

ANIMALS IN (NEW) SPACE: CHIMPONAUTS, COSMODOGS, AND BIOSPHERE II

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Abstract

Like many baby-boomers, I grew up with visuals of chimpanzees being shot up into space as part of NASA's program for space exploration; I read about Laika, the Russian dog who perished on her first space mission, involuntarily recruited from the streets of Moscow where she had lived as a stray. Biosphere II—the failed attempt to re-create earth's ecosystems in an enclosure outside of Tucson, Arizona—similarly instrumentalized animals, this time for food, as part of a larger project investigating the possibilities of human life beyond earth. Now, NewSpace entrepreneurs pursue techno-solutions and space escapes for elites seeking adventurous enclosures beyond earth's climate-changing surface. An ecofeminist perspective enriches our understanding of space exploration ideology by examining how cultural narratives of gender, species, and culture play out both here on earth and beyond our biosphere. Interrogating these techno-scientific pursuits in outer space augments our understanding of contemporary environmental problems such as climate change, environmental justice, and human-animal relations.

Key-words: ecofeminism, animals, gender, climate change, environmental justice, human-animal relations. Laika, Biosphere II.

Resumen

Como muchas de las personas nacidas durante la posguerra, crecí con imágenes de chimpancés catapultados al espacio como parte del programa de la NASA para la exploración espacial; también había leído acerca de Laika, la perra rusa que murió en su primera misión espacial, involuntariamente reclutada en las calles de Moscú, donde había vivido como un perro callejero. La Biosfera II —el intento fallido de volver a crear

ecosistemas de la tierra en un recinto a las afueras de Tucson, Arizona— también se valió de animales, esta vez convertidos en alimento, como parte de un proyecto más amplio que investigaba las posibilidades de la vida humana más allá de la tierra. Ahora, los empresarios de NewSpace se dedican a buscar tecno-soluciones y viajes espaciales para élites en búsqueda de aventuras en recintos más allá de la superficie terrestre que cambia constantemente debido al cambio climático. Una perspectiva ecofeminista puede enriquecer nuestra comprensión de la ideología de la exploración espacial analizando cómo las narrativas culturales de género, especie y cultura se manifiestan tanto aquí en la tierra como más allá de nuestra biosfera. Cuestionar la investigación tecno-científica en el espacio exterior puede mejorar nuestra manera de comprender los problemas medioambientales contemporáneos tales como el cambio climático, la justicia ambiental y las relaciones entre humanos y animales.

Palabras clave: ecofeminismo, animales, género, cambio climático, justicia ambiental, relaciones entre seres humanos y animales, Laika, Biosfera II.

There is nothing transcendent about the values that motivated NASA to have astronauts lodge an identification plaque on the moon indicating that men had landed there. This gesture grates as much as coming upon a tree or a rock defaced with 'John loves Mary' or some similar nonsense in a supposedly wilderness area. ... There is really no difference between the 'humanisation' of space and the colonization of Africa or Latin America.

Collard & Contrucci, *Rape of the Wild*¹

The term “anthropocene” popularized by Dutch chemist and Nobel Prize-winner Paul Crutzen refers to an era of human-induced atmospheric warming that can be traced back to the Industrial Revolution, when specific communities of humans began increasing carbon dioxide emissions by burning coal and oil, building larger and larger cities, cutting down forests, acidifying oceans, and prompting massive species extinctions.² Despite numerous warnings from scientists and scientific organizations around the world, responses to climate change among the most industrialized nations have been slow to put long-term ecological sustainability and health ahead of short-term corporate profits. Instead, like Bill Peet’s children’s book, *The Wump World* (1970), global elites, politicians and business leaders are behaving like The Pollutians, assuming that they can travel from continent to continent, and planet to planet, polluting and then moving on to new pristine environments without changing their ecological and economic behaviors.³ Ideologically fueled by literal interpretations of transcendent theologies which locate heaven and the sacred in the skies above earth, and by western techno-science’s quest to control nature, space programs in both the United States and Russia appropriated

1. COLLARD, Andrée, with Joyce CONTRUCCI. *Rape of the Wild: Man’s Violence against Animals and the Earth*. Bloomington, IN: Indiana University Press, 1989, p. 166.

2. “Anthropocene” was popularized by Crutzen, but its origin is attributed to biologist Eugene F. Stoermer; see REVKIN, Andrew. “Confronting the Anthropocene.” *The New York Times*. May 11, 2011. Accessed at <http://dotearth.blogs.nytimes.com/2011/05/11/confronting-the-anthropocene/> on 12/10/2012.

3. PEET, Bill. *The Wump World*. Boston, MA: Houghton Mifflin Co., 1970.

public monies to fund their search for otherworldly escapes available only to earth's elites, diverting public funds that would otherwise be used to meet real material needs (housing, healthcare, education, food security) or fund research and infrastructure for promoting sustainable energy production, transportation, and agriculture on Earth, the only human-habitable planet in our solar system. What can feminist ecocriticism contribute to our understanding of space exploration ideology? How do narratives of gender, species, class and culture play out beyond the biosphere? And what information do these scientific pursuits of the twentieth century have to tell us about contemporary environmental problems and solutions for the future?

To explore these questions, I juxtapose three parallel narratives testing the limits of extra-terrestrial exploration and survival: the use of non-human animals in space exploration as a precedent to sending humans into outer space; the conception, missions, and ultimate failure of Biosphere 2, a facility constructed to replicate five of Earth's biomes, and test the possibility of indefinite human survival within a sealed enclosure; and the current ventures of NewSpace corporations in cultivating space tourism and settlements. Drawing on feminist philosophy of science, feminist animal studies, and ecofeminist theories, I explore the intersections of gender, species, class, and culture in space exploration narratives.

1. "Under My Thumb": Crash Test Dummies and One Small Step for (a) Man

It suddenly struck me that that tiny pea, pretty and blue, was the Earth. I put up my thumb and shut one eye, and my thumb blotted out the planet Earth. I didn't feel like a giant. I felt very, very small.

Neil Armstrong, first man on the Moon.

The fact that just from the distance of the Moon you can put your thumb up and you can hide the Earth behind your thumb. Everything that you've ever known, your loved ones, your business, the problems of the Earth itself—all behind your thumb. And how insignificant we really all are, but then how fortunate we are to have this body and to be able to enjoy living here amongst the beauty of the Earth itself.

Jim Lovell, Apollo 8 & 13 astronaut.

Notwithstanding arguments that space travel has produced greater environmental awareness via Apollo 8 images of *Earthrise from the Moon* and Apollo

17's image of the *Whole Earth*,⁴ in this section I argue that space exploration is advanced within a framework of masculinist ideology that values a type of holism over specific individuals, heroic feats of conquest amid risk-riddled adventure, and technoscientific solutions to the eco-social problems produced by runaway capitalist imperialisms now warming the earth. The astronauts who suddenly discover a deeper respect for the earth when they are able to blot it out with their thumbs—a gesture of dominance reminiscent of Mick Jagger's "Under My Thumb," a 1966 lyrical celebration of his "squirming dog," "siamese cat" girlfriend-now-turned-pet—do not offer a pathway to environmentalism that can (or should) be widely duplicated, even via the pervasive *Whole Earth* images commodified on calendars, keychains, and coffee cups. Instead, it is the particular relations of animals, places, and cultures that require our environmental and climate justice concerns, bringing us to the roots of contemporary eco-justice crises rather than striving for ever-greater techno-science explorations of space.

Feminist philosophers of science have amply noted the gendered features of the "scientific method" which requires a cutting-off of feelings to produce the "detached eye of objective science" and the distancing of the scientific researcher from the experimental subjects.⁵ Donna Haraway's *Primate Visions* demonstrates that western science's construction of the scientific standpoint is inflected by race, gender, and species supremacy, controlling not only scientific rhetoric and investigations, but also western culture's relationship with nature and other animal species.⁶ In *Nature Ethics: An Ecofeminist Perspective*, Marti Kheel identifies features of masculinism that are not only inflected with race and species supremacy, but are also embedded in "the broader concepts of rationality, universality, and autonomy."⁷ These features are also evident in the rhetoric justifying space exploration, including the belief that humans (particularly those gendered masculine) are propelled by aggressive, self-centered biological drives that must be given controlled, rational expression; the (racist

4. Such arguments are advanced by HENRY, Holly and Amanda TAYLOR. "Re-thinking Apollo: Envisioning Environmentalism in Space." *Sociological Review*, 57: s1(2009), pp. 190-203.

5. See HARAWAY, Donna. *Primate Visions: Gender, Race, and Nature in the World of Modern Science*. New York: Routledge, 1989, p. 13, and FOX KELLER, Evelyn and Helen LONGINO, eds. *Feminism & Science*. New York: Oxford University Press, 1996, respectively.

6. Haraway's understanding of species dominance is limited by her own humanism, and this limits her theorizing considerably; see WEISBERG, Zipporah. "The Broken Promises of Monsters: Haraway, Animals, and the Humanist Legacy," *Journal of Critical Animal Studies* 7:2 (2009), pp. 21-61.

