although many non-human animal species have essential precursor abilities, such as vocal production learning, contextual reference and non-semantic syntax, only humans have a grammatical structure that is sufficiently complex for true linguistic potential. Since no non-human species demonstrate proto-linguistic grammars, proposed mechanisms for the evolution of language in humans remains speculative.”¹³³ However, of great interest, the authors also posit “a convincing and evolutionarily plausible mechanism that could explain the qualitative gap between the regular grammar of animal communication and the CFG [context free grammar] of human language.”¹³⁴ They cite one fascinating example: “Recent work has indicated that complex syntax can develop as the result of simple neurological changes; for example, in Bengalese finches, which have syntax qualitatively more complex than their wild ancestors.”¹³⁵

If ecological stressors induced by *H. sapiens* results in even minute transformations in the communications among other species, than we shall have ample reason to recognize, and work to amend out presence in a manner that more faithfully acknowledges our compatriots in other species here on Earth, and cedes our own sense of superiority at the level of scientific enquiry. That would, in essence, have the appearance of a heathen’s concession, its peer review given over to a new kind of pluralism that has forsaken the idolatry of Self in favor of the Other. A jail escape, in other words, from Plato’s Cave. Nothing could be more welcome. That cave echoes in every human definition of human language. It is, thereby, a tautological abyss, a black hole from which no word or concept can ever hope to be liberated into the outer language spheres of other species where reunion triumphs over words and thoughts and feelings might gain mutualistic pleasure and enlightenment.

In his overview of human linguistic diversity, for example, W. Tecumseh Fitch writes, “Although all animals communicate, and all vertebrates (at least) have concepts, most animal communication systems allow only a small subset of an individual’s concepts to be expressed as signals (e.g. threats, mating, food or alarm

¹³² op.cit., Meeri Kim; and Kershenbaum et al.

¹³³ Kershenbaum et al., *ibid.*, p. 9.

¹³⁴ *ibid.*, p. 10.

¹³⁵ *ibid.* Kershenbaum et al., p. 10, citing Katahira K, Suzuki K, Kagawa H, Okanoya K. 2013 A simple explanation for the evolution of complex song syntax in Bengalese finches. *Biol. Lett.* 9: 20130842 (doi:[10.1098/rsbl.2013.0842](https://doi.org/10.1098/rsbl.2013.0842)).

calls, etc.).”¹³⁶ Yet it is well known that Mustached bats, for example, have at least 33 syllables that are composited in language—imagine their number of consonants? And then compare that linguistic sum with the earlier referenced theory that the first speaking Homos employed no more than three vowels.¹³⁷ That baboons recognize both faked words and specific letters.¹³⁸ That various species of dolphins, prairie dogs, whales, and sea lions have syntax in their languages, meaning phrases, precise association, manipulation, and sentence construction using a combination of linguistic elements meaningful to those individuals rendering an articulation, as well as to their target listeners. In other words, a most sophisticated communication, at the very least, according to a human’s grasp of the concept. Caribbean reef squid, bonobos, and elephants have each shown communication traits that can be readily disentangled (by human bystanders) from any other possible explanation of successfully transmitted codes and modalities of speech and other expression signifying intended and specific meaning.¹³⁹

¹³⁶ “Unity and diversity in human language.” *PhilosTrans R Soc Lond B Biol Sci* 366 (1563): 376–88. doi:[10.1098/rstb.2010.0223](https://doi.org/10.1098/rstb.2010.0223). PMC 3013471. PMID 21199842, p. 377. <http://rstb.royalsocietypublishing.org/content/366/1563/376.full#ref-list-1>; Accessed March 14, 2016.

¹³⁷ Kanwal, J. S.; Matsumura, S.; Ohlemiller, K.; Suga, N. (1994) “Analysis of acoustic elements and syntax in communication sounds emitted by mustached bats”. *Journal of the Acoustic Society of America* 94 (3): 1229–1254. See also, *Hear Res.* 1990 Dec;50(1-2):259–73. Cochlear resonance in the mustached bat: behavioral adaptations. PubMed, Henson OW, Koplas PA, Keating AW, Huffman RF, Henson MM. <http://www.ncbi.nlm.nih.gov/pubmed/2076977>, Accessed June 26, 2016.

¹³⁸ Haghghat, Leila. “Baboons Can Learn to Recognize Words”. *Nature: International Weekly Journal of Science*, April 12, 2012.