7. KHEEL, Marti. *Nature Ethics: An Ecofeminist Perspective*. Lanham, MD: Rowman & Littlefield, 2008.

and imperialist) idea that nations must preserve the “frontier” experience as a legacy for future generations, especially boys; and the notion of adventure (especially high-risk) as counter to and not found in the repetitive realm of biological nature. As Kheel explains, masculinism is inherently anti-ecological for the ways it “idealizes transcending the biological realm, as represented by other-than-human animals and affiliative ties,” and subordinates “empathy and care for individual beings to a larger cognitive perspective or ‘whole’”.⁸ Across the disciplines, men’s movement writers, animal studies and environmental studies scholars expand Kheel’s critique, identifying numerous constructs of masculinity as predicated on themes of maturity-as-separation, with male self-identity and self-esteem based on dominance, conquest, affects (work ethic and emotional stoicism), occupations (valuing career over family and housework), physical strength, sexual prowess, animal “meat” hunting and/or eating, and competitiveness—all developed in opposition to a complementary and distorted role for women: white hetero-human-femininity.⁹ As the conflicted histories of chimpanauts and astrodogs demonstrate, narratives of space exploration are constructed within this larger narrative of masculinist gender ideology that has shaped definitions and practices of science itself.

More than a decade before the United States’ National Aeronautics Space Administration (NASA) produced Neil Armstrong’s famous moonwalk on July 20, 1969, American and Russian scientists used non-human animals—mostly monkeys, chimpanzees, and dogs—to test the effects of rapid acceleration, prolonged weightlessness, atmospheric re-entry, and other hazards of space travel. To obtain these animals, the U.S. funded the capture of young and infant chimpanzees from Africa for space exploration tests at the Holloman Air Force Base in Alamogordo, New Mexico; some sources say the chimpanzee mothers were killed in order for their babies to be taken.¹⁰ In Russia, Soviet scientists took stray dogs off the streets of Moscow. In the cultural ideologies of both nations—intensified by the Cold War—space colonization became a matter of nationalist pride, and the “sacrifice” of non-human animals was seen as a necessary precedent to “manned” flights.¹¹

8. *Ibid.*, p. 3.

9. See ADAMS, Carol. *The Sexual Politics of Meat: A Feminist-Vegetarian Critical Theory*. New York: Continuum, 1990; CONNELL, R. W. *Masculinities*. Berkeley, CA: University of California Press, 1995; PLUMWOOD, Val. *Feminism and the Mastery of Nature*. New York: Routledge Press, 1993.

10. CASSIDY, David with Kristin DAVY. “One Small Step: The Story of the Space Chimps.” (57:00). Distributed by Victory Multimedia, Inglewood, CA. 1989.

11. Marti Kheel offered one of the first ecofeminist perspectives on the rhetoric of animal sacrifice in patriarchal culture and sciences: “Significantly, researchers do not ‘kill’

Beginning June 11, 1948, when the first mammal in space, a Rhesus monkey named Albert I was launched at the U.S. White Sands Proving Ground in New Mexico, a series of Rhesus macaques named Albert 1 through VI were launched and either died on return impact or died from heat prostration following recovery. In 1959, the first U.S. monkeys to survive, Able (a rhesus macaque) and Baker (a squirrel monkey), were soon followed by flights with chimpanzees, Ham (January 31) and Enos (November 29) 1961. Originally nicknamed “Chop Chop Chang,” chimpanzee #65 wasn’t given his official name—an acronym dubbed after the Holloman Aero-Medical Research Laboratory where the space chimps program developed—until it was clear he had survived his 17-minute flight. His name, Ham, also “inevitably recalls Noah’s youngest and only black son,” exemplifying the “stunning racism” in the language of the space program, constructing the paternalistic identity of the scientist as well as the scientific endeavor.¹²

While space race fans have claimed that Ham’s flight was a necessary precedent to the first “manned” U.S. suborbital flight of Alan Shepard in 1961, and Enos’ over three hours and two-orbits demonstration was a precedent for John Glenn’s first U.S. orbital flight in 1962, these heroic human volunteers were simply following in the involuntary handprints of their chimpanzee predecessors. Indeed, one wonders how the space race would have proceeded if non-human animals were not available as “crash test dummies,” and each test flight would have had to be piloted by computer, by a human model, or by a sacrificial and highly-trained human volunteer.¹³ The fact that the animal lives

animals in laboratories; the word ‘sacrifice’ is still employed. Behind the sacrifice of animals at the altar of science lies the ancient and tragic belief that somehow, if animals are killed, human beings will be allowed to live”; see KHEEL, Marti, “From Healing Herbs to Deadly Drugs: Western Medicine’s War Against the Natural World,” pp. 96-114 in PLANT, Judith, ed. *Healing the Wounds: The Promise of Ecofeminism*. Philadelphia, PA: New Society Press, 1989: 104. Kheel is critical of patriarchal religious myths of a Father-God who offers his son to die in exchange for others’ redemption, or who asks his followers to kill their most precious son as proof of their devotion—but will be appeased by the killing of another animal’s offspring instead. For an overview of the linguistic battles between vivisectionists and animal advocates, see GRUEN, Lori, “Experimenting with Animals,” pp. 105-129 in *Ethics and Animals*. Cambridge University Press, 2011.

12. HARAWAY, op cit., pp. 137-38.

13. One notable exception was provided by US Air Force Surgeon Major John Paul Stapp, who created the “Gee-Whizz” sled in 1947, and following test runs with 185-pound mannequins (later dubbed “crash test dummies” by the auto industry, which used these in safety tests after being compelled to do so by the federal government), rode the sled himself with acceleration forces of 45 g’s and survived without lasting injuries; he went on to test the sled on chimpanzees a total of 88 times, with some at a “crushing

used and often destroyed in space exploration were treated with some indifference can be read in the documents describing their deaths: the sacrificial rhesus monkey Albert VI was nicknamed “Yorick” (alluding to Shakespeare’s Hamlet and his graveyard soliloquy with the court jester’s skull¹⁴) and a US Air Force photo shows a small memorial, complete with three rubber mice, plastic flowers and a flower vase, with a card that reads “Sincerest condolences to Thee, our departed friends of Discoverer III, from the Army Monkey.”¹⁵ Testing the effects of high gravity forces (“g-forces”), acceleration and rapid deceleration that might occur on rocket flights, chimpanzees, bears, and hogs were strapped in various positions (sitting up or lying down, head-first, facing forward or back), with and without safety harnesses, on sleds titled “Gee-Whizz,” “Sonic Wind,” “Project Whoosh” and the “Daisy Track,” whimsical names constructed from the standpoint of those who did not ride the tracks at lethal rates. One hog photographed in a crash simulation harness (sitting up, facing backwards) albeit with the head lolling to one side (it’s not clear whether the animal photographed is dead or alive, before or after the test) has a sign resting beneath the beltstrap and between the legs, reading “Project Barbecue, Run #22, 5 August 1952” referencing the fact that after the hogs had suffered, died, and been autopsied, they were cooked and eaten by the Air Force scientists.¹⁶ The rhetoric of these aeronautics scientists’ treatment of animals reinforces the dominance, the adventure, and the unfeeling identity of the scientists and the scientific project at hand.

While the United States was experimenting with monkeys, the Soviet Union was experimenting with dogs. Scientists preferred the small female strays taken from the streets of Moscow since females needed less room to urinate, and could be more easily trained for space flight. Upon capture, the dogs were confined in small places, subjected to extremely loud noises and vibrations, and made to wear newly created space suits, all tests designed to condition the dogs to the experiences they would likely have during the

270 g’s” of force, leaving the animal’s body “a mess” (See BURGESS, Colin and Chris DUBBS, *Animals in Space: From Research Rockets to the Space Shuttle*. Chichester, UK: Springer/Praxis Books in Space Exploration, 2007, p. 103).

14. The actual lines from *Hamlet* read thus: “Alas, poor Yorick! I knew him, Horatio; a fellow of infinite jest, of most excellent fancy; he hath borne me on his back a thousand times; and now, how abhorred in my imagination it is! My gorge rises at it. Here hung those lips that I have kissed I know not how oft. Where be your gibes now? Your gambols? Your songs? Your flashes of merriment, that were wont to set the table on a roar? (*Hamlet*, V:i) The correlation of a court jester and a space chimp most likely sent to his death underscores the “scientific” mockery that was made of these animal lives.

15. BURGESS and DUBBS, op cit., p. 186.

16. *Ibid.*, p. 105.

flight. The first dogs launched, Moscow's Tsygan and Dezik, reached space on July 22, 1951, but did not orbit; however, they were the first mammals successfully recovered from spaceflight. In the next few years, Russia launched numerous dogs into suborbital flight with at least four fatalities, but Soviet scientists were eager to make some "sacrifices" in the Cold War race to beat the U.S. in moving toward outer-atmosphere orbits.¹⁷ At the request of Premier Nikita Khrushchev and the orders of Chief Engineer Sergei Pavlovitch Korolev, on November 3, 1957, to celebrate the 40th anniversary of the Russian Revolution, a thirteen-pound, three-year-old female stray dog was launched into Earth orbit in Sputnik 2. Originally named Kudryavka ("little curly") and later renamed Laika ("Barker"), the little Samoyed-husky dog had been selected for her obedience and calm disposition. Sputnik 2 was an impromptu mission built only a month after the internationally-acclaimed success of Sputnik 1, leaving the Soviet engineers no time to design provisions for the dog's return from space.

Evidence that the Soviet scientists were conflicted about their duties is recorded in events leading up to Laika's launch, when one of the dog's trainers, Vladimir Yazdovsky, took Laika home to play with his children; later, he wrote in his own account of the mission, "I wanted to do something nice for her. She had so little time left to live."¹⁸ A full three days prior to launch, Laika was strapped into the space capsule on October 31, 1957 to monitor her vital systems. On launch day, November 3, Yazdovsky and the medical staff persuaded the engineers that Laika's capsule must be de-pressurized—and then used this change as an opportunity to give Laika her last drink of water.¹⁹ Their actions suggest an emotional turmoil produced by the conflict of "entangled empathy" repressed under obedience to Cold War nationalism and the cultural constructions of masculinized science.²⁰

But the international viewing public was less obedient. As soon as Laika's launch aboard Sputnik 2 was announced to the press, animal-welfare groups around the world expressed outrage and sorrow: in Britain, protesters

17. KEMP, Martin. "A Dog's Life: Laika, the Doomed Stray, Has Achieved a Kind of Immortality." *Nature* 449 (October 4, 2007), p. 541.

18. OULETTE, Jennifer. "Space Dog Laika Finally Gets a Happy Ending." *DiscoveryNews*, July 12, 2011. Accessed at <http://news.discovery.com/space/laika-the-russian-space-dog-finally-gets-a-happy-ending-110712.html> on 11/17/2012.

19. BURGESS and DUBBS., op cit., p. 159.

20. "Entangled empathy" is developed in GRUEN, Lori. "Navigating Difference (again): Animal Ethics and Entangled Empathy." pp. 213-234 in SMULEWICZ-KUCKER, Gregory, ed. *Strangers to Nature: Animal Lives & Human Ethics*. Lanham, MD: Lexington Books, 2012.

assembled at the Russian embassy, and the National Canine Defense League called for a minute of silence each day that Laika was presumed to be in orbit. The initially deceptive Russian news releases soon had to acknowledge that there were no plans for Laika's return to Earth, and though they suggested she remained healthy for several days, over forty years later Dimitri Malashenkov from the Institute for Biological Problems in Moscow finally admitted that Laika became stressed (her heart rate accelerated to three times its normal rate) and overheated, most likely dying a painful and terrifying death. In 1998, Oleg Georgivitch Gazenko, one of the Soviet scientists responsible for the dogs' training, admitted "the more time passes, the more I'm sorry about it. We did not learn enough from the mission to justify the death of the dog."²¹

In the immediate wake of Sputnik 2, Soviet nationalists attempted to construct Laika's capture, confinement and death as an act of heroism: photographs issued by the space agency, with Laika exuding "an air of bright courage," were used on Mongolian and Romanian postage stamps and souvenirs. A Monument to the Conquerors of Space was built in Moscow and inaugurated on 4 October 1964, featuring Laika's turned head and a trace of the space harness.²² Even the U.S. space program was not indifferent, with NASA naming a soil target on Mars after Laika. But on both sides of the space race, the nationalist gratitude for animal lives lost in space exploration has been oddly expressed: taxidermists have stuffed Strelka and Belka, the first animals to orbit the Earth and return alive, and they are now on display in the Memorial Museum of Astronautics in Moscow; Ham's remains are buried at the entrance to the International Space Hall of Fame in New Mexico. And after the space race ended, the U.S. Air Force began leasing the remaining chimpanzees at Holloman Air Force Base to medical labs in the 1970s, and in 1997 "retired" the space chimps to a biomedical testing facility, The Coulston Foundation, which had a known and horrific track record of abusing chimps. Over the years, USDA investigations had found Coulston in violation of numerous animal welfare codes, and at one point confiscated 300 of their chimps. Finally, Dr. Carole Noon, with the backing of Drs. Jane Goodall and Roger Fouts, worked to bring these chimpanzees to sanctuary.²³ These post-mortem heroic

21. OULETTE, *op cit.*

22. KEMP, *op cit.* Forty years later, a website devoted to Moscow's homeless animals still tells the story of Laika; see <http://www.moscowanimals.org/index.html> Accessed on 11/26/2012.

23. After the Air Force denied Noon's requests, awarding even more space chimps to The Coulston Foundation, Noon sued the Air Force for custody and raised funds to build Save the Chimps Sanctuary in Florida, where these chimps can enjoy a life free of testing in an outdoor refuge with islands, play areas, and fresh healthy foods. (See <http://>

narratives fail to conceal the speciesism and animal suffering produced under the name of science.

Illustrating many people's discomfort with the treatment of Ham, Enos, and Laika, recent retellings of these stories in children's literature and media have attempted to explore and make palatable this anguished past.²⁴ In 2007—the fifty-year anniversary of Laika's "one-way" flight—James Vining's *First in Space* appeared, a graphic novel detailing the life of Ham, along with two other children's books about Laika using the dog's own viewpoint as part of the narrative: both Nick Abadzis' *Laika* and Jan Milsapps' *Screwed Pooch* detail the historical events of the Cold War and the Space Race that led up to the capture, training, and selection of Laika as the first and (allegedly) only creature knowingly sent into space to die.²⁵ As Abadzis' novel clearly portrays, the founder of the Soviet Space Program, Sergei Pavlovich Korolev agreed to sending a dog in Sputnik II in order to prove his patriotism to Premier Khrushchev: after spending nearly eight years in Stalin's concentration camps under false allegations of sabotage, Korolev had worked his way up in the Soviet space program and gained respect for his energy, intelligence, and ambition, but was not yet pardoned for the false charges against him. In a particularly insightful scene, Abadzis draws Korolev into the space dogs' caged enclosure for a soliloquy with Laika, where Korolev reflects on his own imprisonment, and recognizes the parallels with Laika's confinement, but concludes that he cannot set her free: still on parole, Korolev believes his freedom might be achieved through her death. In return, he promises to make her "the most famous dog in history"—a reputation that matters very little to dogs.²⁶ The scene is immediately followed by and contrasted with Abadzis'

www.spacechimps.com/theirstory.html) But animal aerospace testing did not end. The American Anti-Vivisection Society reports that through 1996, NASA was still conducting a multi-million dollar research project called Bion that involved sending monkeys whose tails were cut off and who were placed into apparel similar to straight-jackets with restraining rings screwed into their skulls and various electrodes implanted throughout their bodies into space for 14 days. The purpose of Bion was to study the effects of microgravity and radiation in living beings. These flights ended through a confluence of forces involving the deaths of some space monkeys and the persistent efforts of animal rights groups pressuring Congress and NASA.

24. At the same time, heroic and comic narratives continue to be produced as attempts to obscure these historical facts: Richard HILLARD. *Ham the Astrochimp*, Honesdale, PA: Boyds Mills Press, 2007, and the Disney movie, "Space Chimps" (2008), are two such examples.

25. VINING, James, *First in Space*. Portland, OR: Oni Press, Inc., 2007; ABADZIS, Nick. *Laika*. New York: First Second, 2007; MILSAPPS, Jan. *Screwed Pooch*. Booksurge Publishing, 2007.

26. ABADZIS, op cit., p. 132.

fictional character, Yelena Dubrovsky, the dogs' trainer, who articulates the story's ethical concerns: urging Korolev to choose a different dog, she offers to do "anything," an innuendo that is not lost on him. As a woman being used in a male-dominated system of masculinist science, Yelena exhibits the conflict between nationalist loyalty and entangled empathy, which Lori Gruen defines as an empathy that "requires gaining wisdom and perspective and, importantly, motivates the empathizer to act ethically."²⁷ Through the fictional character of Yelena, and through his thematic treatment of the cycles of abuse that converge in Laika's death, Abadzis opens the dog's story for a feminist ecocritical reading of space exploration science and its cultural ideology.

Half a decade after these events, it's easier to see how the real lives of these specific, individual animals—their capture, confinement, training, and deaths—were backgrounded²⁸ by the dazzling material and discursive rhetoric of space exploration, as even the co-authors of *Animals in Space* recall:

One November night in 1957 our rowdy [Boy Scout] cub pack had been herded out of the scout hall at a certain time and made to stand under the crystal clear night sky while our cubmaster patiently told us about Laika and Sputnik 2. Suddenly he pointed with excitement above the darkened horizon, and we quickly fell into an awed silence as we watched a small, bright pin-prick of light silently and majestically traverse the star-spangled firmament over the east coast of Australia (Burgess, xvii-xviii).

I cannot overstate how indelibly the image of a dog in a satellite burned into my youthful imagination. For me, at the age of 11, there was simply no way to comprehend it. It was too novel, too extraordinary an achievement, that it did not fit within any knowledge base that I possessed. It was mythic. . . . *I marveled more for the extraordinary experience given to Laika than I agonized over her fate* (Dubbs, xix; italics mine).