¹³⁹ See “The Secret Language of Elephants,” Dec. 26, 2010, <http://www.cbsnews.com/news/the-secret-language-of-elephants2/>, Accessed March 14, 2016; “The Secret Language of Dolphins,” National Geographic Kids, by Olivia Bluejay, 14 October 2012, <http://kids.nationalgeographic.com/explore/nature/secret-language-of-dolphins/#dolphin-communication.jpg>; Cloney, R.A.; Florey, E (1968), Accessed March 14, 2016. “Ultrastructure of cephalopod chromatophore organs: *Zeitschrift fur Zelforschung und mikroskopische Anatomie* (Vienna, Austria: 1948)” 89 (2): 250–80. doi:[10.1007/BF00347297](https://doi.org/10.1007/BF00347297). PMID 5700268; Byrne, R.A., U. Griebel, J. B. Wood & J.A. Mather 2003. “Squids say it with skin: a graphic model for skin displays in Caribbean Reef Squid (*Sepioteuthis sepioidea*).” http://www.geo.fu-berlin.de/geol/fachrichtungen/pal/eigenproduktion/Band_03/05.pdf. PDF (3.86 MB) *Berliner Geowissenschaftliche Abhandlungen* 3: 29–35, Berlin 2003, Accessed March 14, 2016; See also, Savage-Rumbaugh, E. S.; Fields, W. M. (2000). “Linguistic, cultural and cognitive capacities of bonobos (*Pan paniscus*)”. *Culture and Psychology* 6 (2): 131–154. doi:[10.1177/1354067X0062003](https://doi.org/10.1177/1354067X0062003); See also, Holder, M. D., Herman, L. M. & Kuczaj, S. III (1993). “A bottlenosed dolphin’s responses to anomalous gestural sequences expressed within an artificial gestural language,” in H. R. Roitblat, L. M. Herman & P. E. Nachtigall (Eds): *Language and Communication: Comparative Perspectives*, 299–308. Hillsdale, NJ: Lawrence Erlbaum, Accessed March 14, 2016.

Fig. 4.15 “Peter’s Epauletted Fruit Bats, *Epomophorus crypturus*, Echolocating Diurnally, Isle d’Inhaca, Mozambique,” Photo © M. C. Tobias



The work of Caitlin O’Connell’s study of African male elephant rituals, hierarchy and astonishing communication mechanisms comes to a magical close near the conclusion of her book **Elephant Don—The Politics of A Pachyderm Posse**.¹⁴⁰ O’Connell describes “elephant songlines,” the male’s apparent attempts to align themselves with “compass directions,” relating her observations to studies of magnetic sensitivities in other mammals—dogs and cows, for example—and she summons remarkable insights as to how the elephants she observed were engaged in “synchronizing behavior,” “coordinated infrasonic energy in both the air and ground,” a pachyderm communication system utilizing seismic detection, trunks to the ground for an hour at a time, looking for sounds, contents, communication from their peers, sending out “seventeen-meter long soundwaves,” even using their “front and back feet as sense organs to quadruple the distances between sensors” while “searching for seismic signals.”¹⁴¹

As early as 2005, in examining several whale species, using an underwater Sound Surveillance System and global acoustical maps, Christopher Clark, Cornell University’s I.P. Johnson Director of the Bioacoustics Research Program, working with U.S. Navy researchers Chuck Gagnon and Paula Loveday, had recognized what Clark called “ocean-based” geographic scale for sending and receiving song that can travel “thousands of miles of ocean.”¹⁴²

¹⁴⁰ University of Chicago Press, 2015.

¹⁴¹ *ibid.*, pp. 231–232.

¹⁴² “Secrets of whales’ long-distance songs are being unveiled by U.S. Navy’s undersea microphones—but sound pollution threatens,” by David Brand, <http://news.cornell.edu/stories/2005/02/secrets-whales-long-distance-songs-are-unveiled>, Accessed April 29, 2016.

A Ménage à Trois in the Sea of Cortez

In the late 1990s (Michael) was swimming miles from shore far out in the Sea of Cortez, naked and alone, when I was accompanied by two whale sharks (*Rhincodon typus*) on either side of my astonishingly tiny body, by contrast with my new friends. I had been down there helping to make a film on whale sharks, many years before this region would be protected officially by Mexico.¹⁴³ We communed in a timeless séance that forever transpires in my memory as multiple eternities of feeling and conveyance. I don't know how many minutes or hours we were together—but it was a significant period of time. From what I could discern, they each weighed over 30,000 lb or more. Swimming along their entire lengths, measuring their distance (using my shoulder to finger tips of my right arm as a ruler) from their five gills to their dorsal and pectoral fins to their tails, I estimated 35–40 ft in length, each colored in their unique Matisse royalty. As the three of us doddled like an easy, quiet Chopin Nocturne, atop the warm luscious waters, my eyes touched their respective eyes. Their skin, so smooth and elegant. They moved almost motionlessly, eyes sparkling with, well, it had to be love, joy, innocence. At one point an explosion of Bottlenose Dolphins and Heermann's Gulls nearby caught their attention (certainly mine) but only as a brief distraction, for I was their focal point. The three of us had met, exchanged every curiosity and curtesy, and finally went on our separate ways, but not before I had come to know them. They were a couple, he with clasper, she (ovoviviparous) with cloaca. I was fortunate they did not try to mate in my presence. Being larger than school buses, I would have been perilously in the way. Our eye contact said it all, at least for me. If this world, or the Creation, as some think of her, has ever tested nonviolence in the largest fish in the seas, then these two regal, silent *Rhincodon typus*' proved unequivocally that day that gentleness is the reigning paradigm on Earth.¹⁴⁴

There are no boundaries for communication, other than those humans themselves impose on a world we do not understand. But a large cadre of animal and plant communication researchers give us every reason to turn about, as we have endeavored to intimate, thus far. And so does the amazing history of human aesthetics, as it correlates with the annals of science, geopolitics, and environmental sociology, which we will now, albeit in a passing manner, consider.

¹⁴³ See http://www.imdb.com/title/tt0795991/fullcredits?ref_=tt_cl_sm#cast

¹⁴⁴ The Whale Shark is hunted in parts of the world, but still only listed as "Vulnerable," Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as of 2003, Accessed June 26, 2016.