Like fireworks, the space capsules streaming through the skies offered a visual and material narrative of celebration and heroism especially suited to Euro-western constructions of dominant masculinity—with images that appealed to little boys and Air Force scientists alike. From the chimps' diets of baby cereal and baby diaper clothing to the "team of tender technicians" who put Enos into "a fitted contour couch that looked like a cradle trimmed with electronics," the visual contrasts between tall, white laboratory-coated human men and the small, diapered, and telemetrically-implanted young mammals

27. GRUEN, op cit.

28. Backgrounding is one of the five operations of dominance constructing the Master identity; see PLUMWOOD, Val. *Feminism and the Mastery of Nature*. New York: Routledge, 1993. The other operations include hyperseparation, incorporation, instrumentalism, and stereotyping.

reinforced the masculinity of Cold War science and the “Father Knows Best” authoritative stance of white patriarchs from the U.S. to Russia.²⁹ As one of Laika’s trainers, Oleg Georgivitch Gazenko, acknowledged forty years after her death: “We treat them like babies who cannot speak.”³⁰

Experiments involving other animals’ bodies and lives to obtain information of primary interest to humans have long ago been exposed through well-developed critiques in animal rights theories of the 1970s and animal ecofeminisms of the 1980s as experiments that are often repetitive, painful, frightening, and unnecessary, given the less-expensive non-animal alternatives; two decades later, such acknowledgements are finally appearing in academic theory as well.³¹ Powering and legitimating such scientific experimentation are certain beliefs about what “counts” as scientific research methods, methodologies, and epistemologies.³² Feminist approaches to science differ from traditional (androcentric) science not merely by “adding” women to science, whether as researchers or as subjects worthy of study, but in the ways feminists approach these core beliefs. Feminist methodology requires praxis, an activist approach to scientific research that seeks information to increase understanding and improve real material conditions for marginalized individuals and communities, particularly those under study. Thus, feminist methods require “listening carefully” to women and other marginalized beings for the data provided through their experiences and perspectives, and listening “critically” to how traditional scientists describe this data, seeking out information that traditional scientists “have not thought significant.”³³ Finally, feminist scientists ask questions about what counts as knowledge, who can be a “knower” or “agent of knowledge,” and effectively reconstruct the very identity of the scientist: rejecting the detached, authoritative

29. See “Meditative Chimponaut,” *Time* 78:23 (December 8, 1961), 52-53, and “The Nearest Thing,” *Time* 77:7 (February 10, 1961), 60-61, respectively. In his excellent study of fatherhood across species, Jeffrey MOUSSAIEFF MASSON argues persuasively for nurturance as a crucial characteristic for human fathers, observing the many varieties of fatherhood behaviors across species, and the ways that the behaviors and norms for patriarchal fatherhood (exaggerated in the scientists’ treatment of animals used in space exploration) are culturally distorted and enforced by social institutions. See *The Emperor’s Embrace: Reflections on Animal Families and Fatherhood*. New York: Pocket Books, 1999.

30. ABADZIS, op cit., p. 201.

31. For a critique of this delayed uptake, see GAARD, Greta, “Speaking of Animal Bodies,” *Hypatia* (Summer 2012). Available at <http://thephilosopherseye.com/2012/07/09/hypatia-symposium-greta-gaard/>.

32. HARDING, op cit.

33. Ibid., p. 2.

“context stripping” objectivity of rationalist science, and its reason/emotion value dualism, feminists emphasize the inseparability of subjectivity and objectivity, locating the researcher on the same critical plane as the subject and cultivating the “authority” of both standpoints in the research project.³⁴ Feminists regard as research assets the fundamentally relational character of human inter-subjectivity, reason, and emotions.

Ecofeminists have long ago rejected the highly gendered reason/emotion dualism and the elevation of groups over individuals that characterizes not only Peter Singer’s utilitarian ethics, but also the environmental ethics of “holism” that subordinates empathy and care for individual beings to a larger cognitive perspective or “whole.”³⁵ Instead, ecofeminists and feminist animal studies scholars base ethics on the feelings and reasons that emerge from our relational inter-identities, using the language of care, compassion, sympathy, and empathy.³⁶ They note the linkages among diverse systems of oppression, whether these be the abuse of women, children, and non-human animals; among racism, sexism, and speciesism; or among the oppression of indigenous people, non-heterosexual behaviors, and nature.³⁷ Finally, they reject the elisions of evasive language that background the suffering and death of non-human animals (i.e., “veal”), and the emotionally distancing language of traditional science’s particular brand of humanism that can be seen in

34. See BIRKE, Lynda. “Exploring the Boundaries: Feminism, Animals, and Science.” Pp. 32-54 in Carol J. ADAMS and Josephine DONAVAN, eds. *Animals and Women: Feminist Theoretical Explorations*. Durham, NC: Duke University Press, 1995, and HUBBARD, Ruth. *The Politics of Women’s Biology*. New Brunswick, NJ: Rutgers University Press, 1990.

35. KHEEL, *Nature Ethics*, op cit.

36. See DONAVAN, Josephine and Carol J. ADAMS, eds. *The Feminist Care Tradition in Animal Ethics*. New York: Columbia University Press, 2007; GRUEN, Lori. “Empathy and Vegetarian Commitments” pp. 333-344 in ADAMS and DONAVAN, eds.; CURTIN, Deane, “Compassion And/As Being Human,” in ADAMS and Lori GRUEN, eds. *New Ecofeminisms* (forthcoming); DONOVAN, Josephine. “Participatory Epistemology, Sympathy, and Animal Ethics,” in ADAMS & GRUEN, eds.; DONAVAN, Josephine, “Animal Rights and Feminist Theory” *Signs* 15:2 (1990), pp. 350-375.

37. See ADAMS, Carol J. “Woman-Battering and Harm to Animals.” pp. 55-84 in Carol J. ADAMS and Josephine DONAVAN, eds. *Animals & Women: Feminist Theoretical Explorations*. Durham, NC: Duke University Press, 1995, and GARBARINO, James. “Protecting Children and Animals from Abuse: A Trans-Species Concept of Caring.” Pp. 250-58 in DONAVAN, Josephine and Carol J. ADAMS, eds. *The Feminist Care Tradition in Animal Ethics*. New York: Columbia University Press, 2007; BREEZE HARPER, A., ed. *Sistah Vegan: Black Female Vegans Speak on Food, Identity, Health, and Society*. Brooklyn, NY: Lantern Books, 2010, and KEMMERER, Lisa, ed. *Sister Species: Women, Animals, and Social Justice*. Urbana, IL: University of Illinois Press, 2011; and GAARD, “Toward a Queer Ecofeminism,” *Hypatia* 12.1 (1997), pp. 114-137, respectively.

the terms of “payload” for the living animal trapped aboard a space shuttle; “Chop Chop Chang” and “#65” for a chimpanzee who might not survive the space flight; “sacrifice” for the capture, confinement, training, vivisection and deaths of animals used in science; and Laika’s “fate” or “destiny,” as if her death was something inherent in her being, and not something produced through the agency of the Soviet space scientists.

The anti-feminist, anti-ecological characteristics of space exploration as it has been practiced are amply evident in the economics, methodology, and ethics of the space programs described here. Post-World War II funding for space exploration diverted government funds away from other public projects,³⁸ all the while arguing that the benefits of space exploration would apply to all of humanity. But the Cold War space race between Russia and the U.S. belied those claims, suggesting that masculinism, nationalism and colonialism were stronger motivations than humanitarianism.

2. Biosphere II: Escape to Inner Space

“... Two vast and trunkless legs of stone
Stand in the desert. Near them, on the sand,
Half sunk, a shattered visage lies, whose frown,
And wrinkled lip, and sneer of cold command,
Tell that its sculptor well those passions read
Which yet survive, stamped on these lifeless things...”

Percy Bysshe Shelley, “Ozymandias” (1818)

To link Russia’s “cosmodogs” and NASA’s “chimponauts” with Biosphere II, one needs to consider not only the themes of space exploration and the colonizing drive to be “first”—first in space, first to orbit the earth, first to send a man into space, first on the moon, first woman in space—but also the question of enclosing animals in space missions. None of the dogs or chimpanzees sent into space cared anything about “firsts” or fame; nor did the animals confined in Biosphere II to nourish the human animals also confined there care or benefit from the multi-million dollar experiment going on in Oracle, Arizona. Renowned primatologist Jane Goodall has spoken to both ventures, explaining that Ham’s apparent grin of happiness upon his return to Earth actually signified “the most extreme fear” through his baring of teeth,

38. Though NASA’s budget has remained at or below 1.0% of the U.S. federal budget since 1958, with the exception of the moon-race era, 1962-1972, that 1.0% amounts to billions of dollars. See <http://www.guardian.co.uk/news/datablog/2010/feb/01/nasa-budgets-us-spending-space-travel> accessed 1/20/2012.

and admonishing the biosphereans midway in their two-year enclosure that their confinement was far less than that experienced by caged chimpanzees, who “do not have the mental capacity to understand what is occurring or how to deal with it.”³⁹ But when Goodall returned almost a year later to deliver the final remarks concluding the biosphereans’ two-year enclosure (and extended their mission by twenty minutes) at least one biospherean fumed, “Jane, let us apes out of the cage!”⁴⁰ Goodall’s instruction in the differences between voluntary and involuntary confinement had been lost on the humans, but the parallels of confining animal bodies to serve humancultural conceptions of masculinized astro-science are well worth exploring.

Envisioned in continuity with the space shuttle missions of the 1960s, Biosphere II was built with the two-pronged intention of developing an earth-based shelter for humans—anticipating an uninhabitable future on earth—and providing “the first model and the data ... that will allow the successful building and operation of the Mars settlement.”⁴¹ The charismatic leader of the Synergia Ranch community and visionary for Biosphere II, John Allen envisioned biospheres as “refuges for a small elite from nuclear war or other disasters,” believing “higher forms of life” could survive on “their own energy resources in mountain caverns” and “release full-scale life” back to Earth “after the skies began to clear.”⁴² In Allen’s book *Space Biospheres* written with “biospherian” Mark Nelson, they explain that “the major motivation behind creating Biosphere 2... is to assist the Biosphere [meaning, ‘Biosphere I,’ our global ecosystem] to *evolve off planet earth* into potential life regions of our solar system.”⁴³ The metaphors describing Biosphere II tended to naturalize the project—i.e., “Spaceship Earth” becoming “Biosphere I” and Biosphere II becoming another spaceship like earth—and reveal the hubris of its creators. Roy Walford, the doctor involved in the project, called it “the Garden of Eden above an aircraft carrier” and *Time* magazine even called it “Noah’s Ark: The Sequel” both metaphors referencing the grandiosity of divine creatorship

39. See CASSIDY and DAVIS, op cit., and Jane POYNTER. *The Human Experiment: Two Years and Twenty Minutes Inside Biosphere 2*, New York: Avalon Publishing Group/Thunder’s Mouth Press, 2006, p. 242.

40. POYNTER, op cit, vii.

41. ALLEN, John. *Biosphere II: The Human Experiment*. New York: Viking/Penguin Books, 1991, p. 75.

42. BROAD, William J. “As Biosphere is Sealed, Its Patron Reflects on Life,” *The New York Times*: Science section, September 24, 1991. Accessed online 11/5/2012.

43. ALLEN and NELSON, op cit., p. 3.

assumed by both Allen and his followers.⁴⁴ Thus, despite any professions to the contrary, Biosphere II was a deeply anti-ecological project: instead of seeking ways to nourish living ecosystems by balancing human populations, consumption and waste behaviors, and challenging the economic and political forces affecting those ecosystems, Biosphere II exemplified the “truncated narrative”⁴⁵ obtained from the conjunction of heroic masculinist ideology, technology and the environmental *sciences*, operating in a neoliberal framework without the benefit of knowledge and perspective from the environmental humanities—i.e., environmental economics, environmental ethics, critical animal studies, environmental justice, climate justice, food justice, ecopsychology. Biosphere II offered “a glimpse of where ‘sustainable development’ might lead,” wrote Timothy Luke, “if ‘sustainability’ is viewed as a purely technical and managerial problem.”⁴⁶

From the start, the project’s vision was powered not by science but by ideology and money—namely, Ed Bass, a Texas billionaire and heir to an oil and real estate fortune, who eventually funded the project with \$200 million, more than any governmental agency could afford. In 1984, he formed Space Biospheres Venture (SBV) with Margret Augustine and John Allen, the charismatic leader who had already founded the Institute of Ecotechnics, inspired by 1960’s values of communal living, meditation, theater, and Buckminster Fuller’s concept of synergy and his view of “spaceship earth.” Housed above an art gallery in London, the Institute of Ecotechnics (IE) became involved with projects around the world—not just Synergia Ranch near Santa Fe, New Mexico, but an ocean-going “research” vessel the *Heraclitus*, a cattle station in the Australian outback (Quanbun Downs), and The Caravan of Dreams, a performing arts center in downtown Fort Worth. Eventually, the Institute of Ecotechnics granted “degrees” to many of the Biosphere 2 staff, who otherwise had no college education; for example, the “co-architect” for Biosphere 2, Margret Augustine, was discovered to have no architectural training at all, apart from the IE diploma.⁴⁷ Part of their theater training in the Caravan

44. JORDAN FISHER SMTH, “Life Under the Bubble.” *Discover Magazine*, October 20, 2010. Accessed online at <http://discovermagazine.com/2010/oct/20-life-under-the-bubble> on 11/5/2012.

45. KHEEL, Marti. “From Heroic to Holistic Ethics: The Ecofeminist Challenge,” pp. 243-271 in GAARD, Greta, ed., *Ecofeminism: Women, Animals, Nature*. Philadelphia, PA: Temple University Press, 1993.

46. LUKE, Timothy. “Reproducing Planet Earth? The Hubris of Biosphere 2,” *The Ecologist*, 25:4 (July/August 1995), pp. 157-161. 159.

47. SIANO, Brian. “The Skeptical Eye: Captain Future’s Terrarium of Discipline,” *The Humanist*, March/April 1992: pp. 41-42. Phil Hawes (“T.C.”) was the only licensed

of Dreams, the biosphereans were well aware of the theater of Biosphere II. John Allen's co-author and staunch Synergist, Mark Nelson, reportedly told a colleague, "We do whatever we need to do, and play what roles we need to play, to get done what we need to get done"; according to Jane Poynter, this approach is "liberating" because "one does not get hung up on how credentialed a person is, but instead focuses on how competent he or she is in the role."⁴⁸ In Biosphere II, Synergists played roles as "captain, head of the Agriculture, doctor, or analytical chemist" performed a NASA-like theater, complete with terms like "launch date" and "Mission Control," and costumes of coral-red space jumpsuits with matching boots.⁴⁹

To prepare—and qualify—for their journey inside Biosphere II, a number of people associated with the assembled Synergia community underwent journeys on the *Heraclitus*, spent time in the Australian outback at the cattle ranch, and otherwise lived as invited (or directed) by the leadership team of John Allen and Margret Augustine.⁵⁰ These eager contestants gathered token species from across the globe, all selected for their usefulness to human life and energy conversion processes, to create their Noah's Ark of six biomes: a tropical rainforest, an ocean with artificially-generated waves and a sub-real coral reef, a marsh estuary bridging the ocean and a fresh-water pond, a savannah with plants from three different continents, a desert with plants from four continents, and an agricultural zone which included both plants and animals--fish, goats, pigs, and chickens. The human zone contained both public and private spaces, a library and a kitchen above ground, with the "technosphere" below ground, where all the motors and the "lungs" of the system operated.

Ostensibly intended as a two-year project testing the viability of a self-contained system that recycled air and wastes alike, Biosphere II quickly ran into barriers that were both material and scientific, as well as social

architect on the project, and the community's climate of intimidation and abuse prompted him to pack his bags a year before he quit, waiting that long only because he knew that without his license, the group would not be able to finish the project.

48. POYNTER, op cit., 237.

49. COOPER, Marc. "Take This Terrarium and Shove It," *The Village Voice*, April 2, 1991: pp. 24-33.

50. Margret Augustine was pregnant with John Allen's child during the nine months prior to Biosphere II Closure. The charisma of Allen extended to his love life, of course, involving his wife Marie Harding, who cashed in her entire inheritance to provide the down payment for Synergia Ranch, and later Cathleen Burke, Allen's lover for the ten years she spent in his group, and who reported "beatings" in which Allen "beat mostly the core members of the group" as well as Burke and even his funder, Ed Bass. See SIANO, op cit.

and psychological: after just twelve days, one of the eight “bionauts,” Jane Poynter had to be evacuated for 6.5 hours to receive medical treatment when a fingertip was accidentally cut off in one of the threshing machines. Even in the week-long simulation before “Closure,” the CO₂ low was 554 ppm, eerily simulating global warming phenomena occurring in Biosphere I. But John Allen downplayed this problem, with an adamant insistence on the project’s success, amounting to a “reign of terror” that also included rejecting the research projecting that only 80% of the food needed by the bionauts could be grown inside the Biosphere.⁵¹ After 16 months, with carbon dioxide levels rising up to a high of 4,500 ppm, seven tons of oxygen “missing,” and oxygen levels falling under 15%, causing the resident medical doctor becoming unable to add up simple columns of numbers, an emergency situation was declared and additional oxygen was pumped back in.⁵² Despite working 66-hour weeks to produce food and maintain Biospheric operations, the eight biosphereans were able to produce only 80% of the food needed for their subsistence, as predicted (and suppressed) prior to closure, and although their nutrient levels remained sufficient, their bodies lost weight, sleep, and strength. The biosphereans fell into two warring groups before the first year was out: one group insisted on reporting and responding to the real scientific data, while the other group remained loyal to John Allen and his vision, regardless of the material, biological data from scientific instruments and their own animal bodies. Tensions between the two factions ran so high that from month 10 through the remaining two-year enclosure, biosphereans passed one another in the narrow hallways by averting eyes and hugging the wall.⁵³ Tensions persisted to such a degree that when a second “mission” for a six-month enclosure with seven “bionauts” was launched on March 6, 1994, two members of the first mission travelled from Japan to Oracle, Arizona to break the seals of Biosphere II at 3:00 a.m. on April 5. Their break-in occurred three days after Ed Bass seized control of the project from John Allen and Margaret Augustine, who had been running Biosphere II by mismanaging finances by millions of dollars, and rejecting scientific advice. As of June 27, 2011 the University of Arizona has taken over management of Biosphere II, now termed “B2, Where Science Lives.”

What evidence suggests Biosphere II was anti-ecological? First, the purpose of the mission was colonizing and capitalizing on outer space, not

51. POYNTER, *op cit.*, pp. 115-116.

52. COOPER, Marc. “Faking It: The Biosphere Is a Model of the Earth After All—It’s Suffering From Runaway Greenhouse Effect,” *The Village Voice*, November 12, 1991. pp. 19-21.

53. *Ibid.*

solving environmental problems here on earth. In their introductory chapter of *Space Biospheres*, Allen and Nelson explain that their purpose is “to assist the Biosphere [earth’s ecosystems] to evolve off planet earth into potential life regions of our solar system” and respond to the “historic imperative” of colonizing Mars, given the “inevitable doom” of the Earth.⁵⁴ An odd part of that imperative, months prior to closure of Biosphere II, appeared on May 15, 1991, when plans for commercial development of the 3,600 acres around Biosphere II were submitted to local planning officials and included opening up RV parks, shopping centers, gas stations, offices, schools, hotels, apartments, and a golf course.⁵⁵ The proposed community would include areas for research and development (the Biosphere II building) and ecological public education that would include environmental interpretive centers, learning institutions, technical schools, and accommodations for students, scholars, individuals, and families. The unmasking of technoscience as capitalist commercial venture is seldom so clear.

Second, the mechanistic approach to recreating Biosphere I—tokenism guided by anthropocentrism, selecting the nearly 4,000 species for inclusion based primarily on their functions that benefit humans—is fundamentally anti-ecological and unsustainable (as outcomes from the two enclosures demonstrated). Our planet’s ecosystems and inhabitants interact in ways and on scales still not fully understood by human scientists or material philosophers alike, whose theories about “vibrant matter” and the earth’s “dense network” of agencies have yet to distinguish *right relations* (i.e., ecologically sustainable and socially just) among those agencies, and who tend to ignore inter-species relations (especially between humans and other animal species) altogether.⁵⁶ Attending to the sustainability of these diverse ecological “intra-actions” is crucial, for as even its critics agreed, Biosphere II’s most important lesson is that there is no alternative to earth.

Another lesson involved food: despite attempts in advance planning, the food systems in Biosphere II assumed the deaths of non-human animal species were a requisite part of the human diet. One source reported being surprised at the “belated realization that we had to farm organically” because such a closed system would be “required for permanent bases in far-away places such as Mars”; the agriculture was going to eschew “green revolution” technologies

54. ALLEN and NELSON, op cit., p. 3.

55. COOPER, Marc. “Profits of Doom: The Biosphere Project Finally Comes Out of the Closet—As a Theme Park,” *The Village Voice*, July 30, 1991. pp. 31-36.

56. See BENNETT, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press, 2010.

and go organic, in recognition of how foundational organic agriculture is to ecological sustainability.⁵⁷ But human-nonhuman animal relations were given no consideration in the biospherean diet, and were not seen as relevant to a new ecological vision; hence, the repeated slaughter & consumption of animals whom the biosphereans had regarded as friends clearly diminished their ecological ethics. Poynter recalls, “When in the animal bay, I often thought about how we received all this wonderful milk, eggs, and meat essentially for free. The miniature chickens, pigs, and goats lived off stuff we could not eat.”⁵⁸ It never occurs to her (or the other Synergists) to consider the cost of the animal’s life to that animal was far from “free,” nor did these animals choose to enter the Synergists’ experiment (theater) of Biosphere II. As the biospherean in charge of animal agriculture, Poynter found it “harder and harder to butcher the animals” as she began “living on a mostly vegetarian diet,” because she “felt even more connected to the [animals] once [she] knew [she] would not be eating them.”⁵⁹ Once the food shortages became evident, the biosphereans decided to eat the pigs that had been their companions, as Poynter reports: “I was sad to see Zazu and Quincy go. It felt like a betrayal to eat them. They had been with us for several years, and it was like eating a friend.”⁶⁰ These insights were short-lived.

A fourth anti-ecological feature was that human social culture was given insufficient consideration: the fact that all the biosphereans were white, heterosexual (or celibate), and largely from privileged backgrounds was not seen as a concern, nor was the concern that future biospheres would also be available only to a small group of (presumably elite) humans, as *Space Biospheres* explains: the “first Mars Base... will be corporate in form... the population can range from 64 to 80 people. If more population arrives they will have to begin their own communities”⁶¹ Where these newcomers will find another billionaire to finance their personal Biosphere is not stated. Interpersonal relationships were expected to be subsumed to the group, placing holism over individuals, an ethical strategy strongly criticized by feminists for the ways that it devalues loving partners, children, families, friendships, and individuals as well. Children were not built into the plans for time, energy, or nurturance in the Synergia community that preceded Biosphere II, and

57. POYNTER, op cit., 95, 182.

58. Ibid., 183.

59. Ibid., 184.

60. Ibid., 228.

61. ALLEN & NELSON, op cit., 7.

couples in both communities were expected to maintain their relationships outside of the times allotted for community work and activities.⁶²

Given all these flaws, why did Biosphere II succeed to attract attention and credibility as long as it did? Certainly the millions of dollars in funding from Ed Bass, along with the purchase of scientific individuals and organizations gave the project visibility and credibility.⁶³ The people behind the project took cover behind a diversity of international, incorporated entities—Synergia Ranch (New Mexico), Institute of Ecotechnics (London), Caravan of Dreams Theater (Texas), Space Biosphere Ventures (Arizona), Decisions Investment Team—all staffed by the same people and controlled by the same core group. The group also managed the public media very effectively, and hired lawyers to use threats of litigation when the media coverage was unfavorable. But all these strategies would not have succeeded outside of the encompassing cultural ideologies of masculinist technoscience (notably its corollary beliefs that science and technology will save humanity from any crisis, even providing alternatives to this world if we end up trashing the planet) and neoliberal economics (encapsulated in the slogan that “What’s good for GM is good for the country”, i.e., what is good for an elite few/corporation is good for the nation, and the earth as well; moreover, if a project / person / organization has a lot of money, he/it must have “done something right” and thus be credible and trustworthy). In sum, Biosphere II’s experiment confined animals of diverse species (including humans) in a two-year “spaceship” demonstrating that our animal “entanglement” with earth’s ecosystems cannot be mimicked without severe damages to animal and ecosystem health. Confronting the causes of global climate change, we need to learn from and reject these anti-ecological beliefs.

62. See POYNTER, op cit., and Lawrence VEYSEY. *The Communal Experience: Anarchist and Mythical Counter-Cultures in America*, New York: Harper & Row, 1973.

63. Research funding was given to Dr. Ghilleen Prance, director of the Royal Botanical Gardens at Kew, England, for setting up the rain forest in Biosphere II; the Yale School of Forestry and Ecological Science was given \$20 million to create the Yale Institute of Biospheric Studies, and \$40,000 to work with Biosphere II on ‘carbon budgeting’; the National Center for Atmospheric Research, funded through U.S. taxpayers via the National Science Foundation, directed \$100,000 into Biosphere II (matched by the Biosphere funders); the Smithsonian Institution received at least \$400,000 for the consultancy of Dr. Walter Adey and Dr. Thomas Lovejoy; and the Environmental Research Laboratory (ERL) at the University of Arizona was paid \$5 million to participate in research leading up to Biosphere II. See COOPER, Marc. “Take This Terrarium and Shove It,” op cit.

3. Masculinist Cults, Space Escapes, & Other Techno-Solutions for Climate Change

Taxes takin' my whole damn check,
 Junkies makin' me a nervous wreck,
 The price of food is goin' up,
 An' as if all that shit wuzn't enough:
 A rat done bit my sister Nell.
 (with Whitey on the moon)
 Her face an' arm began to swell.
 (but Whitey's on the moon)

Was all that money I made las' year
 (for Whitey on the moon?)
 How come there ain't no money here?
 (Hmm! Whitey's on the moon)
 Y'know I jus' 'bout had my fill
 (of Whitey on the moon)

Gil Scott-Heron,
 "Whitey on the Moon" (1970)

After the space race of the 1950s and 1960s, and the experiments with Biosphere II in the 1980s and 1990s, huge amounts of money—both government funding and private investments—in conjunction with a masculinist conception of technoscience have continued to power space exploration. As early as 1967, Barron Hilton, president of Hilton Hotels, envisioned putting hotels in space, and similar proposals in the 1970s from Princeton physicist Gerry O'Neill for human habitations in space are now cited by NewSpace proponents as prescient inspirations.⁶⁴ Coined by the Space Frontier Foundation (SFF) in 2006, the term "NewSpace" primarily refers to wealthy entrepreneurs who have launched corporations with names like SpaceX, Virgin Galactic, XCOR, and Bigelow Aerospace, with the primary purpose of designing and promoting space tourism independent of NASA. Their success seems immanent: in late 2010, Virgin Galactic conducted its first landing of WhiteKnightTwo at Spaceport America in New Mexico, with plans to fly customers to suborbital space by 2013; SpaceX's Falcon 9 rocket with its Dragon Space Capsule was

64. See DICKENS, Peter, "The Cosmos as Capitalism's Outside," *Sociological Review*, 57:s1(May 2009), pp. 66-82. 71; and David VALENTINE, "Exit Strategy: Profit, Cosmology, and the Future of Humans in Space," *Anthropological Quarterly*, 84:4 (2012), pp. 1045-1068. 1053.

launched in 2010 and on May 25, 2012, the Dragon successfully docked at the International Space Station.⁶⁵

What motivates these NewSpace advocates? According to Peter Dickens, the cosmos has become capitalism's new "outside," and these "outer space imperialisms" are now seeking "outer spatial fixes"—investments in outer space—to solve the crises of capitalism.⁶⁶ President Eisenhower's neologism of the "military-industrial complex" has become the "military-industrial-space complex" inventing new enemies that require increased surveillance and funding for defense contractors such as Raytheon, General Dynamics, Lockheed Martin, Boeing, and Northrop Grumman. The inter-imperialist rivalries from the Cold War have expanded the world into three power blocs competing for outer space: the USA (whose Department of Defense philosophy is called "Full Spectrum Dominance"), Europe, and China. According to Dickens, three arguments are used to legitimate "outer spatial fixes": appeals to the "pure, universal, scientific knowledge to be supposedly gained" by outer space exploration; benefits to the global environment and world population, including "monitoring" of ecological conditions, collecting solar energy for a world running out of resources, and "protecting" citizens' freedom; and fulfilling the biologically-engrained need of humanity to "explore," and "conquer new horizons," releasing the "human potential" that enabled earlier colonialist ventures.⁶⁷ The gendered and colonialist rhetoric of these arguments needs little commentary: they present science as value-free and acontextual, and scientific knowers' identities are constructed via rugged individualism and conquest, all features of masculinism; and these arguments appeal to fear, satisfying a false need for more "monitoring" when global monitoring already confirms the ecological conditions of a climate change crisis (i.e., melting polar ice, increasingly severe weather events, record-breaking heat, drought, species migrations and extinctions, etc.).

Moreover, using outer space to collect solar energy for a world running out of resources presumes we have exhausted our capacities to collect solar energy here on earth, when this is far from accurate; however, this assumption does express the ideology of NewSpace in its rejection of "limits to growth" positions popular since the 1970s. According to NewSpace advocates, space has boundless amounts of energy, fuel, minerals and land mass; it can provide space-based solar power, metals from mining asteroids, and expanded free

65. VALENTINE, *op cit.*, p. 1054, 1046.

66. DICKENS, *op cit.*, p. 68.

67. *Ibid.*, pp. 78-79.

markets.⁶⁸ Attending the conferences of NewSpace advocates, David Valentine found three sub-groups, each with a different perspective on the purposes of space exploration. At the Space Investment Summits conference, Valentine heard frequent iterations of “space is expensive,” from investors primarily interested in the “exit strategy,” or point at which a business can be sold and investors can reap their profits.⁶⁹ But at the National Space Society’s International Space Development Conference (ISDC), the slogan was “Space is a place, not a program”: here, advocates see space as a “privileged destination” because “the species depends on it.”⁷⁰ This view leads to Valentine’s third group, which measures the success of NewSpace by the point at which “humans don’t have to return to Earth.”⁷¹ These suggestions are eerily resonant with images of Laika in Sputnik 2’s no-return voyage of 1957, or Stanley Kubrick’s *2001: A Space Odyssey* (1968) concluding image of a human fetus floating in outer space, without mother or womb or earth for food, warmth, nurturance. Such images of the future are not “astroenvironmentalisms”⁷² but Icarian, hubristic anti-environmentalisms infatuated with the sublime, defined by Edmund Burke as vastness, darkness, infinity, vacuity, difficulty and danger, confronting us with our mortality and our insignificance in relation to something much greater than ourselves.⁷³ As Patrick D. Murphy has ably argued, the sublime is antithetical to an ecofeminist environmental ethic.⁷⁴

Here on earth, technoscientific attempts to mitigate the pace and effects of climate change are being undertaken by heroic entrepreneurs operating outside the bounds of government. Geoengineering is now attempting to substitute for the real and difficult work of reducing emissions; bringing corporations

68. VALENTINE, op cit., p. 1052.

69. Ibid., p. 1056.

70. Ibid., p. 1050, 1057.

71. Ibid., p. 1058. Valentine’s article advocating that the NewSpace adherents be taken seriously—“How do we take this cosmology seriously without thinking that we already know the answer?”—was funded, in part, by the National Science Foundation; see pp. 1064-1065.

72. This term is used in HENRY and TAYLOR, op cit., p. 200. Their idea that we must extend environmental ethics to include and address “space junk” and other polluting particles fits well with a feminist eco-ethic; my concern here is that until we enact genuine environmental justice here on earth, we cannot pretend to be achieving such environmentalisms in space, or to propose those as a replacement or negation of the need for such actions on earth.

73. SMITH, Warren, “To Infinity and Beyond?” *Sociological Review* 57:s1 (2009), pp. 204-212. 209.

74. MURPHY, Patrick D. “An Ecological Feminist Revisioning of the Masculinist Sublime.” *Revista Canaria de Estudios Ingleses* 64 (Summer 2012), pp. 79-94.

and governments in line with real climate science facts, and creating policies affecting the behaviors and economics at all levels (governments, corporations, communities, individuals); and ultimately adapting to and seeking to mitigate the unavoidable effects of climate change already occurring. After the NASA space race and Biosphere 2, huge amounts of money are still deciding national and international responses to climate change. Who benefits from such denials of ecological science and the ecological humanities, and who pays for those benefits?

As Naomi Klein explains, geoengineering involves “high-risk, large-scale technical interventions that would fundamentally change the oceans and skies in order to reduce the effects of global warming.”⁷⁵ The strategies being considered include “pumping sulfate aerosols into the upper atmosphere to imitate the cooling effects of a major volcanic eruption and ‘brightening’ clouds so they reflect more of the sun’s rays back to space.”⁷⁶ Today, backed by the U.S. House Committee on Science and Technology, the British Government, and billionaire Bill Gates, scientists are preparing to “actively tamper with the complex and unpredictable natural systems that sustain life on earth — with huge potential for unintended consequences.”⁷⁷ The most frightening features of geoengineering are that earth’s systems are connected in ways scientists still do not fully understand (witness Biosphere II) so that geoengineering efforts in one part of the globe could trigger disastrous outcomes in another part of the globe—and there’s no oversight mechanisms in place. Unlike the United Nations Convention on Climate Change, which proposes a community-wide, nation-by-nation commitment to lower greenhouse gas emissions, any individual or group with the will and the funding can attempt a geoengineering “solution.”

Like shooting chimps into space, confining Biosphereans and their “food animals” inside a glass dome, or creating hotels and shuttles for tourists in NewSpace, geoengineering follows the same misguided assumptions that have brought us to the current climate crisis: the belief that humans are somehow separate from and above nature, and humans must control nature. This cultural belief is a deeply Euro-western articulation of heteromascularity whose key characteristic is dominance—physical, economic, political, military, ecological, psychological, emotional, and sexual dominance. Feminists

75. KLEIN, Naomi. “Geoengineering: Testing the Waters,” *New York Times*, October 27, 2012. Accessed online at <http://www.nytimes.com/2012/10/28/opinion/sunday/geoengineering-testing-the-waters.html> on 11/6/2012

76. *Ibid.*

77. *Ibid.*

and anthropologists have described these colonialist Euro-western cultures as “warrior *cults*” shaped and inflected by the assumptions and ideology of cultural heteromascularity. If “we” are not above and in control of nature—whether via imperialism of other non-dominant people, places, and species, or via techno-scientific animal experimentation under the guise of space exploration—then “we” cease to be “real men” and thus cease to be human, becoming not just “humanimals” (Haraway’s term) but more specifically, *earthanimals*. As this essay demonstrates, animals in space are, ultimately, dead animals. Rather than face our *entanglement* with the rest of nature,⁷⁸ and the strengths and limitations of our own *earthanimalities*, outer space advocates pursue techno-scientific solutions in the anthropocene when our future depends on confronting and reducing the causes of climate change itself: industrial, agricultural, and transportation processes and productions, including deforestation and animal-based food production, that are increasing greenhouse gases via first-world overconsumption habits, as climate justice activists from Doha to Detroit agree.

4. Conclusion: Toward Eco-Masculinities on Earth

In *Nature Ethics*, Marti Kheel argues that the social construction of dominant masculinity is inherently anti-ecological for the ways it “idealizes transcending the [female-imaged] biological realm, as represented by other-than-human animals and affiliative ties” and “subordinate[s] empathy and care for individual beings to a larger cognitive perspective or ‘whole.’”⁷⁹ Of major significance is Kheel’s insight that *all environmental ethics are constructed through the lens of gender*. If environmental ethicists and activists want to make more conscious choices about that lens, particularly in the ways that it influences the environmental sciences and humanities, economics and politics, then we’ll need to envision more sustainable, just, and diverse expressions of eco-genders, eco-masculinities, and eco-sexualities.⁸⁰ Already, the climate justice movement has benefitted from the new social movements and radical environmentalisms of the late 20th century, but as even the internationally-acclaimed 350.Org shows, there’s still room to grow.

78. If developed in conjunction with the insights of feminist animal studies, material philosophy (and its use of the term “entanglement”) has the potential to aptly describe our animal embeddedness with earth’s vibrant matter.

79. KHEEL, *Nature Ethics*, op cit., p. 3.

80. For a discussion of ecomasculinity, see GAARD, Greta, “Toward New Eco-Masculinities, Eco-Genders, and Eco-Sexualities,” in ADAMS, Carol and Lori GRUEN, eds., *New Ecofeminisms: Intersectionalities with Animals and the Earth* (forthcoming).

On November 30, 2012, Bill McKibben's "Do the Math" tour made a stop in Minneapolis to update our branch of climate justice activists, MN350.Org, on the challenges and next steps for the climate justice movement. Introduced by folk singer Mason Jennings, with presentations from Marty Cobenais of the Indigenous Environmental Network (IEN), Polar explorer Will Steger, and Winona LaDuke of the White Earth Land Recovery Project (WELRP), Bill McKibben's talk featured Minnesota-based video of our grassroots activists, complemented with video of the global 350.Org movement, beginning in 2007 with "Step It UP" through the Copenhagen Convention and beyond. To save transportation costs, McKibben interspersed his talk with taped interviews from Van Jones of Green For All, an organization to develop a green economy that lifts people out of poverty; the producer of "Gasland" documentary, Josh Fox, describing the human and ecological effects of fracking, and the inadequacy of "backyard" or local eco-activisms without an end to climate change; and Archbishop Desmond Tutu from South Africa speaking about apartheid and the divestment strategies of the 1980s. Contrasting the global warming evidence provided by NASA scientist James Hansen, versus the global warming deniers' pseudo-science funded by oil companies and their think-tanks, McKibben demonstrates a more feminist *eco-masculine* approach to scientific knowledge-construction in his methods of building a grassroots and global environmental movement with racially and nationally diverse leaders (though the 1:7 ratio of his selected speakers in Minneapolis shows that simple gender balance is still lacking), his methodologies of encouraging a strong sense of participatory democracy, and his passionate epistemology, which involves listening to and creating community conversations among all those involved in a climate justice movement that benefits all participants. McKibben's "math" equation is simple: $CO_2 + \$ =$ a burning planet.⁸¹ Accordingly, the next step is subtraction: 350.Org plans to encourage international strategies of divestment, withdrawing college and university investments from global oil corporations like ExxonMobil, Shell, ChevronTexaco, BP, and ConocoPhillips.

But where is the awareness of animals, and the intra-action between species justice and climate justice? Though McKibben mentioned "and other species" several times in his talk, his agnostic position on human-other animal relations was articulated in a 2010 essay published in *Orion Magazine*,

81. See MCKIBBEN, Bill. "Global Warming's Terrifying New Math." *Rolling Stone Magazine*, July 19. Accessed at <http://www.rollingstone.com/politics/news/global-warmings-terrifying-new-math-20120719> on 12/3/2012.

and in e-mails from 350.Org.⁸² McKibben and his organization acknowledge that while it's "pretty clear" that eating less meat is a good idea, "we don't really take official stances on issues like veganism," an omission that seems ludicrous to James McWilliams, author of *Just Food: Where Locavores Get It Wrong and How We Can Eat Responsibly*.⁸³ As McWilliams speculates, there are at least three reasons for McKibben's omission, and they aren't flattering: first, getting arrested in front of the White House for opposing the Tar Sands Pipeline models an eco-heroic (and masculinist) stance that garners headline coverage and is "a lot better for 350.org's profile than staying at home, munching kale, and advising others to explore veganism."⁸⁴ Moreover, pipelines provide the media with clear victims, perpetrators, and a narrative of ecological decline that is less visible than the ongoing first-world overconsumption of intensely-farmed animals and their associated ecological impacts—another example of "slow violence" that is harder to make visible.⁸⁵ Second, meat-eating environmentalists who argue that we must replace feedlot farming with rotational grazing, as McKibben does, nostalgically refer to a pre-industrial and pre-agrarian past, implying that nature is more natural in the absence of human beings. In doing so, they reiterate an entrenched human/nature dualism that persists among diverse branches of environmentalisms, despite incisive critiques from posthumanist, ecofeminist, material feminist and other philosophies. Finally, as McWilliams argues, meat-eating seems to represent "personal freedom" and individual choice, while oil pipelines and coal power plants offer more visible and collectively-shared images of environmental impact, a contrast that articulates differences between rights-based ethics and the more feminist relational ethics of care and responsibility. But the effects of animal-based food consumption as well as unsustainable energy and transportation are all contributing to climate change, and some scientists suggest that a change in diet may be as crucial as stopping an oil pipeline. According

82. See MCKIBBEN, Bill. "The Only Way to Have a Cow." *Orion Magazine*, March/April 2010. Accessed at <http://www.orionmagazine.org/index.php/articles/article/5339> on 12/12/2012.

83. For the 350.Org e-mail, see MCWILLIAMS, James, "Agnostic Carnivores and Global Warming: Why Enviros Go After Coal and Not Cows," *Freakonomics.com*, 11/16/2011. Accessed at <http://www.freakonomics.com/2011/11/16/agnostic-carnivores-and-global-warming-why-enviros-go-after-coal-and-not-cows/> on 12/12/2012. See also MCWILLIAMS, James. *Just Food: Where Locavores Get It Wrong and How We Can Eat Responsibly*. New York: Little, Brown, & Co., 2010.

84. MCWILLIAMS, "Agnostic Carnivores and Global Warming," op cit.

85. Rob NIXON coined the term "slow violence" to describe the persistent and degrading effects of environmental injustices in his book *Slow Violence and the Environmentalism of the Poor*. Boston: Harvard University Press, 2011.

to World Preservation Foundation scientists, publishing in the *International Journal of Climate Change*, steep reductions in livestock production, along with returning the world's pastures (a quarter of the land surface) to grow trees, woodland and native perennial grasses, will soak up at least 20 years of carbon emissions.⁸⁶ Why would McKibben and 350.Org overlook this complement to their climate justice eco-activism? In other words, why would they overlook the influence of gender and species on environmental ethics and activism?

In the necessary move to replace anti-ecological masculinist approaches to the environmental sciences and humanities with more ecological masculinities, we can even find seeds of this transition in even the masculinist hunter-environmentalists Kheel has criticized. As Aldo Leopold wrote in *A Sand County Almanac*, "a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it," a change Leopold urged because "the conqueror's role is eventually self-defeating."⁸⁷ In the role of conqueror, science claims to know "what makes the community clock tick," but in fact "the biotic mechanism is so complex that its workings may never be fully understood." Leopold's land ethic defines a set of paradoxes, and offers humans the linked choices that involve our identity, our use of science, our environmental ethics, and our society's rejection of racism and classism: will our culture be "man the conqueror," or "the biotic citizen"? Will science be "the sharpener of [the conqueror's] sword" or "the searchlight on [the] universe"? And will the earth itself, its interdependent ecosystems, plants, animals, and human communities, become the conqueror's "slave and servant" or "a community to which we belong"?

86. See WEDDERBUM-BISSHOP, Gerard and PAVLIDIS, Lefkothea. "Shorter Lived Climate Forcers: Agriculture Sector and Land Clearing for Livestock." *The International Journal of Climate Change* 3:2, pp. 129-144; STEHFEST, Elkie, et al. "Climate Benefits of Changing diet." *Climatic Change* 95:1-2 (July 2009), pp. 83-102.

87. LEOPOLD, Aldo. *A Sand County Almanac*. New York: Oxford University Press, 1949. Marti KHEEL provides a strong and well-supported critique of Leopold's masculinism (which involved lifelong hunting) in her *Nature Ethics: An Ecofeminist Perspective*, op cit. At the end of his life, Leopold continued to evolve his environmental ethics, and in "The Land Ethic" his writing contains implicit acknowledgements of the links among diverse kinds of oppression—gender, sexuality, race, class, nation. Leopold was radically ahead of his time in challenging the very nature of human identity as linked to environmental behaviors and relationships, although such ideas and language were not available to him in 1948.

If we “do the math,” the relevance of these questions to climate science, climate justice and inter-species relations alike become evident.⁸⁸

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88. Special thanks to Lori Gruen for early conversations and resources on chimpanzees in space exploration, and for her reading of this essay’s penultimate draft.

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